

HIGHER EDUCATION AND THE CHALLENGES OF ARTIFICIAL INTELLIGENCE

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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. 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 2018-2022, achieving the identification of 15 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 China, with 4 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 Higher Education and Artificial Intelligence was Computer Science with 8 published documents, and the Type of Publication most used during the period indicated above was the Journal Article with 8 documents of the total scientific production.

Keywords: Higher education, emotional intelligence.

1. INTRODUCTION

With the emergence of new technologies such as the so-called Information and Communication Technologies (ICTs) and the development of a new Industrial Revolution also called Industry 4.0, it has been possible to provide the industry, in general, with new alternatives that have allowed them to achieve better levels of productivity. Such is the case of Artificial Intelligence, which has gained great relevance in multiple aspects of our daily lives as stated in the article "Artificial Intelligence: Definitions in Dispute": (Giletta, Giordano, Mercaú, Orden, & Villareal, 2020)

At present, Artificial Intelligence (hereinafter: AI) is acquiring an increasing role in people's social life, in the economy, in production, in professions: in activities such as pattern recognition (facial recognition, object recognition in images, spam in email); in the provision of banking services; in health (particularly with regard to the performance of certain diagnoses and image analyses); in agricultural production; in chatbots or virtual assistants for smartphones and personal computers; in e-commerce; in virtual translators, using natural language processing; on streaming services; in video games, among many other applications. (Giletta, Giordano, Mercaú, Orden, & Villareal, 2020)

According to Alberto García Serrano, the term Artificial Intelligence refers to "a set of techniques, algorithms and tools that allow us to solve problems for which, a priori, a certain degree of intelligence is necessary, in the sense that they are problems that pose a challenge even to the human

brain" (García Serrano, 2017, as cited in Giletta, Giordano, Mercaú, Orden, & Villareal, 2020), that is, it is a technological advance capable of replicating certain human skills trying to offer a greater degree of effectiveness in its work.

However, it is necessary to bear in mind that this type of technology must be developed and executed by technicians or professionals from any area, so it is necessary to prepare them in the management of these alternatives in order to reduce the gap between the need for companies to implement the long-awaited Artificial Intelligence and what is really taught to students during the subjects taken in the Higher Education institutions they attend. That is why this research article seeks to describe the main characteristics of the set of publications attached to the Scopus database and that are directly related to our variables, as well as the description of the position of certain authors affiliated with various institutions during the period between 2018 and 2022.

2. GENERAL OBJECTIVE

Analyze from a bibliometric and bibliographic perspective, the elaboration of works on the variables Higher Education and Artificial Intelligence, during the period 2018-2022.

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 of Higher Education and Artificial Intelligence.

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 carried out from the Search tool on the Scopus website, where 15 publications were obtained from the choice of the following filters:

TITLE-ABS-KEY (higher AND education AND the AND challenges AND facing AND artificial AND intelligence) AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018)) AND (LIMIT-TO (EXACTKEYWORD , "Artificial Intelligence") OR LIMIT-TO (EXACTKEYWORD , "Higher Education"))

- Published documents whose study variables are related to the study of Higher Education and Artificial Intelligence.

- Limited to the years 2018-2022.
- No limit of countries.
- Limited to the keywords "Artificial Intelligence and Higher Education".
- No publication area limit.
- 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.

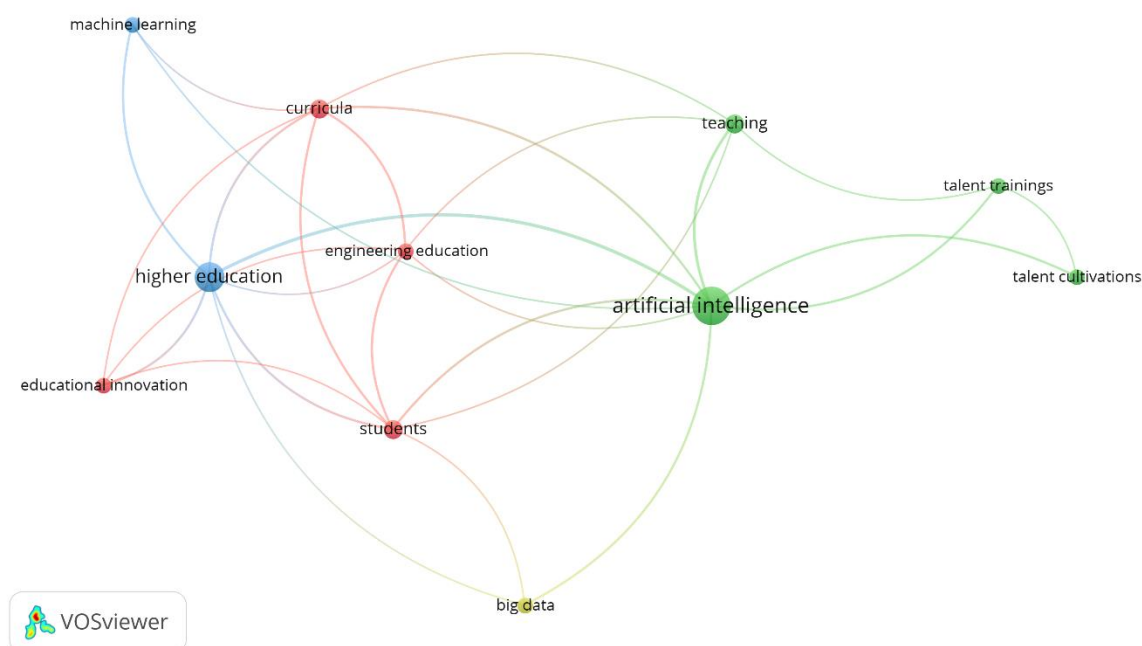


Figure 2. Co-occurrence of words

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

The data in Figure 2, exported from Scopus, shows us our variables and their relationship with other terms which we will explain below.

Artificial Intelligence is known as a fundamental part of computer science so it used to be closely linked to the teaching of engineering programs. However, over time it has been possible to verify that it has been responsible for the improvement of many of the processes carried out by any company and that require more automated and repetitive mechanisms that together contribute significantly to the levels of productivity and efficiency obtained by a company. That is why today, Higher Education Institutions seek to implement this technological advance in all areas of knowledge in order

to train professionals capable of putting into practice different skills and abilities in order to meet the requirements of society.

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

In figure 3 we find the scientific production concerning the variables Student Scientific Production and Writing during the period between 2018 and 2022, which resulted in the publication of 15 documents, in the Scopus database, containing the keywords. Likewise, it is evident that some changes were experienced throughout the period. We started with the year 2018 with 1 document, a figure that becomes 0 during the following year, however, the increase in publications is achieved from 2020 to 2022, the latter reaching the highest number of documents published during the period with a total of 7.

From the year 2020, the conference proceedings entitled "Open innovation laboratory: Education environments 4.0 to improve skills in schoolchildren" stand out, in which it mentions "the adoption of emerging technologies in the productive sectors" and "in the brec has that this has generated between the industry and what the academy is expected to teach " (Cortes, Molina, & Ramirez, 2020) . More than anything it is based on Artificial Intelligence, on the type of skills it can replicate and the challenges faced by the education system in the face of these technological advances. They assure that "universities through professors and infrastructure must develop guidelines for students to improve their skills and generate the necessary competencies", hence the emergence of concepts such as "open innovation" an option that has allowed educational institutions to develop projects that allow the "development of competencies to university students". (Cortes, Molina, & Ramirez, 2020) That is why it has been possible to develop laboratories called "Open Innovation where learning techniques, design methodologies and product realization platforms are merged to provide a cutting-edge concept to meet the demands towards the educational model" (Cortes, Molina, & Ramirez, 2020) trying to unify efforts of the different stakeholders.

4.3 Distribution of scientific production by country of origin.

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

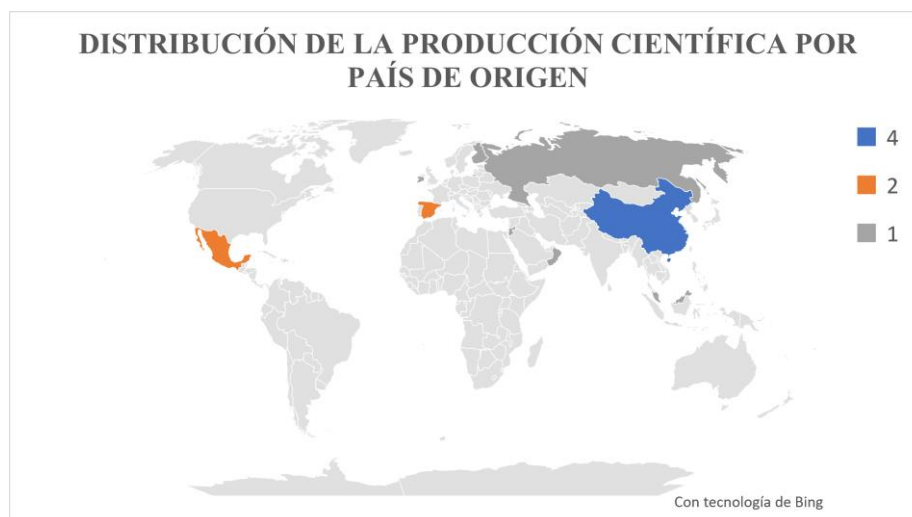


Figure 4. Distribution of scientific production by country of origin.
Source: Own elaboration (2023); based on data provided by Scopus.

In the study of Higher Education and Artificial Intelligence, China leads the list of published documents with a total of 4 records in the Scopus database during the period of the years 2018-2022, followed by Mexico and Spain with 2 documents each .

The article "Modality of training innovative accounting talents in universities that use artificial intelligence" in which the challenges assumed by the accounting profession are presented by "gradually replacing traditional accounting". There is no doubt that in the new era of information and technology it is also necessary to change the teaching methods in the classrooms of different educational institutions mainly with the intention of integrating technologies such as Artificial Intelligence and the training of management professionals. This article manages to demonstrate that with the implementation of a new algorithm model it is possible to achieve "that innovative accounting talents cultivated in schools meet the needs of society and improve their irreplaceability" (Cai, 2022)

At this point, it is important to note that the preparation of scientific publications in many cases is carried out from collaborations that may involve private and/or public institutions from one or more countries. Therefore, the same publication can be linked to one or more authors with different nationalities and thus to more than one country simultaneously, being part of the total number of articles or publications of each of them in the final sum. Next, in *Figure 5*, you will see in greater detail the flow of collaborative work carried out by several countries.

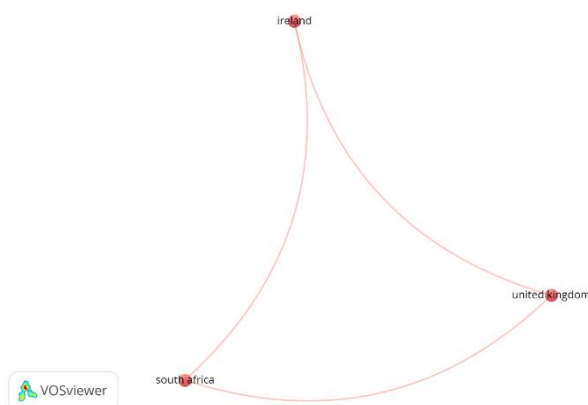


Figure 5. Co-citations between countries.
Source: Own elaboration (2023); based on data provided by Scopus.

Figure 5 shows the grouping of research according to the collaboration between authors belonging to various international institutions. There is evidence of outstanding participation among authors affiliated with institutions in countries such as Ireland, South Africa and the United Kingdom.

4.4 Distribution of scientific production by area of knowledge

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

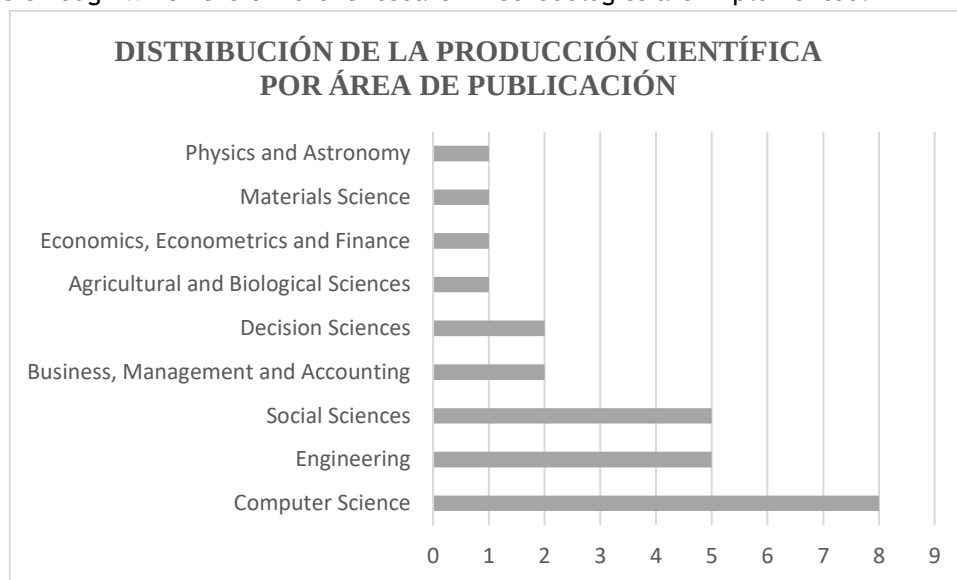


Figure 6. Distribution of scientific production by area of knowledge.

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

Due to the nature of our variables and their importance in the acquisition of skills for the management of Artificial Intelligence systems, it is not surprising that most of the publications found in the Scopus database, on these are made from computer science occupying the main position in the publication of documents. Other areas such as engineering as well as social sciences have contributed to the study of these variables, publishing 5 papers each.

As we can see in Figure 6, the variables object of this study are relevant in various areas of knowledge, since they positively impact the training of professionals familiar with new technologies and therefore able to meet the needs of the labor market that seeks to guarantee greater productivity to companies in any economic sector.

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 7. Type of publication.

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



Figure 7 clearly shows that the predominant type of publication in the study of Higher Education and Artificial Intelligence was the journal article with a total of 8 documents, followed in second and third place by the conference proceedings with 6 publications and book section with only 1 title.

As stated in the article "Virtual trainers with artificial intelligence: degree of acceptance among university students" it is no (Martín-Ramallal, Merchán-Murillo, & Ruiz-Mondaza, 2022) secret to anyone that current education faces great challenges resulting from the need to adapt to the globalized and technological world that is here to stay. In this case, the authors intended to "explain and understand how technologies based on AI-assisted virtual teachers could support higher education and self-directed learning" (Martín-Ramallal, Merchán-Murillo, & Ruiz-Mondaza, 2022) through different interfaces so they conducted their study through "a dual methodology, combining a theoretical perspective based on documentary analysis, and a structured Likert-type questionnaire completed by 662 university students. " (Martín-Ramallal, Merchán-Murillo, & Ruiz-Mondaza, 2022)." The results confirm that, although this paradigm is considered distant, it is appreciated that in the future it will be used as a useful didactic resource". (Martín-Ramallal, Merchán-Murillo, & Ruiz-Mondaza, 2022)

5. Conclusions

After the bibliometric analysis carried out in the present research work, it was established that China was the country with the highest number of records published for the variable Higher Education and Artificial Intelligence with a total of 4 publications, in the Scopus database during the period 2018-2022 and that the area of knowledge with the greatest contribution was computer science with 8 texts.

It is evident that Higher Education Institutions are aware of the need to modify their teaching methods and adapt to new technologies that allow the development of new skills in students who are part of their community. That is, taking this into account it can be said that:

HEIs inserted in knowledge societies are called to reinvent themselves, taking into account the challenges that the 4IR integrates into the formative and social dynamics, where the developments of technology, physics and biology converge, because if they continue with the traditional model, they will not be able to respond to the needs and challenges they face in a world that is increasingly dynamic. This reinvention must focus both on the capacity for scientific development and technological innovation, with the purpose of growing and participating in the solution of the challenges present in the new fields of knowledge and work. (Pérez Rojas, 2020)

Additionally, it is observed that regardless of the area of knowledge, Artificial Intelligence has caused Higher Education Institutions to face many challenges daily for each area of knowledge that is handled, so it is suggested that multiple changes be made in traditional education which "focuses on the development of hard skills in students, However, current technological developments mainly in the fields of artificial intelligence and automation pose a threat to technique and repetitive jobs." (Cortes, Molina, & Ramirez, 2020) Although these same authors argue that the so-called "soft" skills will continue to be required because they cannot be replicated by machines, they assure the following:

Complex problems require the integration of multidisciplinary teams where decision-making and communication skills are enhanced by their individual parts. The massification of Information and Communication Technologies in all sectors of society requires an evolution of the educational model. Consequently, universities through professors and infrastructure must develop guidelines for students to improve their skills and generate the necessary competencies. (Cortes, Molina, & Ramirez, 2020)

For all of the above and with the sole objective of continuing to raise awareness of the importance of guaranteeing access to this type of information in a transparent way by anyone, we hope to encourage with this article the participation of scientific communities in the study of these variables from any scientific profile and area of knowledge always seeking to provide more alternatives that contribute to the investigation of topics of interest general.

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