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INTEGRATION OF ARTIFICIAL INTELLIGENCE IN EDUCATIONAL ENVIRONMENTS: ADVANCES, CHALLENGES AND PERSPECTIVES

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Abstract

A documentary review was carried out on the production and publication of research papers related to the study of the variable Artificial Intelligence and Education. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the period 2017-2022, by Latin American institutions, achieving the identification of 537 publications. The information provided by this platform was organized through graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics have been described, the position of different authors towards the proposed theme is referenced through a qualitative analysis. Among the main findings made through this research, it is found that Brazil with 219 publications was the country with the highest scientific production registered in the name of authors affiliated with institutions in that country. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of the variable Artificial Intelligence and Education was Computer Science with 355 published documents, and the Type of Publication most used during the period indicated above were Conference Articles with 55% of the total scientific production.

Keywords: *Artificial Intelligence, Education, Latin America.*

1. Introduction

The integration of artificial intelligence in the educational environment of Latin America marks a turning point in the approach to the teaching and learning process in the region. In an increasingly digitized world, AI is emerging as a promising tool that can improve the quality of education and provide new opportunities for students and teachers. Latin America, with its cultural diversity and socioeconomic challenges, finds in AI an ally that can help overcome barriers and improve access to quality education.

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The introduction of AI in the educational environment aims to optimize several key aspects of the educational process, such as personalization of learning, adaptation to individual learning styles, objective assessment and identification of students to identify students' difficulties early. The ability to collect and analyze large amounts of data allows educators to better understand each student's progress and tailor their teaching methods accordingly. This not only empowers teachers, but also gives students the opportunity to develop skills at their own pace and according to their specific needs.

However, integrating AI into education in Latin America also faces unique challenges. The digital divide, the availability of technological resources and teacher training are issues that need to be addressed to ensure that all communities have equitable access to these innovations. In addition, it is essential to maintain an ethical and responsible approach when implementing AI in education, ensuring the security of student data and avoiding biases that can perpetuate the learning of existing inequality.

Despite the obstacles, the integration of artificial intelligence in the educational environment in Latin America offers an exciting panorama full of possibilities. When governments, educational institutions and technology companies work together, it is possible to build a future in which AI drives education, fosters inclusion and prepares new generations to meet the challenges of an increasingly digital and globalized world. When exploring the integration of AI in education, it is essential to address both its benefits and implications, with the aim of ensuring sustainable and equitable educational progress across Latin America. For this reason, this article seeks to describe the main characteristics of the compendium of publications indexed in the Scopus database related to the variables Artificial Intelligence and Education.Like this. As the description of the position of certain authors affiliated with institutions, during the period between 2020 and 2022.

2. General Objective

Analyze from a bibliometric and bibliographic perspective, the elaboration and publication of research works in high-impact journals indexed in the Scopus database on the variables Artificial Intelligence and Education during the period 2017-2022 by Latin American institutions.

3. Methodology

This article is carried out through a mixed orientation research that combines the quantitative and qualitative method.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of the scientific production corresponding to the study Artificial Intelligence and Education. On the other hand, examples of some research works published in the area of study indicated above are analyzed from a qualitative perspective, starting from a

bibliographic approach that allows describing the position of different authors against the proposed topic. It is important to note that the entire search was performed through Scopus, managing to establish the parameters referenced in *Figure 1*.

3.1. Methodological design

Figure 1. *Methodological design*

Source: Authors.

3.1.1 Phase 1: Data collection

Data collection was executed from the Search tool on the Scopus website, where 537 publications were obtained from the choice of the following filters:

TITLE-ABS-KEY (artificial AND intelligence, AND education) AND PUBYEAR > 2016 AND PUBYEAR < 2023 AND (LIMIT-TO (AFFILCOUNTRY , "Brazil") OR LIMIT-TO (AFFILCOUNTRY , "Mexico") OR LIMIT-TO (AFFILCOUNTRY , "Ecuador") OR LIMIT-TO (AFFILCOUNTRY , "Colombia") OR LIMIT-TO (AFFILCOUNTRY , "Peru") OR LIMIT-TO (AFFILCOUNTRY , "Chile") OR LIMIT-TO (AFFILCOUNTRY , "Argentina") OR LIMIT-TO (AFFILCOUNTRY , "Costa Rica") OR LIMIT-TO (AFFILCOUNTRY , "Costa Rica") OR LIMIT-TO (AFFILCOUNTRY , "Colombia" "Uruguay") OR LIMIT-TO (AFFILCOUNTRY , "Cuba") OR LIMIT-TO (AFFILCOUNTRY , "Venezuela") OR LIMIT-TO (AFFILCOUNTRY , "Guatemala") OR LIMIT-TO (AFFILCOUNTRY , "Puerto Rico") OR LIMIT-TO (AFFILCOUNTRY , "Panama") OR LIMIT-TO (AFFILCOUNTRY , "Honduras"))

- Published documents whose study variables are related to the study of the variables, Artificial Intelligence and Education.
- Limited to the years 2017-2022.
- Limited to Latin American countries.

- Without distinction of area of knowledge.
- Regardless of type of publication.

3.1.2 Phase 2: Construction of analysis material

The information collected in Scopus during the previous phase is organized and subsequently classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Year of publication.
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

3.1.3 Phase 3: Drafting of conclusions and outcome document

In this phase, we proceed with the analysis of the results previously yielded resulting in the determination of conclusions and, consequently, the obtaining of the final document.

4. Results

4.1 Co-occurrence of words

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.

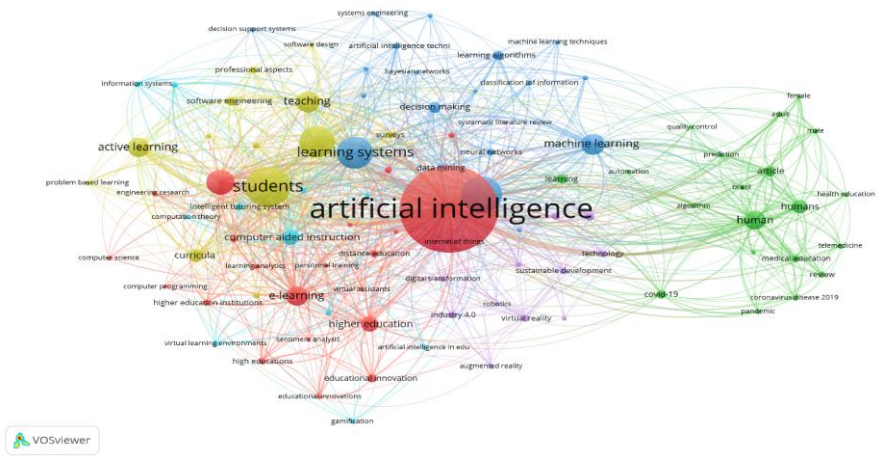

Figure 2. *Co-occurrence of words*

Source: Own elaboration (2023); based on data exported from Scopus.

Artificial Intelligence is the most frequently used keyword within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Students are also among the most frequently used variables, associated with variables such as Education, Learning Systems, Teacher, Machine Learning, Active Learning. In Latin America, where disparities in access to and quality of education are persistent challenges, AI can play an important role in the democratization of education. AI-powered online platforms can bring high-quality educational content to remote or disadvantaged areas, closing the education gap. In addition, AI can help identify patterns of early school leaving and provide preventive interventions to ensure that all students have the opportunity to complete their education.

4.2 Distribution of scientific production by year of publication

Figure 3 shows how scientific production is distributed according to the year of publication.

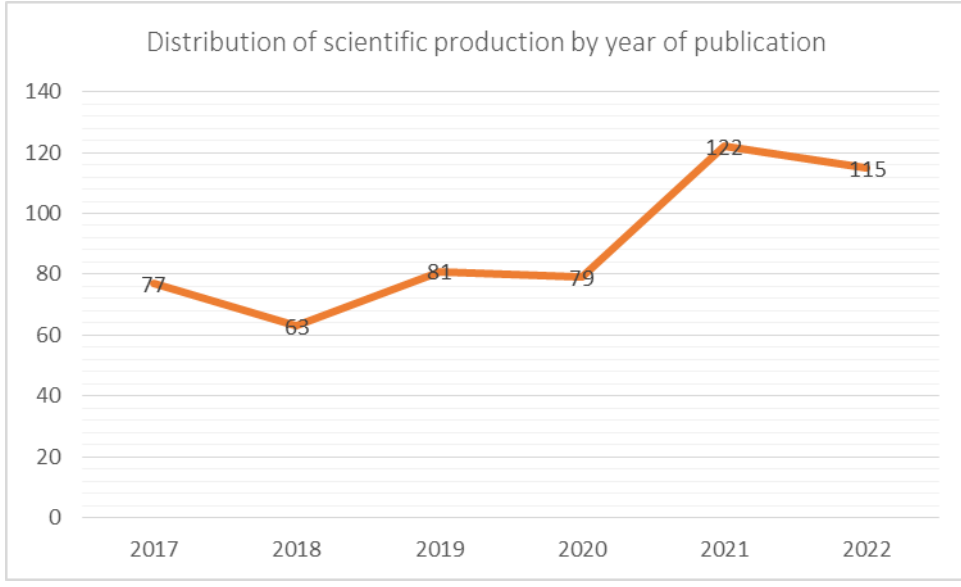

Figure 3. *Distribution of scientific production by year of publication.*

Source: Own elaboration (2023); based on data exported from Scopus

Among the main characteristics evidenced by the distribution of scientific production by year of publication, a level of number of publications registered in Scopus is notorious in the years 2021, reaching a total of 122 documents published in journals indexed in said platform. The above can be explained thanks to articles such as the one entitled "Artificial Intelligence Techniques in the Evaluation of Virtual Education by University Students" The main objective of this study was to

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obtain the assessment of university students about virtual classes, where through the techniques provided by Artificial Intelligence (AI) we have been able to identify a negative assessment in general, And this has helped us to categorize the most relevant characteristics of this evaluation, as consequences of adapting these changes in virtual classes. (Torres-Cruz, 2022)

4.3 Distribution of scientific production by country of origin

Figure 4 shows how scientific production is distributed according to the country of origin of the institutions to which the authors are affiliated.

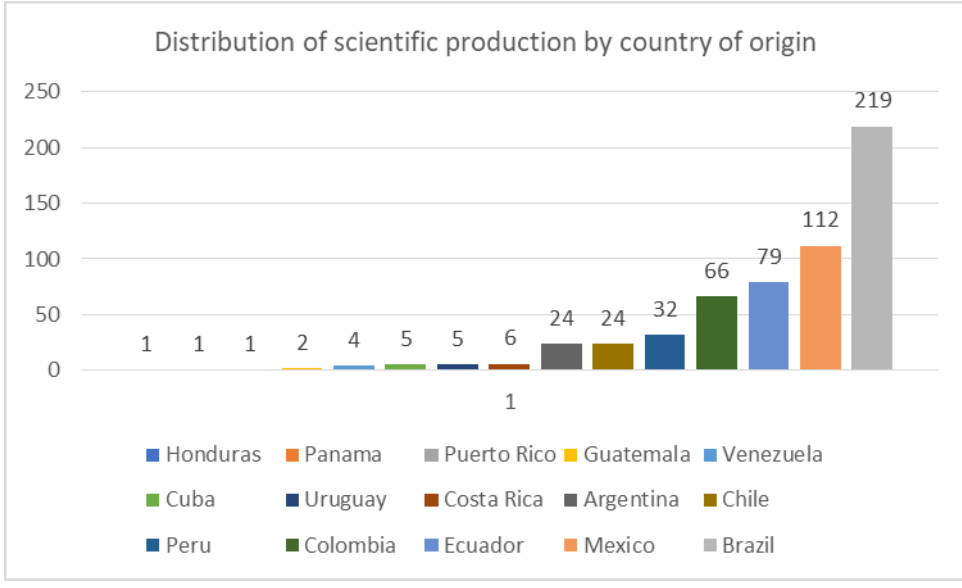

Figure 4. *Distribution of scientific production by country of origin.*

Source: Own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, records from institutions were taken into account, establishing Brazil, as the country of that community, with the highest number of publications indexed in Scopus during the period 2017-2022, with a total of 2019 publications in total. In second place, Mexico with 112 scientific papers, and Ecuador occupying the third place presenting to the scientific community, with a total of 79 documents among which is the article entitled "Education and artificial intelligence: immersive thematic nodes" This article examines, from the point of view of scientific discourse, some of the most important thematic nodes that have been produced in what concurs with the education-Intelligence relationship. Artificial. To this end, a review of 72 academic articles selected from the ERIC (Education Resources Information Center) database was carried out, not only to track the topical network

from which the main Transversal Phenomena have been constituted, the Technological Device and the Educational Matrix, which occupies the scientific-academic attention space in what competes with the education-AI relationship, but it also allowed to appreciate the smartification of education as one of the most dynamic phenomena that emerge in the node of knowledge defined by the terms in question (education-AI).(González, 2022)

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows the distribution of the elaboration of scientific publications from the area of knowledge through which the different research methodologies are implemented.

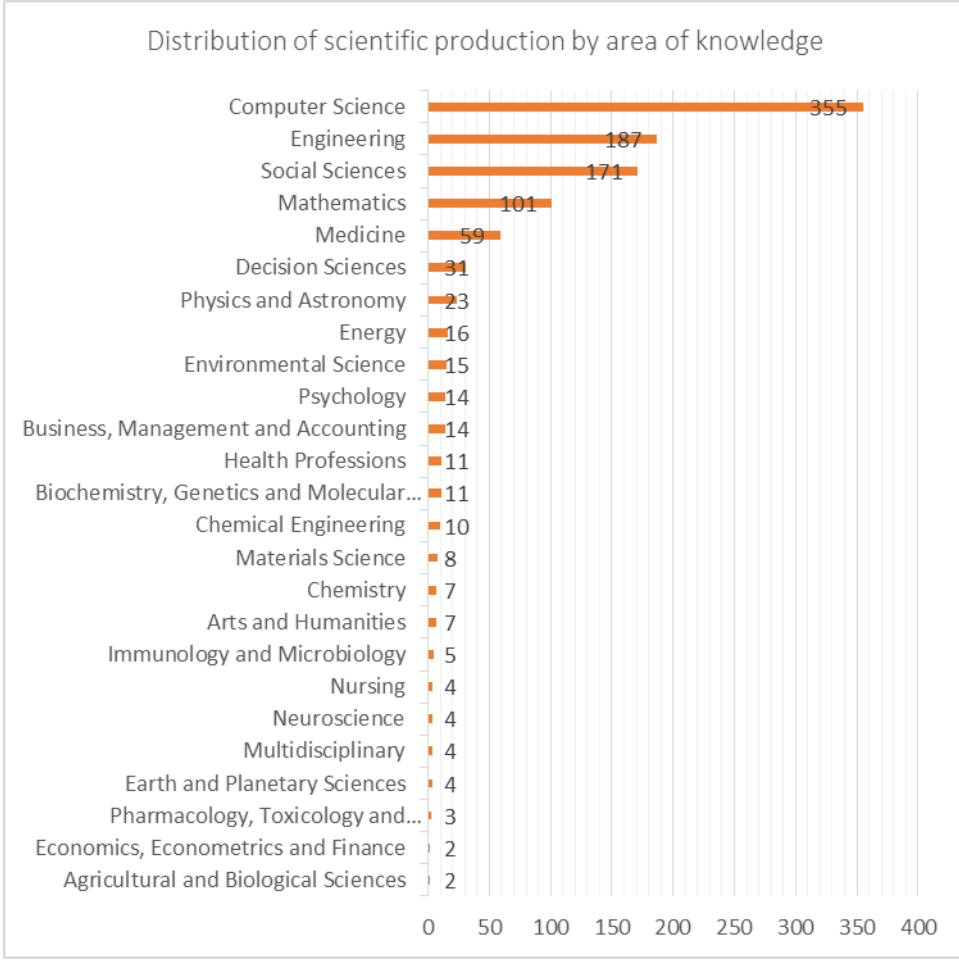

Figure 5. *Distribution of scientific production by area of knowledge.*

Source: Own elaboration (2023); based on data provided by Scopus

Computer Science was the area of knowledge with the highest number of publications registered in Scopus with a total of 335 documents that have based their variable methodologies Artificial Intelligence and Education. In second place, Engineering with 187 articles and Social Sciences in third place with 171. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was registered by the Computer Science area entitled "Connecting brain and heart: artificial intelligence for sustainable development" In this paper, we analyze the inclusion of SD in AI research indexed by the IEEE Xplore database from 2000 to 2019. We address three critical questions: (1) To what extent does AI research address the Sustainable Development Goals (SDGs)? (2) What AI topic areas show an emerging interest in SD? and (3) What patterns of collaboration between regions of the world are being stimulated by AI? Our scientometric analysis consists of (1) Identifying the number of AI articles addressing the SDGs in their titles, abstracts, and keywords. (2) Develop a composite indicator based on the number of papers produced, scientific impact, and inventive impact to distinguish areas with an emerging interest in SD; (3) Explore co-authoring networks at three levels: region, income group, and country.(Chavarro, 2022)

4.5 Type of publication

In the following graph, you will observe the distribution of the bibliographic finding according to the type of publication made by each of the authors found in Scopus.

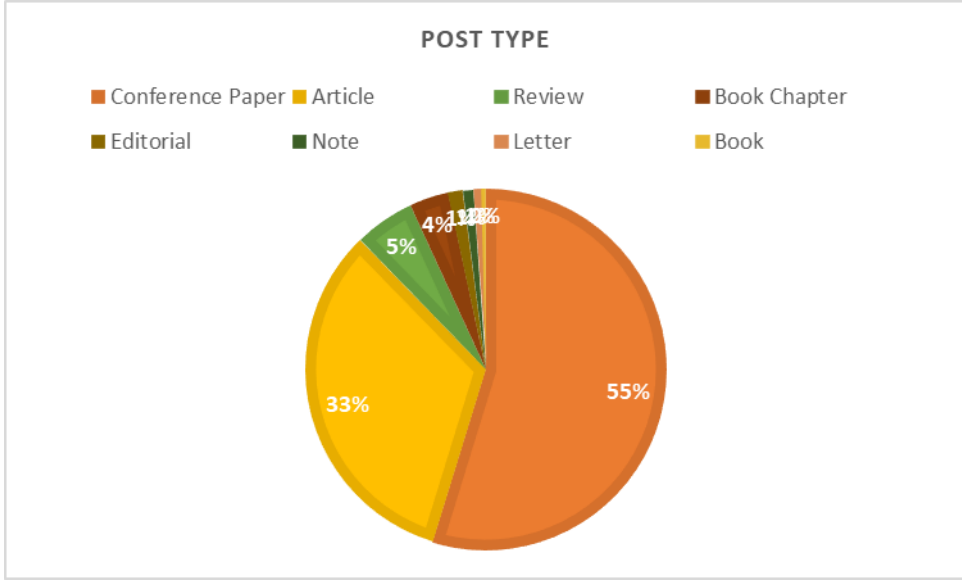

Figure 6. *Type of publication.*

Source: Own elaboration (2023); based on data provided by Scopus.

The type of publication most frequently used by the researchers referenced in the body of this document was entitled Conference Articles with 55% of the total production identified for analysis, followed by Arituclo de Revista with 33%. Journal are part of this classification, representing 5% of the research papers published during the period 2020-2022 in journals indexed in Scopus. In this last category, the one entitled "Artificial intelligence and law education: its incorporation during the Covid-19 pandemic" stands out This study aims to analyze the incorporation of artificial intelligence in law teaching at the university level during the COVID-19 pandemic. It is important because it recognizes the need for its incorporation, which would promote reading, critical thinking, investigative culture and improve the academic performance of law students.

A qualitative research was developed, with a non-experimental design and an exploratory level. An instrument was developed, which was validated using the Deplhi method. The instrument was applied to lawyers who work as professors in Peruvian universities. The results show the importance of the incorporation of technology, which allows a virtual education process, becoming a complementary tool in training processes, with which the replacement of teachers is feared. It was concluded that the incorporation of artificial intelligence in the training process of the law student is feasible because it would prioritize digital literacy.(Quezada Castro, 2022)

5. Conclusions

Through the bibliometric analysis carried out in the present research work, it was established that Brazil was the country with the largest number of records published for the variables Artificial Intelligence and Education. with a total of 219 publications in Scopus database. Similarly, it was established that the application of theories framed in the area of Computer Science, were used more frequently in the integration of artificial intelligence in educational environments in Latin America, since this represents both a challenge and an exciting opportunity to transform the way we teach and learn. As technology continues to advance, it is essential to realize the potential of artificial intelligence to improve the quality of education and address existing disparities in education systems. The successful implementation of artificial intelligence in Latin American classrooms requires a combination of factors, such as significant investments in technological infrastructure, adequate teacher training to take full advantage of artificial intelligence tools, and adapting the curriculum to integrate teaching methods. dynamic and personalized. Since AI can automate repetitive tasks and provide instant feedback, teachers can spend more time on creative activities and develop essential skills in students, such as critical thinking, problem-solving, and collaboration. However, it is critical to address the ethical and societal challenges that arise with the integration of artificial intelligence into education. Robust security measures must be implemented to protect student privacy and ensure that decisions made by algorithms are transparent and fair. In addition, the digital divide in the region could worsen if disparities in

access to technology are not adequately addressed. Ultimately, integrating artificial intelligence into Latin American educational environments can help drive innovation, improve education, and prepare students for an ever-changing digital world.

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