

## EXPLORING THE LANDSCAPE OF ARTIFICIAL INTELLIGENCE RESEARCH IN EDUCATION JOURNALS: A BIBLIOMETRIC ANALYSIS

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### Abstract

In recent years, AI technology has experienced rapid growth, while education remains a driving force for social progress and development. Therefore, this study aims to explore the trends and impact of artificial intelligence research in the field of education through bibliometric analysis. Utilizing tools such as HistCite and VOSviewer, this research collects and analyzes literature from education journals related to AI in recent years. Through the analysis of cited references, a comprehensive understanding of the influence and research status of AI in the field of education can be obtained from various perspectives.

Key words: AI, education, HistCite, VOSviewer, bibliography

### Introduction

Artificial Intelligence (AI) was defined in 1956 as the science and engineering of creating intelligent machines (McCarthy, 2007). Mondal (2020) defines AI as the science and engineering of creating intelligent machines through natural language processing, neural networks, and machine learning to solve various types of problems. The application of AI, as mentioned by Xu et al. (2021), is changing various industries such as medicine, psychology, science, and public policy (Su et al., 2023). In the

field of education, the application of AI has become crucial for colleges and universities, whether in personalized learning, computerized assessment, intelligent education systems, or supporting teaching staff. The support they provide can reduce costs and improve learning outcomes (Gill et al., 2024). AI can help teachers predict students' learning status and performance, and it can also improve students' learning experiences through recommending learning resources and automating assessments (Liang et al., 2021; Mousavinasab et al., 2021). Therefore, further exploration of

AI development in education is warranted.

In order to comprehend the current status of research on artificial intelligence (AI) in the field of education, scientific metrics methods can be employed to evaluate and examine research progress, as well as the efforts made by scholars, nations, and even journals in specific research areas (Konur, 2012). Therefore, this study aims to explore the research status, trends, and impact of AI in the field of education through literature collection and analysis of past articles in educational journals related to AI. This endeavor will enable stakeholders to gain a comprehensive understanding of the impact and research status of AI in education from various perspectives.

### Methodology

WOS (Web of Science) is a vast citation database that provides readers with detailed information about articles published in leading journals worldwide (Leeuwen, 2006). Therefore, this study utilizes WOS as the data source for bibliometric analysis, aiming to construct a knowledge map and evolutionary trajectory for this research. Through the WOS database, this study collects and analyzes articles related to AI published in educational journals over the past decade (2014-), amounting to 585 articles.

VOSviewer and HistCite are primarily used for analysis in this study. These software tools are employed to analyze the output countries, institutions, keywords, and research trends within the scope of this study. They also generate various visualization charts. Bibliometric

analysis utilizes numerical data to illustrate the developmental stages in a specific field, thereby providing researchers with an understanding of the literature progress in that area (Rajeswari et al., 2021).

### Results and Discussion

In this section, the study will utilize HistCite and VOSviewer to conduct descriptive statistics and citation network analysis, followed by discussions based on the results.

#### *Data Collection*

The data for this study comprise articles from educational journals within the Web of Science (WOS), spanning from 2014 to March 2024, covering nearly a decade of literature. A total of 585 documents were included in the dataset, involving contributions from 2,406 authors, 46 journals, 2,009 keywords, 71 countries, and 1,601 institutions. The articles garnered citation scores of 263 local citations and 4,895 global citations, among others.

#### *Distribution of the Number of Articles by Publication Year*

As depicted in Figure 1, it is evident that the topic of AI has garnered significant attention from researchers in the field of education in recent years. (Figure 1)

#### *Distribution of documents by countries*

From Table 1, it is evident that the United States has the highest number of publications with 191 articles. Following

closely is China, ranking second with 90 publications, followed by Spain, Canada,

and Taiwan. In total, there are 71 countries represented.

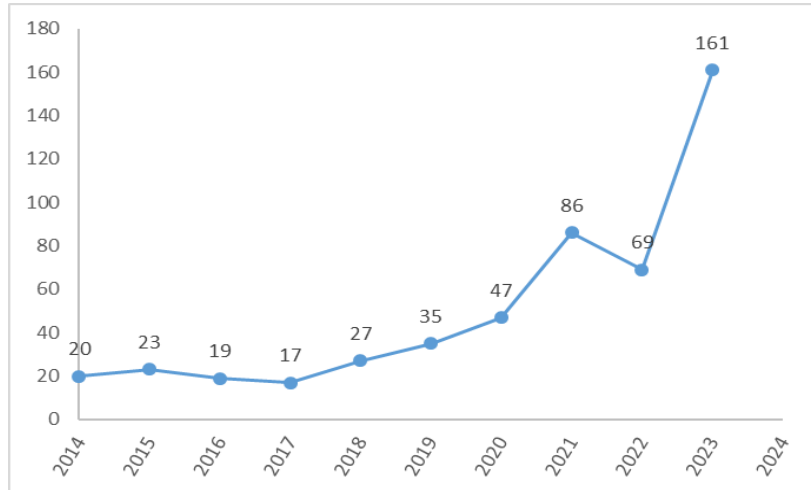


Figure 1. Publication Year's Distribution

Table 1. Distribution of documents by countries

S.No.	Country	Records	%	TLCS	TGCS
1	USA	191	32.6	123	1604
2	Peoples R China	90	15.4	16	361
3	Spain	42	7.2	9	407
4	Canada	39	6.7	27	469
5	Taiwan	36	6.2	10	250

\*TLCS total local citation score, \*TGCS total global citation score

#### *Distribution of documents by Institutions*

Regarding the contributions of different institutions in this analysis, the survey results are presented in Table 2. Among them, National Taiwan University ranks the highest, followed by Stanford University. Following closely are the University of Toronto, University of California San Francisco, and University of Michigan. In total, there are 200 institutions represented.

#### *Distribution of documents by Journals*

If we tally the number of articles published in different journals, "BMC Medical Education" has the highest count with 57 articles. Following closely is "Computer Applications in Engineering Education" with 51 articles. In total, there are 46 journals represented. (Table 3)

#### *Distribution of documents by Authors*

Analyzing the authors contributing to this field and topic, "Ho MJ" has the highest count with 8 articles, followed by authors such as "Cnossen F," each

with 5 articles. The data span only the past decade, hence the authors' accumulated counts may be relatively low, but there is a total of 2,406 participating au-

thors, indicating a significant level of interest from researchers in this topic. (Table 4)

Table 2. Distribution of documents by Institutions

S.No.	Institution	Records	%	TLCS	TGCS
1	Natl Taiwan Univ	16	2.7	10	174
2	Stanford Univ	13	2.2	12	142
3	Univ Toronto	12	2.1	18	118
4	Univ Calif San Francisco	11	1.9	14	68
5	Univ Michigan	10	1.7	2	32

Table 3. Distribution of documents by Journals

S.No.	Journal	Records	%	TLCS	TGCS
1	BMC MEDICAL EDUCATION	57	9.7	0	492
2	COMPUTER APPLICATIONS IN ENGINEERING EDUCATION	51	8.7	9	333
3	MEDICAL TEACHER	48	8.2	48	537
4	ACADEMIC MEDICINE	46	7.9	71	618
5	JOURNAL OF CHEMICAL EDUCATION	35	6	54	327

Table 4. Distribution of documents by Authors

S.No.	Author	Records	%	TLCS	TGCS
1	Ho MJ	8	1.4	8	141
2	Cnossen F	5	0.9	5	74
3	Hu WS	5	0.9	4	34
4	Jaarsma DADC	5	0.9	5	74
5	Lee J	5	0.9	11	59

#### *Distribution of documents by Keywords*

Authors use keywords to represent relevant topics within their research content. Excluding the three keywords central to this study's topic, "artificial," "intelligence," and "education," the most frequent keyword is "learning," accounting for 21.2% of occurrences. Following

closely are "medical" (22.9%), "students" (13.8%), and others. Interestingly, "chatgpt" also represents 6.5% of occurrences. In total, there are 2,009 keywords represented. (Table 5)

This study further analyzed the keywords set by researchers using VOSviewer, excluding terms related to AI

and education (such as AI, artificial intelligence, education, etc.), revealing that topics such as machine learning, medical education, and assessment are more prevalent in research. Examining the

chronological development of research, recent focus has shifted towards investigating chatGPT as a more prominent topic. (Figure 2)

Table 5. Distribution of documents by Keywords

S.No.	Keyword	Records	%	TLCS	TGCS
1	ARTIFICIAL	142	24.3	142	1394
2	INTELLIGENCE	139	23.8	137	1351
3	EDUCATION	136	23.2	120	1753
4	LEARNING	124	21.2	58	1095
5	MEDICAL	93	15.9	104	1339
6	STUDENTS	81	13.8	13	622
7	BASED	70	12.0	10	362
8	USING	52	8.9	20	591
9	TEACHING	46	7.9	9	271
10	CHATGPT	38	6.5	42	422

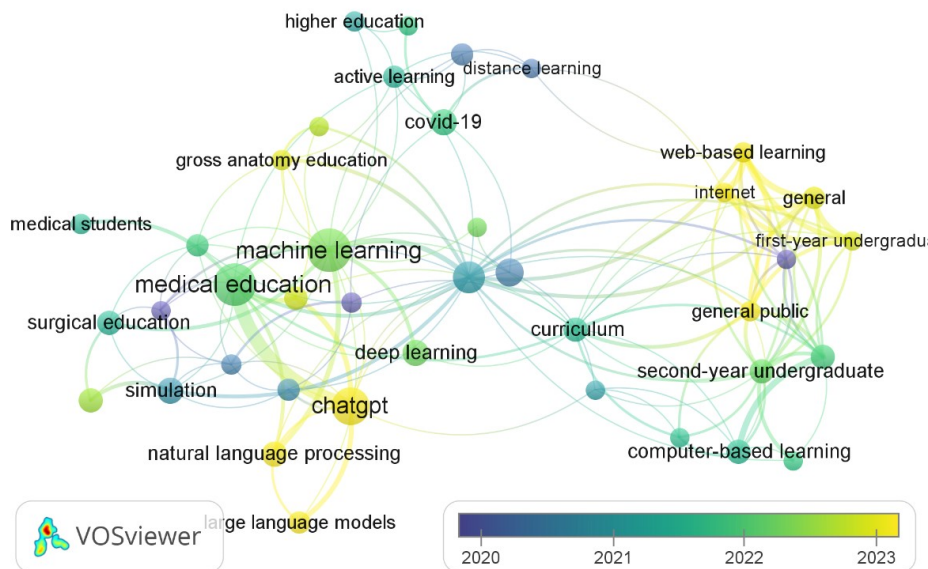


Figure 2. Distribution of Keywords Used by Authors

### Conclusion

In this study, we conducted an analysis based on 585 articles related to artificial intelligence research in educa-

tion journals retrieved from Web of Science, utilizing HistCite and VOSviewer. According to the research findings, it is evident that the number of publications on artificial intelligence in the field of

education has been increasing in recent years, indicating a growing interest among researchers. In terms of publication by country, the United States has the highest number of publications, followed by China and Spain. The institution with the most publications is National Taiwan University, followed by Stanford University. The journal with the highest number of articles is "BMC Medical Education". The topics of learning and medical are prominent in the research, with recent attention focused on ChatGPT. In summary, this paper outlines the current status and trends of artificial intelligence research in the field of education, providing researchers with a better understanding and aiming to facilitate the development of artificial intelligence for more effective assistance in education.

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