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ADGNOSIS

ARTÍCULO CIENTÍFICO

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Impact of artificial intelligence in the Institucion Universitaria Americana in the city of Barranquilla

Impacto de la inteligencia artificial en la Institución Universitaria Americana en la ciudad de Barranquilla

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Abstract

Introduction: Artificial Intelligence (AI) has currently become the evolutionary technology that is most transforming society, including the teaching-learning aspects in the field of higher education; but this can lead to the loss of fundamental human skills and competencies due to over-reliance on the part of students. **Objetive:** This article seeks to examine the impact that artificial intelligence will have on the academic processes of the Institución Universitaria Americana; **Methodology:** the research was approached with a mixed approach, a type of descriptive–reflective study and with a non-experimental cross-sectional emphasis on the impact of AI in education; where a theorization of AI was done, in the field of universities in Colombia, likewise, interviews were conducted with teachers. **Results:** the finding was relevant where students consider positive that AI will improve educational processes, as well as the strengthening of AI research. **Conclusions:** there is potential in the adaptation of AI in learning processes; Therefore, it is imperative to adequately train and prepare academic and administrative staff as a transformative force for educational institutions.

Keywords: *Artificial intelligence; Technology; Higher Education; Future.*

Resumen

Introducción: La Inteligencia Artificial (IA), actualmente se ha convertido en la tecnología evolutiva que más está transformando la sociedad, incluyendo los aspectos de enseñanza-aprendizaje en el ámbito de la educación superior; pero esto puede conducir a la pérdida de habilidades y competencias humanas fundamentales debido a una dependencia excesiva por parte de los estudiantes. **Objetivo:** El presente artículo busca examinar el impacto que tendrá la inteligencia artificial en los procesos académicos de la Institución Universitaria Americana; **Metodología:** la investigación se abordó con enfoque mixto, un tipo de estudio descriptivo – reflexivo y con un diseño no experimental de corte transversal haciendo especial énfasis, en la incidencia de las IA en la educación; donde se hizo una teorización de las IA, en el ámbito de las universidades en Colombia, asimismo, se realizaron unas entrevistas dirigidas a docentes. **Resultados:** fue relevante el hallazgo donde estudiantes y docentes consideran positivo que la IA mejorará los procesos educativos, así como el fortalecimiento en la investigación de la IA. **Conclusiones:** existe un potencial en la adaptación de la IA en los procesos de aprendizaje; por lo que es imperante capacitar y preparar adecuadamente al personal académico y administrativo como una fuerza transformadora para las instituciones educativas.

Palabras Clave: *Inteligencia artificial; Tecnología; Educación Superior; Futuro.*

ADGNOSIS

RESEARCH ARTICLE

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Introduction

Artificial Intelligence (AI) is a constantly evolving technology that is transforming various aspects of society, including education. It is anticipated that, in the future, artificial intelligence will play a crucial role in the teaching-learning process at the higher education level. One of the fundamental advantages of AI lies in its ability to tailor learning in a personalized way to the needs of each student.

In this context, UNESCO (2020) highlights the potential of artificial intelligence (AI) to address current challenges in education and contribute to the achievement of the Sustainable Development Goal (SDG), which seeks to ensure inclusive, equitable and quality education for all. However, the same organization points out the risks and challenges that must be addressed to ensure that the use of AI is in line with the fundamental principles of inclusion, equity and the fight against existing inequalities in access to knowledge, research and diversity of cultural expressions.

According to Moreno (2019):

> AI has a strong potential to accelerate the process of realizing and developing global goals in education by reducing the difficulties of access to learning, automating management processes and optimizing methods to improve learning outcomes; however, the integration of AI into educational settings in certain environments may take time due to the policies and administrative processes of each nation, However, in the current global context of the technological revolution, there are human qualities that still cannot be reproduced by artificial intelligence, such as creativity, the ability to produce new ideas or the capacity to improvise and constantly evolve over time, these limitations are gradually being overcome to achieve a more optimal development that allows going beyond the revolution 4.0 (p.263).

Artificial intelligence systems can analyze each student's data and generate a personalized curriculum that is tailored to their individual needs and abilities. In addition, AI can collaborate with teachers to identify areas where learners require more support, offering additional learning resources accordingly. Another significant contribution of AI to higher education is the automation of administrative and assessment tasks. These systems make it possible to quickly grade exams and tests, allowing teachers to invest more time in teaching and advising (Colombia Aprende, 2022).

Similarly, artificial intelligence (AI) can also contribute to improving accessibility in higher education by providing specific solutions for students with disabilities. For example, the use of speech recognition software benefits students with visual impairments, while reading search engines are a valuable tool for those with learning disabilities. There are studies that show evidence of the ac-

In addition, the field of artificial intelligence and its applications in the educational sector give rise to a multidisciplinary field in which computer science, statistics, psychology and, of course, education converge (Martínez-Comesaña et al., 2023).

In the future, the integration of artificial intelligence in higher education is likely to increase, as it can improve the quality of the teaching-learning process, increase efficiency and reduce the costs of the education system. However, it is crucial to keep in mind that AI cannot completely replace teachers. It is essential to recognize that higher education demands soft skills and a human approach to learning and teaching. In addition, AI should not become a tool to replace student responsibilities, as over-reliance on AI could lead to the loss of fundamental human skills and competencies. Similarly, AI should not hinder diversity and creativity in decision making and educational problem solving (Calvo, 2022).

In line with the above, the following question arises: What will be the impact of artificial intelligence in the academic context at the American University Institution? I n response to this question, it is currently important to analyze the technological factors that are being applied within the university work derived from AI, and that have generated disruption within the teaching-learning processes.

The purpose of this article is to examine the impact that artificial intelligence will have on the academic processes of the Institución Universitaria Americana. In the development of the article, initially, a conceptualization of Artificial Intelligence - AI is made, and then a characterization of the same within the educational sector is made, to later emphasize the impact that these new technologies have in the field of higher education in Colombia. In the results section, a documentary analysis is made, with the support of secondary sources, mentioning the findings of some studies related to the topic studied. In addition to the realization of some interviews to teachers, with special emphasis on the impact that AI may have in this university. At the end, the results are approached as a discussion, making a connotation of them in the university work of the country, and the conclusions are established, showing those relevant aspects derived from the findings obtained in the proposed research.

FRAME OF REFERENCE

2.1. Artificial Intelligence (AI)

The technological development of recent years should not only be analyzed in terms of its positive or negative effects. In the global context, we can observe not only the evolution of societies, but also how these emerging technologies are impacting lifestyles in areas of the world where we live.

such as labor, health, economy and, of course, education (Alonso-de-Castro and García-Peñalvo, 2022). In this educational context, Artificial Intelligence (AI) is presented as a technological tool of great potential for the development of knowledge, teaching and research in general (Vitanza et al., 2019), and it cannot be denied that its expansion is causing a true revolution in the field of information, communication and in the performance of human tasks (Túñez-López and Tejedor-Calvo, 2019). Also, it is impor- tant to consider, that AI can be used to ensure equitable and inclusive access to education (Francesc et al., 2019).

The existence of human intelligence enabled the emergence of the concept of artificial intelligence (AI) in the 1950s, as a means to program a computer and make it behave intelligently (Turing, 2006; Buchanan, 2006). Today, Artificial In- teligence is considered one of the most significant inventions of the fourth industrial revolution (Jeon & Suh, 2017). In addition, digitization, Internet access and global interconnectedness have transformed the way people, businesses and governments operate, colla- borate and interact (Hardy, 2009; Subramanian, 2016).

Engelbart (1962), evidenced that information technology increases human creativity and capabilities. The term Artificial Intelligence presents the relationship between fully human and fully automated options (Kyllonen et.al., 2010). In this sense, they are collaborative tools that improve the efficiency of human intelligence (Breemen et al., 2011).

Artificial Intelligence was first mentioned in 1956 during an informatics conference held by McCarthy at Dartmouth College, which was attended by leading mathematicians and scientists over an extended period of time (Pan, 2016). At that time, algebraic algorithms developed on computers were used to solve alge- braic problems, equations, and even to speak English. Today, Artificial Intelligence is applied in various fields of knowledge, such as telematics, voice recognition, medical diagnostics and, more recently, in autonomous vehicles and voice-controlled assistance (Frank, 2019).

2.1.1. Characteristics of Artificial Intelligence

Artificial Intelligence is a program that has the ability to recognize patterns and a c t on them, therefore, this technology has achieved significant results in many fields. Several authors have made important contributions to artificial intelligence in specific fields. Park and Lee (1998) developed innovative speech and pattern recognition algorithms that improved user interfaces. Abellan-Nebot and Subirón (2010) created intelligent control systems based on fuzzy logic for industrial processes. It is mentioned that García (2009) pioneered the use of neural networks to detect faults in internal combustion engines. In addition, Uraikul et al. (2007) built a novel fuzzy expert system to monitor and control water quality.

For their part, Liu et.al. (2018) devised a cutting-edge deep learning method for detecting errors early in manufacturing equipment, and Topol (2019), advocated in a manner

The authors have been convincing for the incorporation of artificial intelligence in medicine to improve patient diagnosis and follow-up. Together, these authors have expanded the frontiers of artificial intelligence applications, contributing significantly in areas such as pattern recognition, process control, fault detection, prognosis and medical applications of AI. Currently, one of the most relevant computing trends shaping artificial intelligence is the Internet of Things (IoT), in which approximately 50 billion devices will be connected by 2020, generating massive amounts of data (Evans, 2011).

According to Badaró et al. (2013), artificial intelligence (AI) refers to "the emulation of the intellectual capacities of the human brain" (p.35). It is also considered that AI deals with the design of intelligent systems, whose characteristics are associated with intelligence in human behavior. For their part, Mariño and Primorac (2016) state that AI is conceived as part of informatics, which provides "A diversity of methods, techniques and tools to create models and solve problems by simulating the behavior of conscious subjects" (p.232).

It is also conceived that AI is a science aimed at the search for a deep understanding of intelligence, considering its delimitation, its possibilities and characterizing it as a challenge of enormous complexity (Herrera and Muñoz, 2017). However, the concept of artificial intelligence is not new. In 1978, Bellman proposed that artificial intelligence is related to the automation of activities related to human thought processes, such as decision making, problem solving and learning, among other aspects (Bellman, 1978). According to Buchanan (2006), artificial intelligence is not limited to robots; rather, it encompasses the ability to program computers and other technical devices to understand the nature of intelligent thought and action.

Similarly, Schalkoff (1990) argues that artificial intelligence focuses on the explanation and emulation of intelligent behavior through computational processes. For their part, Russell & Norvig (1994) explain that artificial intelligence is defined as the combination of algorithms aimed at creating machines with abilities equivalent to those of human beings. On the other hand, Dean et al. (1995) consider that artificial intelligence refers to the design and study of computer programs that exhibit intelligent behaviors. Winston (1984) defined artificial intelligence as the study of ideas that enable computers to act intelligently (Benaich & Hogarth, 2019). This contribution by Winston (1984) highlights the nece- sity of developing ideas and concepts to get machines to exhibit human-like intelligent behavior, therefore, this early conceptualization has been widely cited about the field of AI.

2.2. Artificial Intelligence (AI) in Higher Education

In the case of higher education, AI is undoubtedly projected to increase work capabilities in various interdisciplinary areas through the implementation of new intelligent machines with the ability to process large volumes of information, learn by themselves and improve. For Osetskyi et al. (2019), artificial intelligence has been consolidated as a new technology in the field of artificial intelligence.

The adoption of the new system is transforming the international educational landscape. Its adoption is transforming the landscape of international education. Likewise, Osetskyi et.al. (2019) state that artificial intelligence is making its presence felt in the world through robotics or algorithms, and its influence is increasing in the educational field. It is considered that the immersion of AI in education has been a "silent" process in conjunction with other established technologies, such as virtual campuses and academic social networks (Flores-Vivar and Zaharía, 2019).

At a general level, there is a consensus that, given the reality of AI, teachers must acquire new digital skills in order to take greater advantage of these new technologies, considering that people in today's society are increasingly dependent on communication and information technologies, and the education sector is no stranger to this dependence (Aguaded and Romero-Rodríguez, 2015). This integration would be beneficial for students by providing them with an increasing understanding of how to interact with artificial intelligence systems, make informed decisions and prepare them to understand the social impact that the future widespread adoption of artificial intelligence will have in areas such as employment, health, democracy and their daily lives in general.

According to Salazar & Benjamins (2021) artificial intelligence makes it possible to optimize:

> Each student's experience is based on hyper-personalization. The learning path of each student, maximizing results and minimizing the possibility of abandonment. The effectiveness of the content, i.e., of the educational material based on a deep understanding of what works and what can be improved (p.146).

The above paragraph highlights the capacity of AI to personalize education to the level of each student, to adapt learning according to individual needs, to analyze and improve content based on data, and therefore, it is a relevant contribution to the discussion on the impact of AI in the educational sphere.

Technological evolution has brought with it both detractors and promoters of the application of emerging technologies within the educational context. In the case of AI, this technological ecosystem is composed of different software components and services that share semantically defined data flows, therefore, its development is applicable to the educational field (Gar- cía-Holgado & García-Peñalvo, 2019).

However, the influence of algorithms and robotization in the field of education has generated concerns in the world, because it can be thought that, in the future, these robots driven by artificial intelligence could replace teachers (Spirina, 2018), but despite this, there are more voices in favor of the application of these technologies in the educational field, considering that teachers are in a golden age with AI (Craig, 2018; Selwyn, 2019; Benjamins & Salazar, 2020; Oliver, 2020; Fengchun & Wayne, 2021; OECD, 2021; Ramírez-Montoya et al., 2022).

What cannot be denied is that AIs have eliminated the demand for work in various disciplinary areas, including education itself, but it cannot be forgotten that these tools are

The AI will play a key role in the field of education, due to its great capacity to create content, support research and provide algorithmic assistance to teachers. Moreover, AI is expected to generate more jobs than it eliminates (Fundación Telefónica, 2015). Although many authors are skeptical about this topic, several experts have an optimistic view about the impact of AI on education. They believe that its adoption will improve the learning experience of students, as it will enable the creation of personalized adaptive learning models and tools (Flogie & Aberšek, 2021).

For UNESCO (2021), AI will have different roles in the field of education globally, such as universal access, intelligent tutoring systems, virtual facilitators, intelligent content, collaboration between teachers and AI, content analysis, tutoring support outside the classroom, and automating administration tasks, among others.

In this sense, Flores-Vivar & García (2023) state that the advance of emerging technologies could be aimed at transforming teaching and learning, which would imply an interruption in education as we know it today. With this in mind, experts agree that Artificial Intelligence in education has the mission of contributing to the planning, personalization, visualization and facilitation of the learning process.

In consideration of the above, the potentially transformative influence of artificial intelligence in education and the various areas in which AI is expected to bring improvements are highlighted. These benefits suggest that the careful integration of artificial intelligence in education has the potential to significantly improve the quality, accessibility, and efficiency of teaching and learning.

2.2.1. Application of AI in the education sector

In relation to programs and countries that are applying AI in their educational processes, initial mention is made of the Ceibal Plan, in which specific programs are identified in the areas of Mathematics and Science. At the National University of Colombia, the Data Analysis Laboratory is being developed with AI support, where students from different academic levels, both undergraduate and graduate and with diverse backgrounds, receive training in artificial intelligence and data science with the purpose of addressing real problems that have a local impact. In addition, reference is made to the Valentina program, an initiative that seeks to foster the development of talent with the aim of reducing unemployment and underemployment in Guatemala and other parts of Latin America. Through a novel and comprehensive approach, it fosters future skills in talented young people, optimizing their capabilities and possibilities in line with the demands of the labor market in the digital era (Organization of Ibero-American States for Education, Science and Culture [OEI], 2023).

Another application of AI in educational programs in Latin America is the ESTER Platform by the Ministry of Education of Panama, in which this platform has been designed so that students can master the training and evaluation contents in an attractive and entertaining way through learning activities. It offers access to training programs

from any mobile device and is available through applications for iOS and Android devices. In Peru, the National Artificial Intelligence (AI) Strategy stands out, and this Peruvian AI system is an electronic-mechanical system capable of making predictions, recommendations and decisions that influence real or virtual environments to achieve goals set by humans. On the other hand, some higher education institutions have developed various initiatives with the aim of addressing emerging technologies in general, with special attention to artificial intelligence; such is the case of the University of Buenos Aires (2023) through "the Innovation and Artificial Intelligence Laboratory (IALAB) of the Faculty of Law offers a research proposal and an academic offer linked to this topic" (p.1).

In Colombia, the Colombian Ministry of National Education and the Explora Park are collaborating in the development of the NOVACAMP Challenge, "a national digital camp to explore, feel and create. In this active learning experience you will have the opportunity to meet people from all over the country as you overcome the different levels of your challenge" (Monto- ya, 2021, p.1).

According to a report presented by the Organization of Ibero-American States - OEI (2023), about the future of Artificial Intelligence in education in Latin America, it is considered at a general level that AI can be a favorable factor for all educational institutions in Latin America, because it has the ability to reduce educational disparities both nationally and internationally is evident.

However, academics are more pessimistic about these dimensions and the future role of artificial intelligence in the educational field in Latin America, considering that it will generate an unfavorable disruption in the university professoriate and a certain displacement of teaching staff in higher education, since technological resources can transmit knowledge with certain relative advantages over time.

On the other hand, the ability to transfer data in real time and the agility to re-solve academic problems are some of the aspects that are becoming a serious concern for teaching in universities. But despite this, until the year 2030, although there is still uncertainty about its potential impact in the near future (Organization of Ibero-American States [OEI], 2023).

2.2.2. Impact of AI in the university sector

Continuing with the impact of AI in higher education, this technology has the potential to create new options external or complementary to educational institutions by directly providing students with digital learning experiences. In addition, AI can play an important role in automating the assessment of learning, thus facilitating feedback more efficiently for students. This process can help teachers focus their task on more teaching time or indivi- dual tutoring with students (Organization of Ibero-American States [OEI], 2023). What is a

The undeniable fact is that AI will transform the environments and possibilities of university education, and it should be conceived that, with the advent of AI in higher education, a set of skills can enable "people to access, understand, analyze, create and use the digital environment critically, ethically and creatively" (Mor- duchowicz, 2020, p.4).

It is generally considered that the use of Artificial Intelligence by university students could lead to plagiarism, facilitation, and laziness in the study and research processes, in addition to the fact that it could jeopardize teaching, due to its ability to process, analyze and synthesize information in an agile and accurate manner. In this sense, Boude (2023) states that "if teachers are assigning tasks to students that can be answered by artificial intelligence (AI), are they really helping them to learn, are they assessing competencies correctly" (p.1). Therefore, this author states that it is necessary to review these alternatives to evaluate learning through these technologies, and to confer the need to begin to further develop autonomy, collaborative work, the joint construction of knowledge and to strengthen the academic training processes.

Given the risk of AI in universities, it should be understood that this system is similar to that of human intelligence, which can automatically provide knowledge and training to create intelligent applications to facilitate problem solving (Bali and Bali, 2022), and therefore, it cannot be an impediment to the development of educational processes, but rather, tools that should help strengthen it, and although AI is a system that thinks rationally and possesses capabilities of human behavior and knowledge, such as understanding human language, storage, memory, judgment and problem solving (Halim & Prasetyo, 2018), this should not be an obstacle to its use for educational service in universities.

It is evident that there are several related studies of how university-level teachers adopt AI in emerging practices at the higher education level. One such research was conducted by McGrath et al. (2023), who conclude that, in terms of competence building, university teachers may require training to understand the implications of artificial intelligence technologies in their teaching, thus more effectively preparing themselves for other technologies that are currently being incorporated in higher education. In particular, the use of ChatGPT by teachers is perceived as a tool that generates high expectations due to its disruptive potential (Kei- per et al., 2023). This recognition of expectations and disruptive potential suggests that the adoption of ChatGPT is being considered as a significant contribution in education (Ratten & Jones, 2023).

On the other hand, the use of AI is enabling digital transformation and eliminating barriers in the teaching-learning processes in education, especially at the higher education level. Removing internal barriers can be achieved through teacher training, involving strategic planning, professional development and the promotion of a collaborative culture. In addition, external barriers are addressed by ensuring that

necessary resources, establish more favorable educational policies for arti- ficial intelligence (AI), and foster collaborative practices among stakeholders (Keung & Wang, 2023; Lukić et al., 2023; Chiu et al., 2023; Li, S. et al, 2023; Li, M. D. et al., 2023; Vecchiarini & Somia, 2023; Su et al., 2023; & Márquez et al., 2023). Similarly, "the use of AI (artificial intelligence) and ML (machine learning) in educational pedagogy will undoubtedly enhance transformative changes in academic pedagogical engagements" (Okagbue, 2023).

AI tools should be used in education to explain and assist with learning and teaching (Senior & Gyarmathy, 2021). Gyarmathy, 2021), and perhaps the biggest impediment to the integration of AI in educational processes in universities is the scarcity of expertise in AI technology on the part of teachers, which has become an imperative, to study and acquire new cross-cutting skills and knowledge in AI, Therefore, a good AI implementation plan is required to dispel doubts about the use, advantages and integration of such a technological tool in favor of knowledge construction in universities (Lianu et al., 2022, Alonso et al., 2019; Mahmud et al., 2020). University teachers should consider that implementing AI in their academic work can be assimilated in terms of opportunities, and not so much in terms of challenges or concerns that can be overcome in the formative development as such (Kuleto et al., 2021a; 2021b; 2021c).

METHODOLOGY

The article presents a descriptive-reflective approach, with special emphasis on the impact of AI on education at the American University Institution. The research is based on secondary sources of information, which were consulted in databases, and applying a documentary analysis of studies conducted on the subject at the international, national and local levels. In relation to the primary sources, the results of the survey on AI directed to students, teachers and administrators at the American University Institution are described.

In the development of the article, a theorization of AI is made, validating some key aspects of the same, and making a contextualization of this phenomenon in education, and specifically, in the field of universities in Colombia. In relation to primary sources, interviews were conducted with teachers of the Institución Universitaria Americana, with the purpose of identifying the impact that artificial intelligence has had on their academic work at the university. The results contain an analysis of the incidence of AI in the Institución Universitaria Americana, and at the end, a conclusion is drawn about the results obtained and possible recommendations on the researched topic.

The reference population of the research is made up of 7409 students, 200 teachers and 12 administrative personnel, from which a probabilistic sample is extracted for students and teachers, through the application of a sampling formula for finite data whose formula is:

$$n = \frac{N\,Z^2\ \ pq}{d^2\ (N-1) + Z^2\ \ pq}$$

Donde: N = Total de la población
Z= 1.75 al cuadrado (si la seguridad es del 96%)
p = proporción esperada (en este caso 6% = 0.06)
q = 1 – p (en este caso 1-0.05 = 0.05)
d = precisión (en su investigación use un 5%) (Aguilar, 2005)

Entonces: N =7409, d = 6 % = 0.06, Z = 96 % ≈ 1.75, p = 0.5 ∧ q = 0.5

$n = [(7409) \times (1.75)^2 \times (0.5) \times (0.5)] / [(0.06) \times (7409 -1) + (1.75)^2 \times (0.5) \times (0.5)]$
$n = 5676 / (26.66 + 0.766) = 5676 / 27.4 = 208$

Para el caso de los docentes se aplica la misma fórmula:
$n= [(200) \times (1.75)^2 \times (0.5) \times (0.5)] / [(0.06) \times (200-1) + (1,75)^2 \times (0.5) \times (0.5)]$
$n = 153.6 / (11.94 + 0.766) = 153.6 / 12,706 = 12$

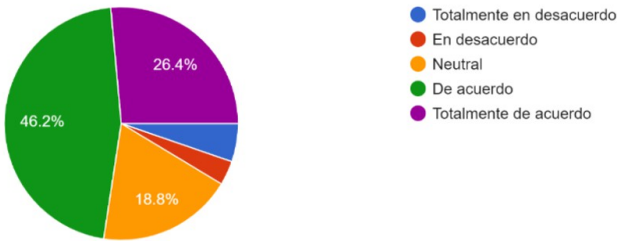
From the total population, a sample of 208 students and 12 teachers was obtained. In the case of the selection of the sample of administrators, and in consideration of the limitations of the study, a convenience sample was established by determining a number of 12 people who hold administrative positions at the university. The following is a description of the results of the survey of 208 students, 12 teachers and 12 academic administrators on Artificial Intelligence (AI) at the American University Institution.

RESULTS

4.1. Results of the student survey

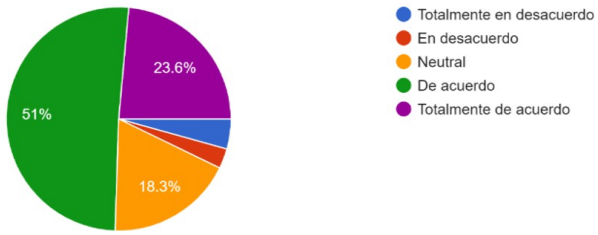
In relation to the findings of the student survey on Artificial Intelligence (AI) at the American University Institution, a large majority of students (72.6%) believe that AI will improve the educational processes at the American University Institution, and 84.6% believe that AI has a positive effect on the academic environment (see Figure 1).

Figura 1
Mejora de los procesos educativos



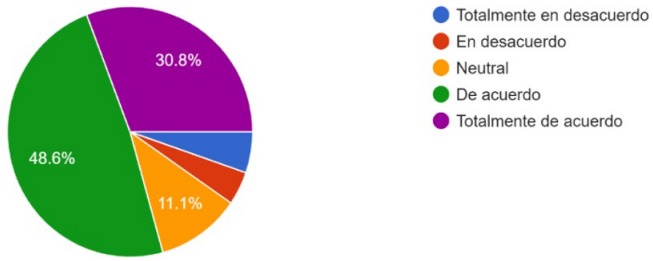
The results of the survey reflect a broadly positive view, with 78.4% of students thinking that AI can enhance the processes of creativity and innovation at the institution. However, the student community is divided in that 38% think that AI can influence academic decisions, while a similar percentage (37%) has doubts about this aspect (see Figure 2).

Figura 2
Impacto en entorno académico



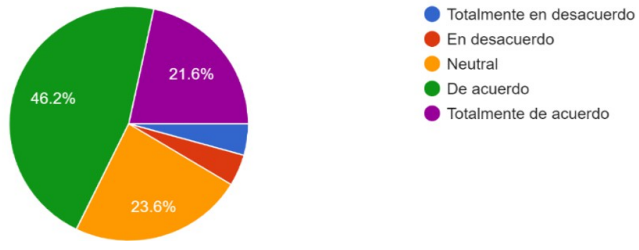
Likewise, a significant number (80.7%) of students believe that AI can improve the overall quality of universities, and 77% believe that this instrument can raise the quality of education specifically at the American University. In addition, a large 84% of students are willing to receive additional resources to make the most of AI in their learning (see Figure 3).

Figura 3
Mejora de la innovación y la creatividad



The survey also shows that there is recognition of the potential challenges, with 43.3% of students acknowledging that there are challenges in implementing AI in education. However, there is some concern that AI may reduce academic effort, with 23.6% agreeing that it may have a negative effect and 11.1% strongly agreeing with this statement. On the other hand, 67.8% of the students expect a strengthening of AI research (see Figure 4).

Figura 4.
Fortalecer la investigación



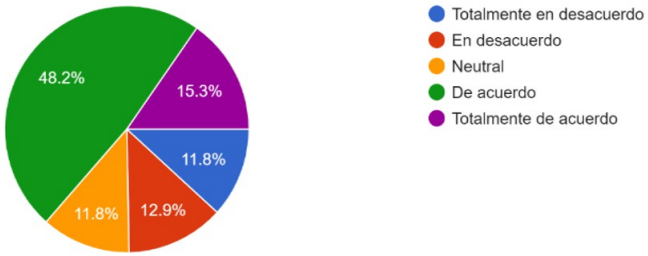
In summary, the overall perception of American University students regarding AI is positive. Most see AI as a powerful tool for improving educational quality, fostering creativity, and strengthening research. However, there are legitimate concerns about the challenges of implementing AI and its possible influence on academic decisions and student effort. In that sense, it is vital that the university address these concerns when considering the implementation or expansion of AI technologies on college campuses.

4.2. Results of the teacher survey

In relation to the survey of teachers, 60% of them say that AI can improve the quality of education at the American university. For the majority, 51.8%, the university is already using AI to personalize student learning. The majority of respondents (63.5%) believe that AI facilitates collaboration between students and faculty (see Figure 5).

Figura 5

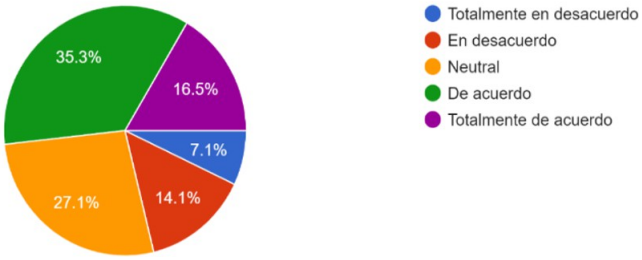
Colaboración entre docentes y estudiantes



Similarly, 63.5% believe that AI fosters innovation and creativity in teaching. On the other hand, half, 49.4%, believe that the university is promoting research and development in AI and 25.9% are not sure about it. In addition, 51.7% say that AI facilitates faster and more detailed feedback on student performance and, conversely, 31.7% disagree with this statement (see Figure 6).

Figura 6

Personalización del aprendizaje



Personalization of learning

Similarly, the survey shows that 49.4% believe that AI will improve educational accessibility and more than half (55.5%) believe that AI will enhance personalization and adaptability.

of educational resources. However, 24.7% have doubts about it. As for how AI is collaborative with library and resource management, 54.1% say that AI has improved the efficiency of library and resource management. A significant finding of the survey is that almost half of the faculty (45.9%) say that the university guarantees fairness and impartiality in the use of AI. This reflects a moderate confidence that the institution is taking measures to avoid bias and discrimination in automated decisions.

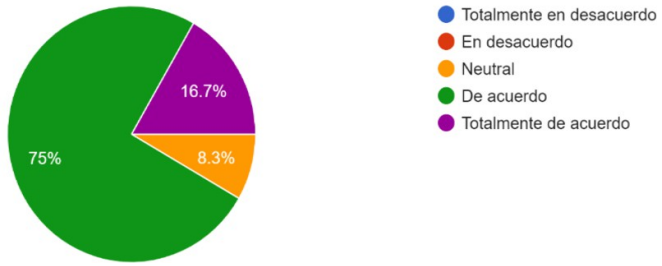
In general, the vision of teachers about the integration of AI in the American University Institution environment is predominantly positive. Teachers believe that this tool can boost quality, personalization of learning, collaboration and innovation. However, there are areas in which a significant proportion of teachers have doubts or do not agree. The institution, in planning its AI strategy, should take these areas of uncertainty into account and work to address the concerns and maximize the bene- fits. Also, while a reasonable proportion of faculty are confident that the institution is adequately addressing the ethical challenges of AI, there are a considerable number who are unsure or do not have a formed opinion. This could indicate a need for more transparency and communication from the university about how potential biases and discriminations in automated decisions are being addressed. It might also be useful to conduct training or workshops to inform and educate faculty about actions taken in this area.

4.3. Results of the administrative survey

In the case of the administrative survey, 67.7% believe that AI will improve these processes and 91.7% state that AI will have a positive impact on the overall functions of the institution. On the other hand, 41.7% disagreed that AI presents significant risks to administrative processes, while only 33.3% agreed, indicating a balance towards a perception of lower risk. Regarding institutional collaboration, the majority of respondents (83.3%) consider that AI facilitates collaboration among students, professors and administrators. Likewise, 86.7% of administrators believe that, although AI brings advantages, it also generates challenges at the administrative level, but despite this, 75% of administrators believe that AI could improve the quality of education (see Figure 7).

Figura 7

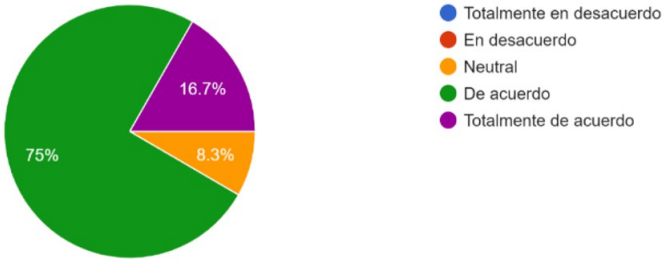
Impacto positivo en áreas funcionales



There is also a shared perception regarding personnel preparation, with 41.7% being neutral and 33.4% disagreeing that adequate measures are being taken. The majority (58.3%) are neutral as to whether sufficient support and resources are in place, and only 25% believe that such support is in place (see Figure 8).

Figura 8

Desafíos en lo administrativo



For 66.7%, collaboration between administrative staff and teachers in the use of AI is favorable for the educational process. In turn, a significant percentage of respondents (83.4%) stated that AI will have a significant impact on the future development of the university.

DISCUSSION

In consideration of the theory already expressed, in the development of this research, and based on the results obtained in the survey of students, faculty and administrators at the American University Institution, the analysis of these empirical results reflects an overall positive perception of Artificial Intelligence (AI) at the American University Institution. However, some areas of ambiguity and concern emerge that merit a de- carved discussion. In the case of students, the consideration of AI as a powerful tool for educational improvement, both in processes and in the academic environment, may stem from previous experiences with educational technologies, future expectations, or the current drive toward digitization of education.

Similarly, the fact that a significant proportion of students associate AI as a potential for innovation and creativity reflects an evolved understanding of the technology beyond its utilitarian use, seeing it as a tool that can enrich the educational process. In relation to academic decision making regarding the application of AI, some may value the potential of AI in personalizing and adapting learning, while others may be concerned about autonomy and objectivity in automated decision making.

There is optimism regarding confidence in artificial intelligence (AI) as a catalyst for raising educational standards, both in a general context and at their specific university. Likewise, the search for additional resources reflects a proactive attitude on the part of students towards AI, as they are willing to engage and adapt, but are waiting for the right support.

However, recognition of the challenges inherent in implementing AI at the university cannot be ignored. These may include concerns about accuracy, objectivity, or simply effective integration into the curriculum. On the other hand, the fact that some students are concerned that AI may diminish academic effort is a signal to educators of the need to maintain a balance between automation and human effort in the learning process. Students also perceive AI as a means to drive research and inquiry.

As for teachers, there is a widespread view that artificial intelligence (AI) is a key tool for personalizing education. In addition, it is considered that it can improve collaboration between students and teachers, driving future initiatives that use AI to encourage interaction and teamwork. On the other hand, the fact that the majority of teachers believe that AI can enhance innovation and creativity is a testimony to the revolutionary role that AI can play in the academic process, research and university extension. Similarly, faculty perceive that AI is improving resource management, although there is still room to show its impact more broadly. The issue of equity and im- partiality in the use of AI remains a critical area. Faculty perceptions suggest that not everyone is convinced, so the institution needs to work on improving communication and possibly strengthening measures to ensure fairness.

As for administrative staff, their view on artificial intelligence (AI) is similar to that of teachers, as they highlight the growing importance of AI in the educational field. The op- timism regarding the application of AI is notable, focusing on the improvement of administrative processes and its positive impact on general functions. This perspective is fundamental, given that administration is a central axis for the smooth functioning of any educational institution and in which, the issue of risk involved in the introduction of any new technology must be considered. As perceived by teachers, administrators consider that AI facilitates collaboration between different sectors of the university, becoming a communicative bridge between the different functional areas of the institution. However, it is clear that the adoption of AI is not without its challenges. Thus, the potential of AI to improve educational quality aligns with the global trend of integrating technology into higher education in order to achieve better outcomes.

The advent of AI within the context of the American University Institution leads to the need for adequate training and preparation of academic and administrative staff, the provision of sufficient resources for AI, collaborative links between faculty and administrators, where AI can be the bridge between different facets of the university. It is generally conceived that AI comes as a transformative force for educational institutions.

CONCLUSIONS

The American University Institution takes on the challenge of integrating artificial intelligence (AI) into its academic environment, therefore, the opportunities and benefits are clearly recognized.

that AI can bring, as manifested in the enthusiasm of students and the generally positive view of teachers and administrators. Although it is worth mentioning that this optimistic perception is tempered by legitimate concerns about the challenges, uncertainties and possible risks of such integration.

To ensure a smooth and successful transition of artificial intelligence (AI) to the university environment, it is imperative that these institutions adopt a proactive approach focused on continuous communication, education and training. In addition, the need for investment in adequate resources, supports and protocols presents itself as essential elements to maximize the benefits of AI. In this path towards educational digitization, the active involvement and training of the teaching staff stand out as crucial factors to achieve an effective and responsible adaptation of AI in the academic environment.

The importance of AI in the university environment lies in its potential to innovate and enrich the educational process, and therefore, both teachers and students perceive this tool as a powerful tool for improving education, associated with innovation and creativity, which in turn indicates an evolved understanding of technology. However, there are concerns about the objectivity and autonomy of automated decisions, as well as the possibility of AI diminishing human effort.

In general terms, AI is seen as a tool for personalizing education and improving collaboration between students and teachers. In addition, the potential of AI to improve administrative processes and to be an instrument that facilitates collaboration between different sectors of the institution is highlighted.

The academic community is also aware of the risks and challenges associated with the implementation of new technologies in the curricula of Colombian universities. Adaptation to this environment brings with it other types of educational demands, so it is important to focus on the need to train and prepare the academic and administrative staff of universities. This challenge is particularly relevant in the case of the American University Institution in the city of Barranquilla, which must face the challenges and maximize the benefits of artificial intelligence (AI) in its academic environment. At the same time, a reflective and critical approach to the adoption and integration of these emerging technologies in this entity arises.

References

Abellan-Nebot, J. V. & Subirón, F.R. (2010). A review of machining monitoring systems based on artificial intelligence process models. The International *Journal of Advanced Manufacturing. Technology, 47,* 237–257. https://doi.org/10.1007/s00170-009-2191-8

Aguaded, J. I. y Romero-Rodríguez, L. M. (2015). Mediamorfosis y desinformación en la infoesfera: Alfabetización mediática, digital e informacional ante los cambios de hábitos de consumo informativo. *Education in the Knowledge Society,* 16(1), 44-57. https://doi.org/10.14201/eks20151614457

Aguilar, B. (2005). Fórmulas para el cálculo de la muestra en investigaciones de salud. *Salud en Tabasco, 11*(1-2), 333-338.

Alonso, R. S., Prieto, J., García, Ó. & Corchado, J. M. (2019). Collaborative learning via social computing. *Frontiers of Information Technology & Electronic Engineering 20*(2), 265–282.

Alonso-de-Castro, M. G. & García-Peñalvo, F.J. (2022). Successful educational methodologies: Erasmus+ projects related to e-learning or ICT. *Campus Virtuales, 11*(1), 95-114. https://doi.org/10.54988/cv.2022.1.1022.

Arrieta-Valderrama, E. J. ., Cabarcas Velasquez, M. ., & Rodríguez-Arias, C. A. . (2019). Análisis de las necesidades de bienestar laboral de los empleados de universidades en la región caribe: Caso barranquilla. *Ad-Gnosis, 8*(8). https://doi.org/10.21803/adgnosis.v8i8.365

Badaró, S., Ibañez, L. & Agüero, M. (2013). Sistemas expertos: fundamentos, metodologías y aplicaciones. *Ciencia y Tecnología,* (13), 349-364. http://dx.doi.org/10.18682/cyt.v1i13.122

Bali, A. & Bali, N. (2022). Chapter 8 - Role of artificial intelligence in fast-track drug discovery and vaccine development for COVID-19. En V. Chang, M. Abdel-Basset, M. Ramachandran, N. G. Green & G. Wills (Eds.), *Novel AI and Data Science Advancements for Sustainability in the Era of COVID-19* (p.201-229). Academic Press.

Bellman, R. (1978). *An Introduction to Artificial Intelligence.* Boyd & Fraser Pub. Co. https://www.worldcat.org/es/title/An-introduction-to-artificial-intelligence-:-can-computers-think/oclc/3933653

Benaich, N. & Hogarth, I. (2019). *State of AI Report 2019.* https://www.stateof.ai/

Benjamins, R. & Salazar, I. (2020). *El mito del algoritmo. Cuentos y cuentas de la Inteligencia artificial.* Ediciones Anaya Multimedia. https://bit.ly/3Q-fzhwR

Boude O. (2023). *La inteligencia artificial y su impacto en la educación.* https://www.unisabana.edu.co/portaldenoticias/al-dia/la-inteligencia-artificial-ia-y-su-impacto-en-la-educacion/

Breemen, A., van Farkas, J. & Sarbo, J. (2011). Knowledge representation as a tool for intelligence augmentation. *In IGI Global (Ed.), Computational Modeling and Simulation of Intellect* (pp. 321-341). IGI Global. https://www.igi-global.com/chapter/knowledge-representation-tool-intelligence-augmentation/53311

Buchanan, B. (2006). A (very) brief history of artificial intelligence. *Ai Mag, 26*(4), 53–60. https://doi.org/10.1609/aimag.v26i4.1848

Calvo J. (2022). *La Inteligencia Artificial y la creatividad.* https://www.educaciontrespuntocero.com/tecnologia/inteligencia-artificial-creatividad/

Chiu, T.K., Xia, Q., Zhou, X., Sing Chai, C. & Cheng, M. (2023). Systematic literature review on opportunities, challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence,* 4, 100118. https://doi.org/10.1016/j.caeai.2022.100118

Colombia aprende (2022). Aplicaciones de la inteligencia artificial en la educación. https://colombiaaprende.edu.co/agenda/tips-y-orientaciones/aplicaciones-de-la-inteligencia-artificial-en-la-educacion

Craig, S. (2018). *Tutoring and intelligent tutoring systems. Nova Science.* https://bit.ly/3yS92W8

Dean, T., Allen, J. & Aloimonos, Y. (1995). *Artificial Intelligence: Theory and Practice.* Benjamin/Cummings Pub. https://www.umiacs.umd.edu/publications/artificial-intelligence-theory-and-practice-0

Engelbart, D. (1962). Augmenting Human Intellect: A Conceptual Framework; Summary Report, Contract AF 49–1024. Stanford Research Institut. https://www.lri.fr/~mbl/ENS/FONDIHM/2020/papers/Englebart-Augmenting62.pdf

Evans, D. (2011). The Internet of Things: How the Next Evolution of the Internet Is Changing Everything. Cisco Internet Business Solutions Group (IBSG). https://www.cisco.com/c/dam/en_us/about/ac79/docs/innov/IoT_IBSG_0411FINAL.pdf

Fengchun N. & Wayne H. (2021). *International Forum on AI and the futures of Education Developing Competencies for the AI Era.* UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000377251

Flogie, A. & Aberšek, B. (2021). Artificial intelligence in education. *En B. Aberšek (Ed.), Advanced Methodologies and Technologies in Artificial Intelligence, Computer Simulation, and Human-Computer Interaction (*pp. 1-17). IntechOpen. https://doi.org/10.5772/intechopen.96498

Flores-Vivar, J. & García P. (2023). Reflexiones sobre la ética, potencialidades y retos de la Inteligencia Artificial en el marco de la Educación de Calidad (ODS4). *Revista Comunicar, 31* (74). http://eprints.rclis.org/43878/2/10.3916_C74-2023-03.pdf

Flores-Vivar, J. & Zaharía, A. (2019). Las redes sociales académicas en la difusión de la producción científica. *Estudio de caso: Academia y Mendeley. Revista Dialnet 25*(3). https://doi.org/10.5209/esmp.66993

Francesc, P., Subosa, M., Rivas, A. y Valverde, P. (2019). *Artificial Intelligence in education: Challenges and opportunities for sustainable development.* https://unesdoc.unesco.org/ark:/48223/pf0000366994

Frank, M. R. (2019). *The Evolution of AI Research and the Study of Its Social Implications.* https://medium.com/mit-media-lab/the-evolution-of-ai-research-and-the-study-of-itssocial-implications-4a9598b3d7db

Fundación Telefónica (2015). *El trabajo en un mundo de sistemas inteligentes.* Editorial Ariel, S.A.

García Sánchez, A., (2009). *Optimización de los parámetros de soldadura en el proceso de arco eléctrico con protección de gas (GMAW) para soldar una cero A-27.* [Tesis de maestría, Corporación Mexicana De Investigación De Materiales]. https://comimsa.repositorioinstitucional.mx/jspui/handle/1022/63

García-Holgado, A. & García-Peñalvo, F. J. (2019). Validation of the learning ecosystem metamodel using transformation rules. *Future Generation Computer Systems, 91,* 300-310. https://doi.org/10.1016/j.future.2018.09.011

Halim, C. & Prasetyo, H. (2018). Penerapan Artificial Intelligence dalam Computer Aided Instructure (CAI). *Jurnal Sistem Cerdas,* 1(1), 50 - 57. https://doi.org/10.37396/jsc.v1i1.6

Hardy, Q. (2009). *Peter Drucker: Perception As Survival Skill. Forbes* https://www.forbes.com/2009/10/09/management-workplace-internet-intelligent-technology-drucker.html#73e1843038e8

Herrera, L. & Muñoz, D. (2017). Inteligencia artificial y lenguaje natural. *Lenguas Modernas, 19,* 157-165. https://lenguasmodernas.uchile.cl/index.php/LM/article/view/45790

Jeon, J. & Suh, Y. (2017). Analyzing the major issues of the 4th Industrial Revolution. *Asian Journal of Innovation and Policy 2017,* 6, 262–273

Keiper, M. C., Fried, G., Lupinek, J. y Nordstrom, H. (2023). Artificial intelligence in sport management education: Playing the AI game with ChatGPT. *Journal of Hospitality, Leisure, Sport & Tourism Education, 33.* 100456. https://doi.or-

g/10.1016/j.jhlste.2023.100456

Keung Cheng, E. C. & Wang, T. (2023). Leading digital transformation and eliminating barriers for teachers to incorporate artificial intelligence in basic education in Hong Kong. *Computers and Education: Artificial Intelligence 5,* https://doi.org/10.1016/j.caeai.2023.100171

Kuleto, V., Ili´c P., M., Stanescu, M., Rankovi´c, M., Ševi´c, N.P., Paun, D., y Teodorescu, S. (2021b). Extended Reality in Higher Education, a Responsible Innovation Approach for Generation Y and Generation Z. *Sustainability, 13* (21), 11814. 10.3390/su132111814

Kuleto, V., Ili´c, M., Dedi´c, V. & Raketi´c, K. (2021c). Application of Artificial Intelligence and Machine Learning in Higher Education, Available Platforms and Examining Students' Awareness. *EdTech Journal 1*(1), 24–28

Kuleto, V., Ili´c, M., Dumangiu, M., Rankovi´c, M., Martins, O.M.D., Paun, D. & Mihoreanu, L. (2021a). Exploring Opportunities and Challenges of Artificial Intelligence and Machine Learning in Higher Education Institutions. *Sustainability, 13* (18), 10424. 24. https://doi.org/10.3390/su131810424

Kyllonen, P. C., Roberts, R. D. & Stankov, L. (2010). *Extending Intelligence: Enhancement and New Constructs.* Edition Routledge

Lakshmi, A. J., Kumar, A., Kumar, M. S., Imran Patel, S., Lokesh Naik, S. & Ramesh, J. (2023). Artificial intelligence in steering the digital transformation of collaborative technical education. *The Journal of High Technology Management Research, 34*(2), 100467

Li, M. D. & Little, B.P. (2023). Appropriate Reliance on Artificial Intelligence in Radiology Education. *Journal of the American College of Radiology,* https://doi.org/10.1016/j.jacr.2023.04.019

Li, S.; Jiang, H., Ding, Z., Fan, S., Li, N. & Li, X. (2023). Application of image super-resolution recognition and artificial intelligence system in repairing students' psychological education problems. *Preventive Medicine, 173.* 107590. https://doi.org/10.1016/j.ypmed.2023.107590

Lianu, C., Radulescu, I., Gudei, S., Lianu, C. & Mindrescu, V. (2022). Cohesion Forces Determinants in Cluster Development: A Study Case for Romania. *Sustainability, 14* (6), 3359. https://doi.org/10.3390/su14063359

Liu, R., Yang, B., Zio, E. & Chen, X. (2018). Artificial intelligence for fault diagnosis of rotating machinery: A review. *Mechanical Systems and Signal Processing,* 108, 33–47.

Lukić, A., Kudelić, N., Antičević, V., Lazić-Mosler, E., Glunčić, V., Hren, D. & Lukić, I. K. (2023). First-year nursing students' attitudes towards artificial intelligence: Cross-sectional multi-center study. *Nurse Education in Practice, 71.* 103735. https://doi.org/10.1016/j.nepr.2023.103735

Mahmud, S. N. D., Husnin, H. & Tuan Soh, M. T. (2020). Teaching Presence in Online Gamified Education for Sustainability Learning. *Sustainability, 12* (9), 3801. https://doi.org/10.3390/su12093801

Mariño, S. & Primorac, C. (2016). Propuesta metodológica para desarrollo de modelos de redes neuronales artificiales supervisadas. *IJERI: International Journal of Educational Research and Innovation (IJERI), 6,* 231-245. https://www.upo.es/revistas/index.php/IJERI/article/view/1654/1569

Márquez, R., Barrios, N., Vera, R. E., Méndez, M. E., Tolosa, L., Zambrano, F. & Li, Y. (2023). A perspective on the synergistic potential of artificial intelligence and product-based learning strategies in biobased materials education. *Education for Chemical Engineers. 44,* 164-180. https://doi.org/10.1016/j.ece.2023.05.005

Martínez-Comesaña, M., Rigueira-Díaz, X., Larrañaga-Janeiro, A., Martínez-Torres, J., Ocarranza-Prado, I. & Kreibel, D. (2023). Impact of artificial intelligence on assessment methods in primary and secondary education: Systematic literature review. *Revista de Psicodidáctica* (English ed.), 28(2), 93-103.

McGrath, C., Cerratto, P., Juth, N. & Palmgren, P. (2023). University teachers' perceptions of responsibility and artificial intelligence in higher education - An experimental philosophical study. *Computers and Education: Artificial Intelligence, 4,* 100139. https://doi.org/10.1016/j.caeai.2023.100139

Montoya, V. (2021). El Ministerio de Educación Nacional y Parque Explora te invitan a que participes en el Desafío Novacamp. https://www.colombiaaprende.edu.co/agenda/convocatorias/participa-en-el-desafio-novacamp

Morduchowicz, R. (2020). *La ciudadanía digital como política pública en educación en América Latina.* https://unesdoc.unesco.org/ark:/48223/pf0000376935

Moreno Padilla, R. D (2019). La llegada de la inteligencia artificial a la educación. Revista de Investigación en Tecnologías de la Información (RITI), 7 (14). https://dialnet.unirioja.es/servlet/articulo?codigo=7242777

Mosquera Castro, A. L. ., Leal Céspedes, J. C. ., & Montoya Monsalve, J. N. . (2021). El bienestar como práctica de alto rendimiento en la Organización. Una mirada desde el modelo de Ryff. *Ad-Gnosis,* 10(10), 83-101. https://doi.org/10.21803/adgnosis.10.10.471

OECD. (2021). *OECD Digital Education Outlook 2021: Expanding frontiers with artificial intelligence, blockchain, and robots.* OECD Publishing. https://www.oecd-ilibrary.org/education/oecd-digital-education-outlook-2021_589b283f-en

Okagbue, E. F., Ezeachikulo, U., Akintunde, T., Tsakuwa, M., Ilokanulo, S., Obiasoanya, K., Ilodibe, C. & Tidiane Ouattara, C. (2023). A comprehensive overview of artificial intelligence and machine learning in education pedagogy: 21 Years (2000–2021) of research indexed in the Scopus database. *Social Sciences & Humanities Open, 8*(1). 100655. https://doi.org/10.1016/j.ssaho.2023.100655

Oliver, N. (2020). Inteligencia Artificial, naturalmente. Centro de Publicaciones. Ministerio de Asuntos Económicos y Transformación Digital. Gobierno de España. https://bit.ly/3Olt5SE

Organización de Estados Iberoamericanos para la Educación, la Ciencia y la Cultura [OEI]. (2023). *El futuro de la Inteligencia Artificial en educación en América Latina.* https://oei.int/oficinas/secretaria-general/publicaciones/el-futuro-de-la-inteligencia-artificial-en-educacion-en-america-latina

Osetskyi, V., Vitrenko, A., Tatomyr, I., Bilan, S. & Hirnyk, Y. (2019). Artificial intelligence application in education: Financial implications and prospects. *Financial and Credit Activity Problems of Theory and Practice, 2*(33), 574-584. https://doi.org/10.18371/fcaptp.v2i33.207246

Pan, Y. (2016). Heading toward artificial intelligence 2.0. *Engineering, 2* (4), 409–413

Park, S. & Lee, S. (1998). EMG pattern recognition based on artificial intelligence techniques. *IEEE Transactions on Rehabilitation Engineering,* 6 (4), 400–405

Ramírez-Montoya, M. S., Castillo-Martínez, I. M., Sanabria-Z, J. & Miranda, J. (2022). Complex thinking in the framework of education 4.0 and open innovation systematic literature review. *Journal of Open Innovation,* 8(1), 4. https://doi.org/10.3390/joitmc8010004

Ratten, V. & Jones, P. (2023). Generative artificial intelligence (ChatGPT): Implications for management educators. *The International Journal of Management Education, 21*(3), 100857. https://doi.org/10.1016/j.ijme.2023.100857

Russell S. & Norvig, P. (1994). *Artificial Intelligence. A Modern Approach.* Englewood Cliffs, NJ: Prentice Hall

Salazar, I. & Benjamins, R. (2021). El algoritmo y yo. Guía de convivencia entre seres humanos y artificiales. Ediciones Anaya Multimedia. https://bit.ly/3BU2VUL

Schalkoff, R. (1990). *Artificial Intelligence: An Engineering Approach.* McGraw-Hill

Selwyn, N. (2019). *¿Debería los robots sustituir al profesorado?* La IA y el futuro de la educación. Ediciones Morata. https://bit.ly/3zxyPmO

Senior, J. & Gyarmathy, E. (2021). AI and Developing Human Intelligence Future Learning and Educational Innovation; Routledge

Spirina, K. (2018). *Is AI here to replace human teachers or is it a teacher's assistant?* Towards Data Science. https://bit.ly/3N27Xkq

Su, J. Kit Ng, D. T. & Wah Chu, S. K. (2023). Artificial Intelligence (AI) Literacy in early childhood education: The challenges and opportunities. *Computers and Education: Artificial Intelligence. 4,* 100124. https://doi.org/10.1016/j.caeai.2023.100124

Subramanian, C. (2016). Alvin Toffler: What he got right - and wrong. BBC News. https://www.bbc.com/news/world-us-canada-36675260

Topol, E. (2019). High-performance medicine: The convergence of human and artificial intelligence. *Nature Medicina,* 25, 44–56

Túñez-López, J. y Tejedor-Calvo, S. (2019). Inteligencia artificial y periodismo. *Doxa Comunicación,* 29, 163-168. https://doi.org/10.31921/doxacom.n29a8

Turing, A. (2006). Computing machinery and intelligence. *Mind Lix 1950, 236,* 4334–4360

UNESCO (2020). *La Inteligencia Artificial en la Educación.* https://es.unesco.org/themes/tic-educacion/inteligencia-artificial#:~:text=La%20inteligencia%20artificial%20(IA)%20tiene,la%20consecuci%C3%B3n%20del%20ODS%204

UNESCO (2021). *Recomendación sobre la ética de la Inteligencia Artificial.* https://www.unesco.org/es/articles/recomendacion-sobre-la-etica-de-la-inteligencia-artificial

Universidad de Buenos Aires [UBA]. (2023). *Inteligencia Artificial en ayuda del Derecho.* https://www.uba.ar/noticia/20195

Uraikul, V., Chan, C. & Tontiwachwuthikul, P. (2007). Artificial intelligence for monitoring and supervisory control of process systems. *Engineering Applications of Artificial Intelligence,* 20, 115–131

Vecchiarini, M. & Somià, T. (2023). Redefining entrepreneurship education in the age of artificial intelligence: An explorative analysis. *The International Journal of Management Education, 21*(3). 100879

Vitanza, A., Rossetti, P. & Mondada, F. (2019). Robot swarms as an educational tool: The Thymio's way. *International Journal of Advanced Robotic Systems. 16*(1). https://doi.org/10.1177/1729881418825186.

Winston, P. H. (1984). Artificial Intelligence (2a ed.). *Addison-Wesley.* https://courses.csail.mit.edu/6.034f/ai3/rest.pdf.