EXPLORING LEARNING STYLES IN HIGHER EDUCATION THROUGH ARTIFICIAL INTELLIGENCE PLATFORMS

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Summary

A documentary review was carried out on the production and publication of research papers related to the study of the variables Learning Styles, 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 2017-2022, achieving the identification of 37 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 the United States and China, with 8 publications, were the countries with the highest scientific production registered in the name of authors affiliated with institutions of these nations. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of Learning Styles in Higher Education through Artificial Intelligence platforms, was Computer Science with 20 published documents, and the Type of Publication most used during the period indicated above were Journal Articles with 46% of the total scientific production.

Keywords: *Learning Styles, Higher Education, Artificial Intelligence.*

1. INTRODUCTION

In today's digital age, AI platforms have revolutionized various aspects of society, including higher education. These platforms offer unprecedented opportunities to enhance teaching and learning in educational institutions, enabling adaptation to individual student needs and preferences. An important aspect that has been addressed in the use of artificial intelligence in higher education is the diversity of learning styles. Learning styles refer to the preferences and ways in which students absorb, process, and retain information. Each student has a unique learning style and AI platforms can provide a personalized experience tailored to each. These platforms can identify students'

learning styles through data collection and analysis, enabling the creation of an individualized and effective learning environment.

In higher education, artificial intelligence has the ability to provide different teaching methods that meet students' preferences. Some students may learn more effectively through reading and writing, while others prefer visual or auditory learning. AI platforms can tailor course content and learning activities to each student's learning styles and provide learning material for their specific needs.
In addition to adapting learning materials, AI platforms can also use techniques such as gamification to promote student engagement and motivation. Interactive elements, challenges, and rewards can be designed according to students' learning styles, allowing them to learn more effectively and enjoy the learning process. However, it is important to note that the implementation of AI platforms in higher education must be careful and ethical. Personal data collection and automated decision-making can raise data protection and fairness issues. Clear policies and safeguards must be put in place so that students can benefit from these platforms without compromising their safety and well-being.
AI platforms in higher education can transform the way students learn by adapting to their individual learning styles. By personalizing educational content and activities, these platforms can improve learning efficiency and promote student engagement. However, it is important to respond responsibly and ethically to the challenges of privacy and equality so that all students can benefit from this innovative technology. 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 Learning Styles, Higher Education and Artificial Intelligence, as well. As the description of the position of certain authors affiliated with institutions, during the period between 2017 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 Learning Styles, Higher Education and Artificial Intelligence, during the period 2017-2022.

3. METHODOLOGY

This article is carried out through a research with 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 Learning Styles, 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 towards 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 37 publications were obtained from the choice of the following filters:

- TITLE-ABS-KEY (learning AND styles. AND higher AND education, 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)
- Published documents whose study variables are related to the study of Learning Styles, Higher Education and Artificial Intelligence.
- Limited to the years 2017-2022.
- Without distinction of country of origin.
- 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.

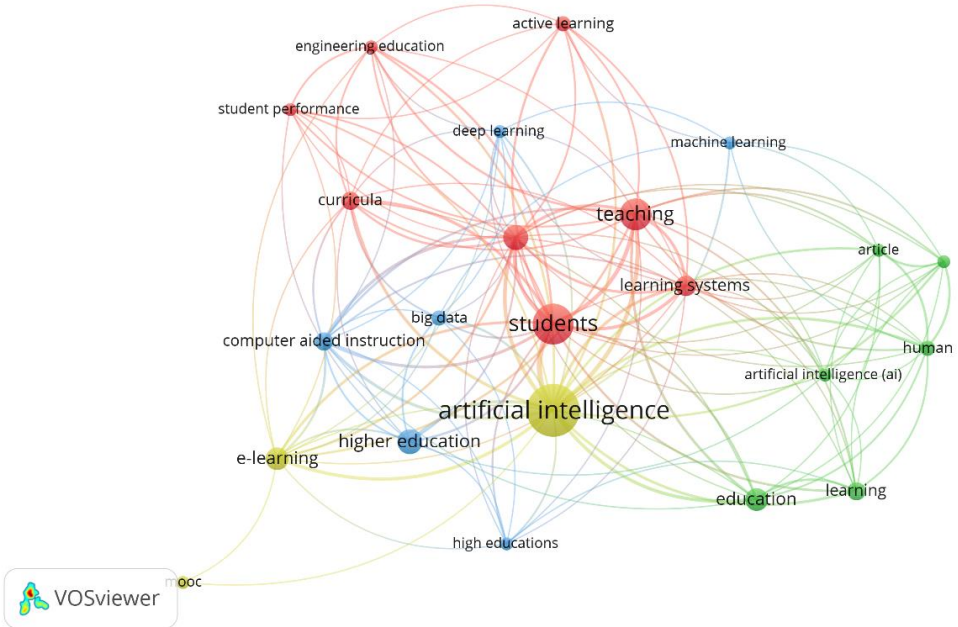

***Figure 2**. Co-occurrence of words*

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

Artificial Intelligence 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. Students are also among the most frequently used variables, associated with variables such as Learning Systems, Big Data, Higher Education. From the above, it is striking that the introduction of learning styles driven by artificial intelligence in higher education is a trend that is attracting the attention of educators, students and professionals in the field of educational technology. The combination of learning styles that respect the diversity of students with the adaptability of artificial intelligence is expected to revolutionize the way knowledge is taught and acquired in educational institutions. Another reason why this implementation is so interesting is because artificial intelligence has the ability to identify patterns and trends in the collected data. This means that platforms can offer personalized recommendations of learning resources and activities, as well as identify areas for improvement and provide individualized feedback. This can help students optimize their learning process and focus their efforts on areas that need more attention.

4.2 Distribution of scientific production by year of publication

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

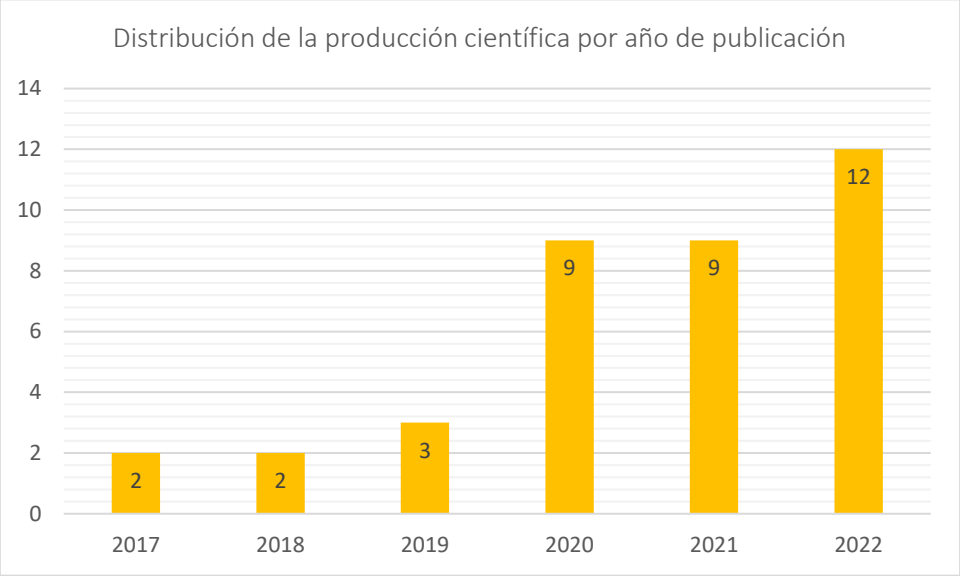

***Figure 3**. Distribution of scientific production by year of publication.*
Source: Own elaboration (2023); based on data exported from Scopus

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 2022, reaching a total of 12 documents published in journals indexed in said platform. This can be explained thanks to articles such as the one entitled "Do you support inclusive learning using chatbots? An interview study led by Chatbot" This research aims to investigate the opportunities and requirements of chatbots as an intelligent helper to facilitate learning equity. We developed a chatbot as an experimental platform to investigate design opportunities for using chatbots to support inclusive learning. Through a chatbot-led user study with 215 college students, we found that chatbots provide the opportunity to support students who are disadvantaged, with diverse living environments, and with varied learning styles. This could be achieved through an accessible, interactive and confidential manner.(Gupta, 2022)

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.

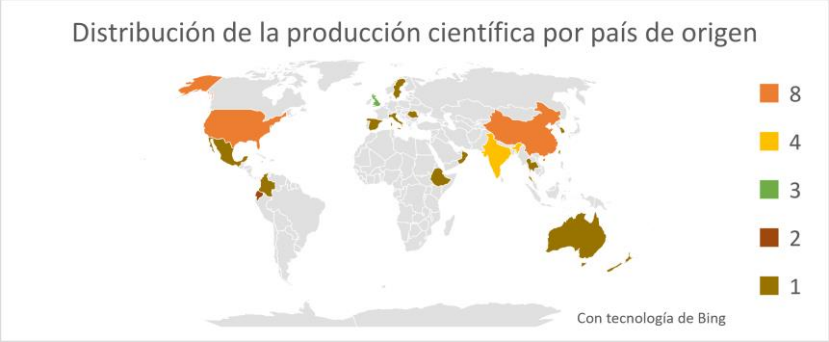

***Figure 4**. Distribution of scientific production by country of origin.*
Source: Own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, records from institutions were taken into account, establishing the United States and China, as the country of that community, with the highest number of publications indexed in Scopus during the period 2017-2022, with a total of 8 publications in total. In second place, India with 4 scientific papers, and the UK ranking third presenting to the scientific community, with a total of 3 papers among which is the article entitled "Student performance, engagement and satisfaction in an inverted classroom of statics and mechanics of materials: a case study" This article presents a case study of the evidence-based practice of flipping a classroom. The flipped (or flipped) classroom has long been promoted as a method of improving student engagement in the classroom, as it creates opportunities for active learning experiences during class time that would otherwise be consumed in passive instruction. A flipped classroom relies on students independently preparing for class before the scheduled lesson time, usually by watching pre-lesson videos or reading instructor-assigned material. Having been exposed to lecture material, synchronous class time can be used to complete active learning exercises in small groups with direct supervision and immediate feedback offered by the instructor. At Johns Hopkins University, Statics and Mechanics of Materials has been taught for many years using a traditional lecture-style mode of instruction to students of civil, environmental, and mechanical engineering. Aware of the documented benefits of the flipped classroom model, in 2019 the author created a library of pre-lesson videos and accompanying in-class learning exercises to experiment with this mode of instruction. (Sangree, 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.

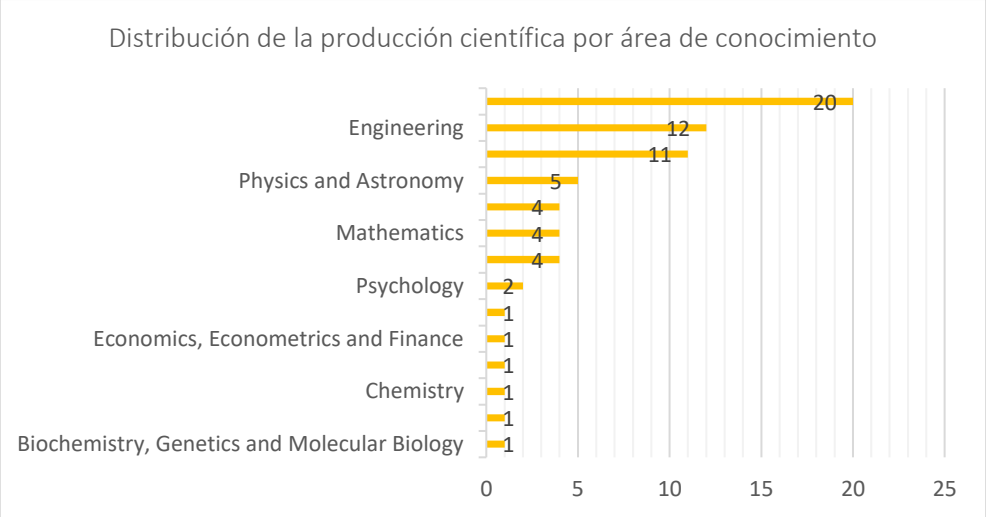

***Figure 5**. Distribution of scientific production by area of knowledge.*

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 20 documents that have based their methodologies Learning Styles, Higher Education and Artificial Intelligence. In second place, Engineering with 12 articles and Social Sciences in third place with 11. 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 "Cross-validation of a rubric for the automatic classification of cognitive presence in MOOC debates" This article reports on a validation study where transcripts of discussions from a target massive open online course (MOOC) were classified into cognitive presence phases to validate The use of an adapted rubric with a larger dataset and with more coders involved. Our results indicate that the adapted rubric remains stable for categorizing target MOOC discussion transcripts to some extent. However, the proportion of disagreements between coders increased compared to the previous experimental study with less data and encoders. Informal writing styles in MOOC discussions, which are not as prevalent in credit courses, caused ambiguities for programmers. We also found that most disagreements appeared in adjacent phases of cognitive presence, especially in the intermediate phases. The results suggest that additional phases adjacent to the current categories of cognitive presence may exist when the educational context shifts from traditional smaller-scale courses to MOOCs. Other researchers can use these findings to build machine analytics applications to support online teaching and learning for broader educational contexts in open and distance learning. We propose refinements to cognitive presence methods and suggest adaptations to certain elements of the Research Community (CoI) framework when used in the context of MOOCs.(Hu, 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.

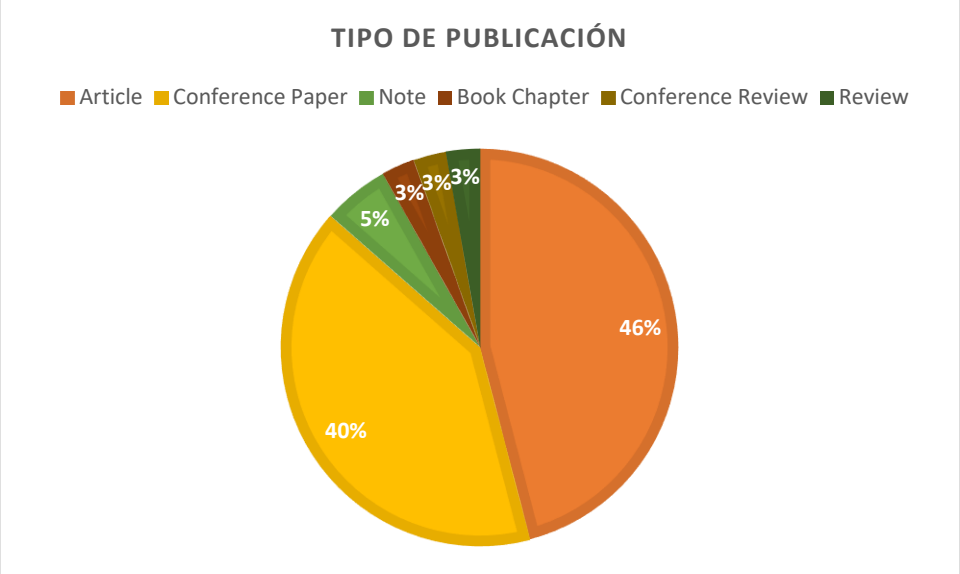

***Figure 6**. Type of publication.*

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 the Journal Article with 46% of the total production identified for analysis, followed by the Session Paper with 40%. Note are part of this classification, representing 5% of the research papers published during the period 2017-2022 in journals indexed in Scopus. In this last category, the one entitled "Artificial intelligence and machine learning approaches in digital education: a systematic review" stands out. First, the study follows a repeatable and objective process of literature exploration. Secondly, the study describes and explains the topics of the literature related to the use of AI-based algorithms in digital education. The findings of the study present six topics related to the use of machines in digital education. The evidence synthesized in this study suggests

that machine learning and deep learning algorithms are used in several digital learning topics. These topics include the use of smart tutors, dropout predictions, performance predictions, adaptive and predictive learning and learning styles, group-based learning and analytics, and automation. Artificial neural network algorithms and support vector machines appear to be used among all identified topics, followed by random forest algorithms, decision trees, naïve Bayes, and logistic regression.(Munir, 2022)

5. CONCLUSIONS

Through the bibliometric analysis carried out in the present research work, it was established that the United States and China was the country with the largest number of records published for the variables Learning Styles, Higher Education and Artificial Intelligence with a total of 8 publications in the Scopus database. Similarly, it was established that the application of theories framed in the area of Computer Science, were the most frequently used in the measurement of learning styles in higher education, since these have undergone an important change with artificial intelligence platforms. These platforms have opened up new opportunities to tailor learning and tailor it to individual student preferences, resulting in greater student access and more effective learning. AI platforms use advanced algorithms and techniques to gather information about student achievements and preferences. In this way, teachers can more accurately identify students' learning styles and provide materials and activities that meet individual needs. In addition, these platforms can provide instant and personalized feedback, helping students identify and correct their mistakes in time. Artificial intelligence has also encouraged the application of different learning methods, such as problem-based learning, collaborative learning and adaptive learning. These approaches allow students to develop problem-solving skills, work in groups, and progress at their own pace. AI platforms provide the infrastructure needed to implement these methods and provide a dynamic and interactive learning environment. However, it is important to note that AI platforms will not completely replace human interactions in higher education. While these tools can be useful for individual learning, developing social and emotional skills and building relationships remain core elements of education. It is therefore important that teachers use AI platforms to complement their teaching, promoting the right balance between technology and human interaction.

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