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Implementation of Artificial Intelligence in the Teaching–Learning Process in Higher Education Institutions

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Abstract

This study analyzes the implementation of Artificial Intelligence (AI) in the teaching–learning process in higher education, a topic of growing significance due to its transformative potential in the educational field. The research addresses the problem of limited understanding regarding how AI is applied in higher education institutions, an issue of critical importance given its implications for students' professional development. Adopting a qualitative approach grounded in the scientific method, the study employs a documentary research design, rigorously analyzing and synthesizing information from multiple scholarly articles. The findings identify the frequency and types of academic populations utilizing AI, the teaching, learning, and assessment activities in which AI proves beneficial, and the associated advantages, challenges, and difficulties of its integration into higher education. Data processing included analysis of tables and figures from selected sources, enabling the formulation of conclusions and recommendations that highlight key aspects of AI adoption and its potential to enhance educational practices.

Keywords: Artificial Intelligence; Teaching–Learning Process; Higher Education; Educational Technology; Student Engagement

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INTRODUCTION

In the 21st century, the emergence of new technologies has had a huge impact on today's society, as they have been incorporated into various activities and fields, such as work and education, thereby modifying or altering their processes.

One of those technologies, which at one point seemed utopian, is artificial intelligence (AI), since it is thought, it seeks to simulate the behavior of a human brain, something extremely complex.

In other words, "AI refers to the ability of machines to perform cognitive tasks that previously could only be performed by humans." (Ojeda et al., 2023)

Since its inception, artificial intelligence has become a necessity due to its ability to autonomously streamline processes and work. Because of this, Artificial Intelligence has become a tool in higher education for creating content, for assessments, as a reference source, as an auxiliary tool during the implementation of pedagogical strategies such as questionnaires, gamification, projects, etc., and as a learning method that enriches the most personalized educational experience because it typically captures students' preferences and interests.

Furthermore, in the research area, which is considered one of the three pillars of higher education, Artificial Intelligence, especially chatbots such as Chat GPT, Perplexity, Gemini, and Copilot, are useful in helping educators and students search, analyze, and write scientific articles.

However, "these AI technologies present certain inconsistencies in the sense of providing biased information, incomplete data, and their inability to understand biological aspects and ethical behavior." (Ojeda, et al., 2023)

Meanwhile, other AI tools are gaining ground within the university academic community. Examples include Gamma, Quizizz, and Fliki. The former creates presentations based on a prompt in a matter of seconds, while the latter creates videos or voice-over presentations related to the instruction.

Finally, there are apps that have added an AI feature for creating online quizzes, such as Kahoot and Quizizz.

With all this described, it implies a challenge for educators and students, due to its form of use, since the way it is used can significantly influence the teaching-learning process.

Artificial Intelligence (AI) is believed to contribute to increasing inequality in education systems at all levels. To this end, "UNESCO suggests that its application in education be based on the principles of inclusion and equity."(United Nations Educational, Scientific and Cultural Organization (UNESCO), 2023)

This logic is considered because not all students and educators have the opportunity to use artificial intelligence for their academic activities due to various limiting conditions, such as internet access, access to a device (laptop, smartphone, tablet), and lack of awareness of its existence and use.

It must be said that the disruptive introduction of artificial intelligence into education at all levels poses an abrupt change in teaching environments and methods, as well as in the way students manage their learning. It also, to a certain extent, forces higher education institutions to analyze their own curricula for the programs they offer to ensure that the incorporation of artificial intelligence (AI) is as natural and effective as possible for students, either through specific subjects or within the course content.

From this, a knowledge gap emerges. As this is a contemporary phenomenon, research is beginning to flourish seeking to understand it within specific contexts. This raises the need for this research to analyze existing information on the manifest phenomenon.

The objective of this research, based on a bibliographic review, is to analyze the impact of artificial intelligence on the teaching-learning process in higher education.

It is important to emphasize that the emphasis on higher education is due to the fact that higher education institutions such as universities and specialized institutions are where the academic population most consciously uses this type of intelligence to develop their academic teaching and learning activities in the areas of research, teaching, and social engagement.

METHODOLOGY

In the present research, a qualitative approach was chosen, which presents the characteristic of understanding social phenomena through the interpretation of individuals' perceptions or opinions.

For all research with a qualitative approach, a literature review is a priority.

The Literature Review (also known as a bibliographic review, review article, or review) is a genre (or type of text) that consists of a systematization of the findings of existing scientific studies on a given topic. The purpose is to report to a research community what is known and what is not known about it, which allows for the identification of unexplored areas of study and motivates new research. (Lobato Concha, n.d.)

In other words, a literature review involves a rigorous review of various scientific articles on a particular topic, with the goal of systematizing this information and providing new insights that motivate further research in that area.

Since it is an investigation carried out based on the review of documents or articles, it is determined to be a documentary study.

Documentary studies are those that are based on records and documents, from which information is obtained.(Müggenburg Rodríguez & Perez Cabrera, 2007)

Within documentary research, there are different types. In this case, the documentary research chosen is of the State of the Art type, which consists of "a type of documentary research about the way in which different authors have dealt with a specific topic by searching, reading, and analyzing bibliography found in relation to the topic to be investigated."(Ramírez Gomez, sf)

Based on the type of documentary research, documentary analysis is key, considered a documentary research technique whose purpose, from a qualitative perspective, is to "delve into meanings, identify patterns, and accept the subjective nature of the interpretive or constructivist paradigm."(Arias Odón, 2023)

In practice, the aim is to review and analyze information from various scientific articles related to the research topic, reviewing key data or information related to the topic to discover or identify patterns that contribute to the generation of new knowledge or validate or refute data from other authors.

RESULTS

As this is a documentary research based on the use of various sources of information, the results expressed are based on the analysis of different articles from indexed journals.

First, as it is a cutting-edge technology, about which there is limited knowledge, higher education institutions have taken various positions, from a radical position of limiting its use to opening training processes for teachers and students so that its inclusion during the teaching-learning process is as optimal and useful as possible throughout a student's academic journey.

From Lieviens' (2023) perspective, many universities have not yet taken a clear position regarding this new technology, and have adopted different strategies to address the challenges posed by its use in higher education: from prohibiting any form of AI in the university, or exploring how students and faculty take advantage of its potential to improve the teaching-learning process, to including an express mention of its use in teaching guides or establishing guidelines and standards of behavior in this matter.

It must be said, from a teacher-student perspective, that the use of artificial intelligence in the teaching-learning process in higher education has been within a context of adaptability. This means that teachers and students understand that generative AI is an ally in this process, as it is capable of personalizing learning based on the needs of each student.

According to AI algorithms, they can identify each student's learning patterns, difficulties, and strengths, adjusting content and methodologies to optimize knowledge acquisition. For example, if a student struggles with a specific topic, AI can generate additional exercises, explanatory videos, or interactive simulations tailored to their level, providing a more effective and personalized learning experience. This not only improves academic performance but also fosters greater engagement and autonomy in students who feel the content is tailored to their needs. (Jardón Gallegos et al., 2024)

As mentioned above, AI is capable of performing certain learning activities. To this end, the example proposed by Ojeda et al. (2023) was used, which consisted of ChatGPT writing an essay in relation to a prompt. Additionally, to corroborate the essay's level of originality, the team used plagiarism analysis software (Turnitin).

Table 1. Essay prepared by ChatGPT. Taken from (Ojeda, et. al., 2023)

Content	Section Type
Introduction	**Analysis of the situation**
Supposedly, here I present a possible essay on poverty in Colombia: Poverty is one of the most serious challenges facing Colombia. Despite the efforts made by the government and social organizations to reduce poverty, it continues to be a harsh reality for millions of Colombians.	Introduction
Arguments and thesis statement	**Arguments and thesis statement**
According to data from the National Administrative Department of Statistics (DANE), in 2020, 42.5% of the Colombian population was in poverty. This means that almost half of Colombians do not have sufficient income to cover their basic needs such as food, housing, health, and education. Furthermore, 15.1% of the population is in extreme poverty, which means they do not have sufficient income to cover their food needs.	Arguments and thesis statement
Poverty in Colombia affects all ages, but it is particularly evident in the most vulnerable social groups, such as the elderly, indigenous people, women, and children. This is due to various structural factors, such as lack of access to quality education, unemployment and underemployment, discrimination and social exclusion, lack of access to basic services, and insecurity.	Arguments and thesis statement
The social problem becomes more complex when we consider that Colombia is a country rich in natural resources, which has been affected by armed conflict for decades. These problems have contributed to creating an unfavorable socioeconomic environment for the development of cities, especially those living in regions most affected by violence.	Arguments and thesis statement
Furthermore, poverty in Colombia is multidimensional, which means that multiple factors contribute to this situation. This includes public policies and programs that promote access to education, job training, gender equality, adequate housing, food security, and social protection for the most vulnerable.	Arguments and thesis statement
It is also important to mention that the creation of sustainable employment and economic development, especially in rural areas, where most of the poor live. The promotion of sustainable agriculture and access to technology and markets have contributed significantly to reducing poverty in these areas.	Arguments and thesis statement
Conclusion	**Conclusion**
In conclusion, poverty in Colombia is a complex problem that requires a comprehensive approach to address it. Poverty reduction is not only essential for individual and collective well-being, but also for Colombians to promote sustainable socioeconomic development and a more just and inclusive society.	Conclusion

Source: Taken from Ojeda, et. al., (2023)

Table 2. Originality analysis based on data provided by Turnitin.

Source	Similarity Index
Internet sources	34%
Publications	8%
Student papers	9%
Total similarity	**35%**

Source: Taken from Ojeda, et. al., (2023)

Looking at both figures, it can be seen that ChatGPT is a powerful tool for writing texts or content. However, it also raises a certain level of concern about the quality of the information used as sources to construct the essay, in this case.

Rubrics are one of the main tools for assessing the teaching-learning process. This time, a rubric developed with ChatGPT and Bard (now called Gemini) by Ortega Estrada & Hernández Fabián (2024) was used as an example.

In this exercise, the instruction was: I am a professor of the Bachelor's Degree in Pedagogy, teaching the subject International Organizations and Education Systems. I would like you to help me create a rubric with four performance levels to evaluate my students' final project, which consists of completing an international organization specialized in education. The guidelines for the final project are as follows; please be very specific about the elements to be evaluated.(Ortega Estrada & Hernández Fabián, 2024)

Table 3. Rubric developed based on Chat GPT and Bard.

Criteria	Exceptional (4)	Notable (3)	Acceptable (2)	Unsatisfactory (1)
1. Name of the international organization	Creative, relevant and consequent; clear with the objectives of the organization.	Clear, relevant and consistent; adequate with the objectives of the organization.	Adequate, but may lack clarity; organized but direct connection with the objectives.	Vague, not relevant or inappropriate.
2. Slogan	Impactful, clear, relevant and memorable; strictly related to the organizational identity.	Clear, relevant and contributes to the organizational identity.	Acceptable, but may lack originality or clarity in its connection with the organization.	Too short, too extensive or not significantly related to the organizational identity.
3. Classification (governmental or non-governmental)	Clear classification, correctly justified with deep understanding of the differences.	Adequate justification, showing understanding of the differences.	Basic justification, may lack depth regarding the differences.	Insufficient justification or no present.
4. Conception of the organization	Reflects exceptionally the essence and values of the name and slogan of the organization, creating a clear vision.	Reflects notably the essence and values of the name and slogan of the organization.	Adequate, although it may lack depth in the name and slogan of the organization.	Vague or too clear, and the name and slogan of the organization are not specifically related to each other.
5. Lines of action (3)	Clearly defined, with coherence with the organization's mission and relevant objectives.	Defined, although they may lack specificity or complete coherence with the organization and its relevance.	Defined, although they may lack clarity or direct coherence with the organization and its relevance.	Vague or too clear, not adequately defined, or not relevant.
6. Theoretical framework	Well developed, consistent with the lines of action and relevant to the organization's authors.	Developed and related to the lines of action, although it may lack depth or focus on relevant authors.	Basic, may lack direct connection with the lines of action or relevant authors.	Insufficient, confused or not relevant to the lines of action.
7. Actions of the international organizations	Highly relevant and coherent with the lines of action and the organization's mission, producing a benefit to the education of the country.	Relevant and consistent with the lines of action and the organization's mission.	Relevant, but may not be coherent with the lines of action.	Poorly relevant or not coherent with the lines of action.
8. Collaboration with Mexico	It is coherent with the organization's classification.	-	-	It is not coherent with the organization's classification.

Source: Obtained from Ortega Estrada & Hernández Fabián, (2024).

To design the rubric in Figure 3, the team first instructed Chat GPT to create a rubric according to the specifications described above. As a result, the rubric provided by Chat GPT was very generic. The team then performed the same exercise with Google's Bard, which provided a rubric with more relevant guidelines than those provided by Chat GPT. The rubric in Figure 3 was created from the rubrics generated by Chat GPT and Bard.

Ortega Estrada & Hernández Fabián, (2024) state that "the majority of the evaluation criteria of the final rubric came from Bard's rubric without omitting that there was editing, that is, some modifications to the criteria or their descriptions."

With this, chatbots are useful in creating assessment rubrics; however, it's impossible to ignore the absence of student participation, as each teaching activity has specific characteristics that these chatbots cannot assimilate due to their specific context. One aspect worth highlighting about using artificial intelligence chatbots is the speed with which they generate a rubric, making it easier for educators to create it in less time.

After examining content generation and assessment, what would be the benefits, challenges, or challenges associated with the use of artificial intelligence (AI) in higher education?

To understand the benefits, the following table was analyzed, the question being: In your opinion, what are the most significant benefits of using AI in university education?

Table 4. Opinions of teachers at the University of Los Lagos in Chile according to the benefits they obtain from using AI in their educational activities.

In your opinion, what are the most significant benefits of AI in university education?

Benefit/Opinion	Number of mentions (n=27)	%
Content Improvement and Access to Information	5	18.52%
Efficiency and Time Optimization	7	25.93%
Creativity and Productivity	3	11.11%
Administrative Facilitation	4	14.81%
Educational Support and Complement	3	11.11%
Inclusivity and Accessibility of Views	1	3.70%
Concerns and Non-use of AI	4	14.81%

Source: Obtained from Kroff, Coria, & Ferrada, (2024).

The table reveals that the main perceived benefit of AI in higher education is "Efficiency and Time Optimization" (25.93%), indicating improvements in academic processes. This is followed by "Improved Content and Access to Information" (18.52%), highlighting its potential to enrich educational resources. "Administrative Facilitation" and "Concerns and Non-Use of AI" received 14.81% of mentions each, reflecting both benefits

to administration and reservations about implementation. "Creativity and Productivity" and "Educational Support and Complement" were mentioned by 11.11%, suggesting benefits in these aspects, while "Inclusivity and Diversity of Viewpoints" was the least mentioned (3.70%), indicating that it is not considered a main benefit.(Kroff, Coria, & Ferrada, 2024)

On the other hand, the challenges of integrating artificial intelligence into the teaching-learning process in higher education are numerous, among which the most notable is the lack of training in its use or management among the academic community; in other words, there is still a lack of technological illiteracy regarding the use of AI. This poses the challenge of training all teaching staff to effectively integrate AI into their teaching processes.

Another challenge is the technological infrastructure present in higher education institutions, as it requires an investment of resources to convert the space into a place that promotes the use of artificial intelligence for academic purposes, something that is not the same for all higher education institutions (HEIs).

This particular situation can create inequality among students, because "some may have difficulty accessing these technologies, making many of them less skilled in their use." (Cotton, Reuben Shipway, & Cotton, 2023)

A challenge that is of great concern to higher education institutions is the area of academic integrity. This refers to ethics, the use of information in a transparent, honest, and responsible manner, and, in turn, the protection of data submitted by the academic community to AI.

This idea is shared by Cotton, Reuben Shipway, & Cotton, (2023) in which they raise a series of risks such as: The inherent biases in the data used to train the IAG, incomplete or false content that could confuse researchers, teachers, and students in the development of their academic tasks, the emergence of new forms of plagiarism and academic fraud, the impersonation of authorship, the veracity of information, the lack of transparency, etc.

The challenge for higher education institutions is to develop mechanisms that facilitate the effective and ethical use of AI, such as training and informational workshops, and a Code of Ethics with clear guidelines that address the issue of academic integrity.

Also, it is important to recognize that the implementation of Artificial Intelligence has raised doubts in relation to the cognitive process of learning, in relation to the student's ability to create or elaborate texts, content, mathematical operations on their own.

For Freire-Aviles et al. (2024), "the use of ChatGPT highlights the advantage of autonomous learning. However, excessive use of this can cause dependency."

DISCUSSION

Considering that the stated objective was to analyze the impact of artificial intelligence on the teaching-learning process in higher education, it is essential in this discussion to compare or contrast the results of this research and that of other authors.

Analyzing the results, Artificial Intelligence is considered a pedagogical learning tool, due to its ability to create texts, reports, essays, presentations, and interactive videos, which aim to personalize learning based on the needs of each student.

This idea is echoed by Schönberger (2023), ChatGPT as a tool for teachers: ChatGPT is particularly well-suited as a working tool for teachers. The focus here is not so much on automated text generation. Instead, experimenting with ChatGPT should raise teachers' awareness and provide them with ideas for their lessons, such as ideas for quiz questions, arguments for pro- and con-debates, or ideas for role-playing games. ChatGPT can also help create individualized materials, such as assignments for students. It can also transfer existing content into new formats, such as scripts for podcasts or instructional videos. It can also help streamline instructions, summaries, and the like, and create standardized text types, such as event descriptions.

On the other hand, artificial intelligence can be used as a tool for generating assessment instruments; however, it is important that the instruction provided be as congruent as possible, since the specific nature of the activity may result in very general or dissociative assessment categories or criteria, that is, ones that are not in line with the specific activity.

Ortega Estrada and Hernández Fabián (2024) support this idea when they mention that it is important to be careful when writing instructions to achieve relevant results using the least amount of time and effort. However, it is difficult to obtain a satisfactory rubric response from a single interaction. This does not mean that the quality of the responses

prevents their use, but rather that, given the current state of these technologies, human supervision is absolutely necessary.

It is also necessary for teachers or students to review and edit AI for their teaching or learning activities, as appropriate, since, as mentioned, it provides general information or information that is distant from what is needed.

One of the concerns expressed by several authors, and which is consistent with this study, is the issue of academic integrity, as AI can lend itself to plagiarism or academic fraud due to a lack of training in AI use.

In this regard, Sullivan et al. (2023) acknowledge that the use of IAG tools in university assessments raises some concerns regarding academic integrity. They mention cases in which a high percentage of students have been detected using ChatGPT in assessment tasks, leading some universities to prohibit its use. This raises questions about how to ensure fairness and authenticity in assessments, and how to prevent academic fraud from compromising the education system.

To counter this situation, higher education institutions must train their members, invest in infrastructure, and create regulatory mechanisms for the use of AI, such as codes of ethics or policies that contribute to the protection of the academic community's data.

As mentioned, the implementation of AI forces members of Higher Education Institutions to undergo training, for example, Jardón Gallegos, et al, (2024) supports this idea by saying that, "many professors find that the adoption of AI-based technologies implies an additional challenge in terms of continuous training and adaptation to new methodologies."

According to the findings of this research related to academic integrity, several authors support this idea, as in the case of Reverón, (2024), who argues that the implementation of AI "requires educational institutions to establish clear policies that protect privacy and ensure the responsible use of student and teacher data." Meanwhile, Mayol, (2023), says that "the presence of AI in the academic field drives an ethical debate that involves both the privacy of student data and the use of algorithms that are often not transparent."

Furthermore, Mora Naranjo, et. al, (2023) mention in their results that "42% of the educational community expresses concern about data privacy and 15% is concerned about the transparency of algorithms."

Aligned with infrastructure, some authors consider that this can generate inequality in the training process of students, arguing that, due to factors such as unequal investment in infrastructure between HEIs, resistance to applying this technology or the same access by students to them due to economic conditions, can affect the existence of differences in the level of skill in handling AI in a professional environment.

One of the studies that supports this idea is that of Mora Naranjo, et. al, (2023), which states that 28% of the academic community participating in that research is concerned about "equity in access to AI."

CONCLUSION

The results obtained from the analysis of the literature review show that Artificial Intelligence (AI) is useful in creating texts or content such as essays, reports, presentations, videos, and questionnaires, all based on detailed instructions on what is needed. Despite this, AI often provides generic information about the content, making intervention through editing by the subject essential to specify the content based on their particular case.

AI is also capable of creating assessment tools such as rubrics, tests, and checklists, but as mentioned above, AI typically provides general information, often requiring educators to edit these tools.

One of the advantages of AI is the speed and efficiency with which it performs these tasks, contributing to time savings, allowing teachers and students to focus on other academic activities.

Some challenges that AI poses in the teaching-learning process in higher education are academic integrity, inequality in student learning due to causes such as poor infrastructure, lack of training in its use, or resistance on the part of the student or teacher to use it in the academic context, which implies a challenge, the continuous training of the academic community on the implementation of AI in the teaching-learning process, taking into consideration aspects of the advantages or benefits and the ethical challenges.

Finally, higher education institutions must create policies and mechanisms that contribute to the integration, regulation, and optimal use of artificial intelligence, incorporating it meaningfully into the development of course content or program curricula so that its use has a rationale. Furthermore, AI management is a new skill that must be developed by every professional working in the industry and by every student who will become a professional in the current and future generations.

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