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Exploring the Implementation of Artificial Intelligence in Higher Education: Advantages and Hurdles

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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 variables Higher Education and Artificial Intelligence in Latin America. 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 121 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 on the proposed topic is referenced through a qualitative analysis. Among the main findings made through this research, it is found that Mexico, with 38 publications, was the country with the highest scientific production indexed in Scopus by authors affiliated with Latin American institutions, while Brazil and Colombia occupy the second and third place with 28 and 24 published documents, respectively. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material related to the study of Artificial Intelligence and Higher Education in Latin America was Computer Science with 85 published documents, and the most used Publication Type during the period indicated above were Conference Articles with 63% of the total scientific production.

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

1. Introduction

Accounting for the benefits that artificial intelligence brings to society would be innumerable, these technologies provide society with access to evolution and transformation. Knowing this, artificial intelligence has revolutionized the paradigm of education, leaving aside traditional and teaching methodologies and implementing more avant-garde methods and unlimited access to large amounts of information. As contemporary education grapples with the effects of globalization and the demands of an ever-changing global economy, these intelligences offer this educational sector formidable benefits and challenges.

One of the benefits offered by incorporating this AI in higher education is to offer students personalized learning experiences, with the help of educators, students could be

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offered learning methods according to the needs of each student and with this address the academic difficulties they present, an adaptive method that thinks about the academic well-being of those present. "The Impact of AI on Teaching and Learning in Higher Education Technology" The interface of algorithms that can execute these technologies would improve the performance of educational platforms, adapt the methods of delivery of activities, improve evaluation methods and in turn promote a methodology of learning autonomously and effectively. (Singh, 2022)

In addition to this, incorporating these AI strategies in education evidences the benefits of improving efficiency and optimization of resources since optimizing administrative tasks in universities, grades and data analysis allow educators to focus their time on activities of great impact for these institutions such as, implement university tutorials, develop new academic courses and innovate in pedagogical methods. This efficiency not only optimizes the workload of teachers, but also optimizes the resources of the educational establishments. Likewise, improving learning platforms in higher education, which brings with it an impact on geographical barriers, which provides quality access to student learning at a global level. This democratization has the quality of being able to close this gap of inequity faced by students around the world and to have unilateral access to learning and promote inclusion in education.

However, taking advantage of all these technological resources is not without facing challenges, since a successful incorporation of this artificial intelligence would require training and total adaptability on the part of educators, since they must be at the forefront of future learning methods and constantly redesign paradigms focused on teaching. Resistance to change, coupled with the need to be able to deliver comprehensive learning plays a role against the flow of AI in existing educational institutions and programs. In addition, the cost and improvement of educational facilities are taken into account, since implementing AI technologies implies a substantial economic contribution since training classrooms, hardware and software must be improved and this represents limitations for educational access and which challenges maintaining artificial intelligence systems that are at the forefront. The absence of standardized frameworks and regulations for AI in education poses challenges in terms of ensuring quality, equity, and accountability. Establishing guidelines that address the ethical use of AI and set industry standards is crucial to fostering responsible implementation. 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 Higher Education and Artificial Intelligence in Latin America, as well. Such as the description of the position of certain authors affiliated with institutions, during the period between 2017 and 2022.

2. General Objective

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

3. Methodology

This article is carried out through a research with a mixed orientation 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 of the variables Artificial Intelligence and Higher Education. On the other hand, examples of some research works published in the area of study mentioned above are analyzed

from a qualitative perspective, based on a bibliographic approach that allows describing the position of different authors on the proposed topic. It is important to note that the entire search was carried out 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 carried out from the Search tool on the Scopus website, where 121 publications were obtained from the following filters:

- TITLE-ABS-KEY (artificial AND intelligence, AND higher AND education) AND PUBYEAR > 2016 AND PUBYEAR < 2023 AND (LIMIT-TO (AFFILCOUNTRY , "Mexico") OR LIMIT-TO (AFFILCOUNTRY , "Brazil") OR LIMIT-TO (AFFILCOUNTRY , "Colombia") OR LIMIT-TO (AFFILCOUNTRY , "Ecuador") OR LIMIT-TO (AFFILCOUNTRY , "Peru") OR LIMIT-TO (AFFILCOUNTRY , "Argentina") OR LIMIT-TO (AFFILCOUNTRY , "Chile") OR LIMIT-TO (AFFILCOUNTRY , "Cuba") OR LIMIT-TO (AFFILCOUNTRY , "Venezuela") OR LIMIT-TO (AFFILCOUNTRY , "Panama") OR LIMIT-TO (AFFILCOUNTRY , "Costa Rica")
- Published documents whose study variables are related to the study of the variables Artificial Intelligence and Higher Education.
- Limited to the period 2017-2022.
- Limited to Latin American countries.
- Without distinction of area of knowledge.
- No distinction of type of publication.

3.1.2 Phase 2: Construction of analytical material

The information collected in Scopus during the previous phase is organized and then 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, the results of the previous results are analysed, 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.

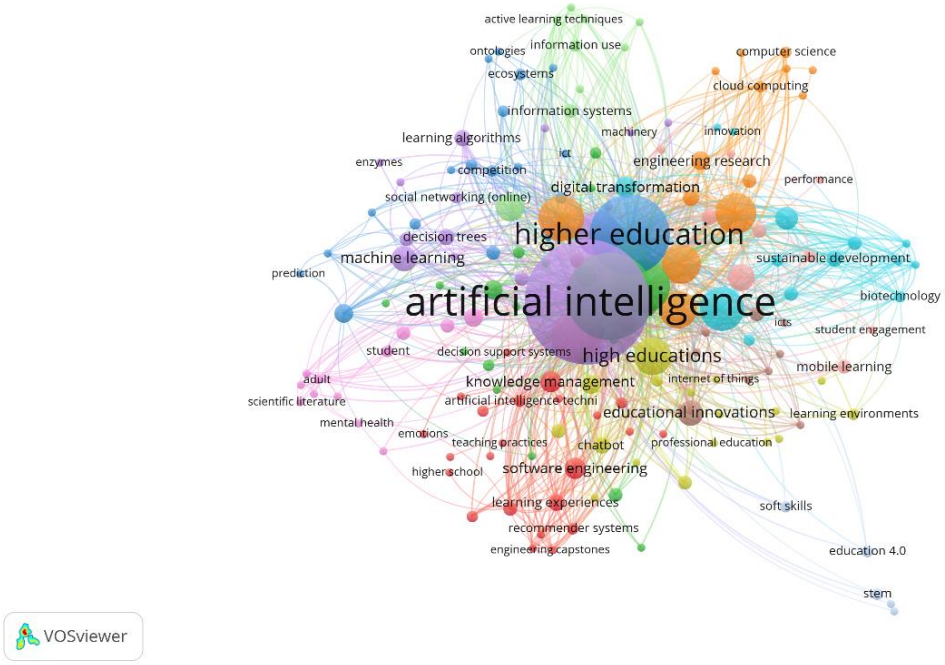

Figure 2. Co-occurrence of words

Source: Authors' own elaboration (2023); based on data exported from Scopus.

Artificial Intelligence was 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. Higher Education is among the most frequently used variables, associated with variables such as Innovation, Students, Education 4.0, Learning System, Innovative Technology, Sustainable Development, Educational Ecosystems. The incorporation of AI in higher education holds immense promise to revolutionize the way students learn and educators teach. The benefits, ranging from personalized learning experiences to administrative efficiency, contribute significantly to the advancement of the education sector. However, addressing challenges related to privacy, ethics, bias, and workforce readiness is critical to ensuring responsible and sustainable integration of AI into higher education. As the educational landscape continues to evolve, a balanced and strategic approach is essential to harness the full potential of AI while safeguarding the values and principles that underpin the pursuit of knowledge and learning.

4.2 Distribution of scientific production by year of publication

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

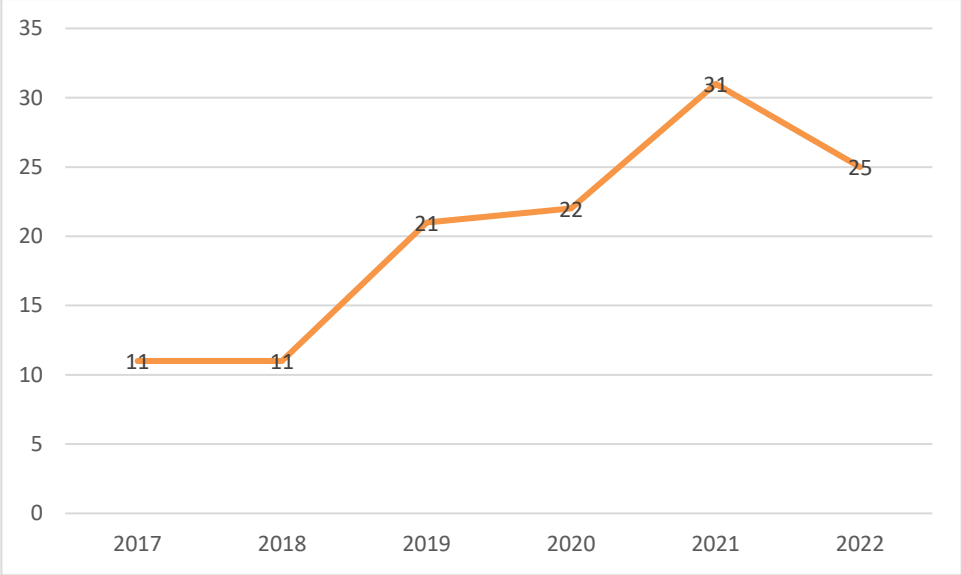

Figure 3. Distribution of scientific production by year of publication.

Source: Authors' own elaboration (2023); based on data exported from Scopus

Among the main characteristics evidenced through the distribution of scientific production by year of publication, the number of publications registered in Scopus was in 2021, reaching a total of 31 documents published in journals indexed on this platform. This can be explained thanks to articles such as the one entitled "Artificial Neural Networks in the Prediction of Academic Performance: Systematic Implementation and Evaluation of Predictors" The first objective of this study is to test a systematic procedure to implement artificial neural networks to predict academic performance in higher education. The second objective is to analyze the importance of several well-known predictors of academic achievement in higher education. The sample included 162,030 male and female students from public and private universities in Colombia. The findings suggest that it is possible to systematically deploy artificial neural networks to classify students' academic performance as high (82% accuracy) or low (71% accuracy). Artificial neural networks outperform other machine learning algorithms in evaluation metrics such as recall and F1 score. In addition, prior academic performance, socioeconomic conditions, and high school characteristics are found to be important predictors of students' academic performance in higher education(Rodríguez-Hernández, 2021)

4.3 Distribution of scientific production by country of origin.

Figure 4 shows how the scientific production is distributed according to the nationality of the authors.

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

Source: Authors' own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, the registrations from institutions were taken into account, establishing Mexico as the country of that community, with the highest number of publications indexed in Scopus during the period 2017-2022, with a total of 38 publications in total. In second place, Brazil with 28 scientific papers, and Colombia occupying the third place presenting to the scientific community, with a total of 24 documents, among which is the article entitled "Analysis of the effects of confinement on staff and students of universities in Spain and Colombia using natural language processing techniques" The aim of this study is to analyze the effects of confinement using data processing techniques. natural language, in particular sentiment analysis methods applied on a large scale. In addition, our work seeks to analyze the impact of COVID-19 on the university community, jointly on staff and students, and with a multinational perspective. The main findings of this study show that the most related words were "family", "anxiety", "home" and "life". In addition to this finding, we have also shown that staff have a slightly less negative perception of the consequences of COVID-19 on their daily lives. We have used artificial intelligence models such as spinning embedding and a multi-layered perceptron as classification algorithms. The performance achieved in terms of accuracy metrics was 88.8% and 88.5% for students and staff, respectively. The main conclusion of our study is that higher education institutions and policymakers around the world can benefit from these findings when formulating policy recommendations and strategies to support students during this and any future pandemic.(Jojoa, 2022)

4.4 Distribution of scientific production by area of knowledge

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

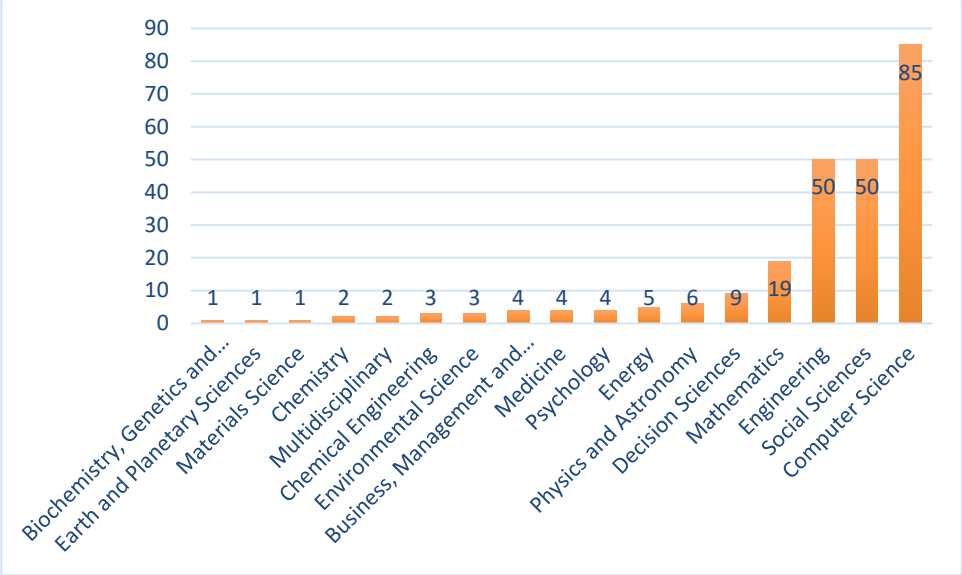

Figure 5. Distribution of scientific production by area of knowledge.

Source: Authors' 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 85 documents that have based their methodologies on the Artificial Intelligence and Higher Education. In second place, Social Sciences with 50 articles and Engineering in third place with 50. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was registered by Computer Science entitled "Teaching through learning analysis: prediction of the learning profiles of students in a physics course in a higher education institution" This study aims to determine to what extent the K-nearest neighbor and random forest algorithms could become a tool useful to improve the teaching-learning process and reduce academic failure in two Physics careers at the Instituto Tecnológico de Monterrey, Mexico (n = 268). A quasi-experimental and mixed-method approach was carried out. The main results showed significant differences between the first and second trimester assessments in the two groups. One of the main findings of the study is that the predictions were not very accurate for each student on the first-quarter assessment. However, the predictions became more accurate as the algorithm was fed larger datasets from the second-quarter assessment. This result indicates how predictive algorithms based on decision trees can offer a close approximation of the academic performance that will occur in the class, and this information could be used together with the personal impressions coming from the teacher.(Rincon-Flores, 2022)

4.5 Distribution of scientific production by type of publication

Figure 6 shows the distribution of the elaboration of scientific publications based on the area of knowledge through which the different research methodologies are implemented.

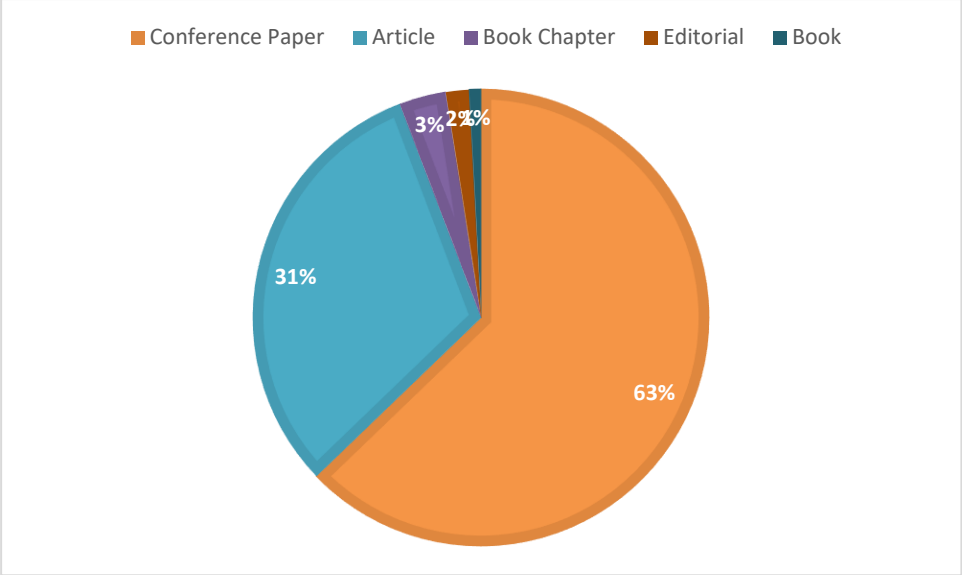

Figure 5. Distribution of scientific production by type of publication

Source: Authors' 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 the one entitled Session Paper with 63% of the total production identified for analysis, followed by Journal Articles with 31%. Chapter of the Book are part of this classification, representing 3% of the research papers published during the period 2017-2022, in journals indexed in Scopus. In this last category, the one entitled "Distance proctored exams: a guarantee of integrity in online education?" stands out. This mixed-methods study aimed to understand the extent to which remotely proctored exams impacted the online graduate students' learning process and their academic integrity (ethics), in addition to the technological factor involved. The results revealed a significant impact of remotely proctored exams on personal academic honesty because they minimized the possibility of performing acts of dishonesty. Students attributed this to a sense of obligation and a feeling of being watched, rather than an internal motivation or a process of personal reflection. Lack of privacy and anxiety emerged as areas of concern for students.(Gudiño Paredes, 2021)

5. Conclusions

Through the bibliometric analysis carried out in this research work, it was established that Mexico was the country with the highest number of published records regarding the variables Artificial Intelligence and Higher Education. With a total of 38 publications in the Scopus database. In the same way, it was possible to establish that the application of theories framed in the area of Computer Science, were used more frequently when determining what would be the pros and cons when incorporating artificial intelligence in higher education. Universities must contemplate the innumerable advantages that these AIs bring and at the same time recognize the shortcomings that would arise when it comes to executing them and thus be able to address the complexities that may arise. With this, it can be stated that one of the benefits of contemplating these AIs in education is their ability to improve already established academic stereotypes and, hand in hand with innovation, to be able to create new academic approaches, with this it is possible to improve teaching methods, improve the quality of education and encourage autonomous learning. The benefits of artificial intelligence with its algorithms would allow educators to apply learning and teaching techniques with a personal focus, with this they would seek to address the academic challenges of each student and improve their shortcomings, allowing them to improve performance within the institution and improve grades. This

personalization fosters a deeper environment of the different learning styles, this seeks to gradually accelerate the learning processes and take advantage of technological resources for continuous access to information. These advantages in education exploit the power of students and within institutions improve academic quality since this AI would improve the internal processes of teachers, improve teachers' workloads and focus on being able to exploit pedagogical methodologies, with this, virtual tutorials and personalized education are in favor of academic improvement. Virtual tutoring offers students the opportunity to learn in which part of the world, access to the educational network and at the same time have academic flexibility which seeks to leave aside face-to-face classrooms and forge a more digitized horizon and greater connectivity. But it should be taken into account that this incorporation requires to be executed carefully since institutions must establish solid policies when overstoring data and information, ensuring that the data uploaded to the students' network are protected and used ethically, with this would seek to minimize the algorithms presented by these technologies to ensure access to education in a fair and equitable way for students. To conclude, the difficulties when it comes to establishing these AIs is the constant need for teachers and institutions to adapt to these technologies, which are constantly changing. Providing teachers with training programs and digital development initiatives are necessary skills to be able to make good use of this AI.

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