Bibliometric Analysis of Studies on the Use of Chatbots in Higher Education

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Abstract

This research aimed to determine the trend towards the use of Chatbots in higher education. 539 documents published in the SCOPUS database were analyzed with Bibliometrix, an open source tool from bibliometric analysis methods, and Biblioshiny, a rich web application. Findings from the research revealed that documents related to the use of Chatbots in higher education were published in the SCOPUS database for the first time in 2015. The most productive year was determined to be 2024. The most productive source in the field is "LECTURE NOTES IN COMPUTER SCIENCE (INCLUDING SUBSERIES LECTURE NOTES IN ARTIFICIAL INTELLIGENCE AND LECTURE NOTES IN BIOINFORMATICS) with 28 documents, and the most relevant author is "Tan, S.". The most productive countries in the field are "USA, INDIA, UK, GERMANY, INDONESIA, CHINA, SPAIN, MALAYSIA, AUSTRALIA and UKRAINE", while the most relevant institution is "UNIVERSITY OF GRANADA". The most cited document on a global scale was determined as "RUDOLPH J, 2023, J APPL LEARN TEACH-a" with DOI number 10.37074/jalt.2023.6.1.9, while the most frequently used words in the documents were determined as "Chatbots" and "higher educations". In higher education, it is recommended that authors who will conduct research on the use of chatbots take into account the findings obtained from this research.

Keywords

Bibliometric, Chatbots, AI, Higher Education, Bibliometrix

1. Introduction

Chatbots are actively used alongside AI technology today. Three AI chatbot prototypes were introduced at the University of Warwick in 2019, and their history is presented. These bots were developed to provide comprehensive contributions to postgraduate simulation games, educational application use, and assistance [1]. Following the publication of ChatGPT, another study examined 23 articles on AI chatbots in higher education, presenting existing fields, learning theories, and analyses of chatbots, highlighting theoretical shortcomings and current use cases [2]. Another study examines the characteristics of generative chatbots like ChatGPT and their potential marketing in higher education, focusing on the ethics, dissemination, and developments of chatbots that provide personalized learning opportunities [3].

Another study, examining 24 studies published between 2022 and 2023, analyzed higher education students' perceptions and usage patterns of AI chatbots, revealing their concerns about accurate information, critical thinking, and creativity [4]. Another study, addressing ethical concerns regarding the use of generative AI bots like ChatGPT in education, highlights risks such as data privacy, algorithmic biases, and addiction; and recommends developing policies and raising ethical awareness against these issues [5].

An examination of ChatGPT usage and student perceptions using data from 5894 students at Swedish universities reveals attitudes that differ by gender and field, highlighting the need to develop local, student-focused AI tools [6]. Gender differences in AI chatbot usage among Norwegian university students were examined, revealing that men use genAI tools more widely and in a variety of fields, while women are more concerned about critical thinking and reliability, indicating a need for informed

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use [7]. Findings based on a literature review of generative AI chatbots such as ChatGPT and Copilot in higher education institutions, highlighting the importance of ethical use [8].

The socio-emotional and relational factors of chatbots used in academic advising by university students in the UAE are examined, and ease of use and social impact are considered important, while recommendations are offered on trust and ethics [9]. The adoption and usage behavior of graduate students in China using AI chatbots is examined using the UTAUT and ECM models, examining the personal innovativeness of "approval" and "satisfaction" [10]. The adoption of AI chatbots in higher education is evaluated from the perspective of students and instructors, revealing concerns such as trust, privacy, and bias [11]. In another study examining undergraduate students' tendencies to use AI chatbots for educational purposes, compatibility, trialability, and trust were found to positively affect intention to use [12]. In a study examining the role of AI-based chatbots in higher education and their relationship with the Sustainable Development Goals (SDGs) using the PRISMA method, the impact of chatbots in education and their benefits in terms of sustainability, particularly focusing on SDG 4 (Quality Education), are highlighted [13].

The remainder of the paper is structured as follows: Section 2 presents the methodology, Section 3 reports the findings, and Section 4 provides the discussion and conclusions.

To achieve the research purpose, the following questions were answered:

1. What is the distribution of publications in terms of main information, such as year, document type, etc.?
2. What is the distribution of studies by year?
3. What are the most relevant sources?
4. Who are the most relevant authors?
5. Which countries are the most productive?
6. Which institutions are the most relevant?
7. What are the most cited documents and the most frequently used words in these documents?

2. Method

The purpose of this study is to determine the trend towards the use of Chatbots in higher education and to guide future studies. In the study where bibliometric analysis methods were preferred, the SCOPUS database was preferred for the data. SCOPUS; It was chosen because it analyzes a reliable and rich pool of information that provides independent data and measurements on research areas, authors, and institutions[1]. To achieve the purpose of the study, 539 documents were obtained by scanning with the keywords "Chatbots" AND "Higher Education". The search was carried out in the SCOPUS database by selecting the "Article title, Abstract, Keywords" search option and ended on July 4, 2025. To perform bibliometric analysis, bibliometrix, an open source tool developed by Massimo Aria and Corrado Cuccurullo [14], and biblioshiny, a rich web application, were used[2]. In the study, the distribution of documents by years, the most productive years and countries, the most relevant authors in the field, and the most published sources were analyzed, and the most used words and trending topics in the documents were analyzed.

3. Results

In this section of the study, the findings obtained from the research are included.

3.1. General information of publications on the use of Chatbots in Higher Education

General features of the published documents regarding the use of Chatbots in higher education are given in Table 1.

[1]Scopus https://www.scopus.com/home.uri
[2]Bibliometrix https://www.bibliometrix.org/home/index.php/layout/bibliometrix

Table 1
Main information about data

Description	Result
Timespan	2015:2025
Sources (Journals, Books, etc)	332
Documents	539
Annual Growth Rate %	63,56
Document Average Age	1,46
Average citations per doc	17,29
References	20289
DOCUMENT CONTENTS	
Keywords Plus (ID)	1628
Author's Keywords (DE)	1213
AUTHORS	
Authors	1707
Authors of single-authored docs	61
AUTHORS COLLABORATION	
Single-authored docs	64
Co-Authors per Doc	3,46
International co-authorships %	19,85
DOCUMENT TYPES	
article	241
book	5
book chapter	58
conference paper	194
conference review	22
editorial	5
erratum	3
review	11

Documentation on the use of Chatbots in higher education began to be published for the first time in 2015. The total number of documents published until July 4, 2025, is 539 and was included in a total of 332 sources. It was determined that 1707 authors carried out studies on the use of Chatbots in higher education, and 61 authors were authors of single-authored documents. From the findings obtained, it is seen that the authors mostly prefer to carry out collaborative studies. When the type of documents published in the SCOPUS database was examined, it was determined that the authors mostly published in the "article" document type ($n = 241$). Other published document types were determined as "conference paper" ($n = 194$), "book chapter" ($n = 58$), "conference review" ($n = 22$), "review" ($n = 11$), "book" and "editorial" ($n = 5$), respectively. The least preferred document type was determined to be "erratum" ($n = 3$).

3.2. Distribution of documents according to publication years

The distribution of documents published in the SCOPUS database by years is given in Table 2.

As seen in Table 2, the first documents on the use of Chatbots in higher education began to be published in the SCOPUS database in 2015 ($n = 1$). No documents were found in 2016 and 2017. 5 documents were published in 2018, 10 in 2019, and 11 in 2020. It is seen that the documents started to increase quantitatively as of 2021 ($n = 28$). The most productive year was determined as 2024 ($n = 215$). While it was determined that 137 documents related to the field were published in 2025, it is thought that this number will increase by the end of the year. In light of the findings, it can be said that studies on the use of Chatbots in higher education are becoming increasingly important and production will increase further in the coming years.

Table 2
Annual Production

Year	Articles
2015	1
2016	0
2017	0
2018	5
2019	10
2020	11
2021	28
2022	34
2023	98
2024	215
2025	137

3.3. Distribution of sources where documents are published

The 10 most relevant sources in the SCOPUS database, which publish documents on the use of Chatbots in higher education, are given in Table 3.

When the top 10 sources that published the most on the field between 2015 and July 2025 were examined, it was determined that the most published documents were 28. "Education And Information Technologies" Chatbots in higher education While “Lecture Notes In Networks And Systems” published 16 documents for its use, the other sources most relevant to the field are “ACM International Conference Proceeding Series” ($n = 11$), “Computers And Education: Artificial Intelligence” ($n = 11$), “IEEE Global Engineering Education Conference, EDUCON”. ($n = 11$), “Education Sciences” ($n = 10$), “Journal Of Applied Learning and Teaching” ($n = 9$), “Communications In Computer And Information Science” ($n = 5$), and “Frontiers In Education” ($n = 5$).

The findings will shed light on researchers who will study the use of Chatbots in higher education in terms of accessing the most relevant resources.

3.4. Most relevant authors

Table 3
Most relevant authors

Sources	Articles
Lecture Notes In Computer Science (Including Subseries Lecture Notes In Artificial Intelligence and Lecture Notes In Bioinformatics)	28
Education And Information Technologies	17
Lecture Notes In Networks And Systems ACM International Conference Proceeding Series	16
Computers And Education: Artificial Intelligence	11
IEEE Global Engineering Education Conference, Educon	11
Education Sciences	11
Journal Of Applied Learnıng And Teaching	10
Communications In Computer and Information	9
Science	5
Frontiers In Education	5

The authors who have conducted research on the use of Chatbots in higher education and are most relevant to the field are given in Table 4.

As seen in Table 4, the author most relevant to the field is "Tan, S." with 8 articles. The other authors most relevant to the field are; “Rudolph, J.” ($n = 6$), “Chen, Y.” ($n = 5$), “Abbas, N.” ($n = 4$), “Al Yakin, A.” ($n = 4$), “Gupta, S.” ($n = 4$), “Tsivitanidou, O.” ($n = 4$), “Aeni, N.” ($n = 3$), “Barranco, F.” ($n = 3$) and “Bell, D.” ($n = 3$). It is recommended that authors who will work in this field in the future take the documents of the researchers whose names are listed in Table 4 as examples.

Table 4
Most Relevant Authors

Authors	Articles	Articles Fractionalized
Tan, S	8	2,45
Rudolph, J	6	1,78
Chen, Y	5	1,23
Abbas, N	4	0,70
Al Yakin, A	4	0,60
Gupta, S	4	1,20
Tsivitanidou, O	4	0,95
Aeni, N	3	0,43
Barranco , F	3	0,49
Bell, D	3	1,00

3.5. Most productive countries

This study also aimed to determine the countries that focus on studies on the use of Chatbots in higher education. As a result of the analysis, the top 10 most productive countries in the field are given in Table 5.

Table 5
Country Production

Country	F
USA	241
INDIA	140
UK	89
GERMANY	87
INDONESIA	85
CHINA	70
SPAIN	68
MALAYSIA	56
AUSTRALIA	46
UKRAINE	46

As seen in Table 5, the most productive country in the field was determined to be the USA with 241 publications. The other most productive countries are: INDIA ($f = 140$), UK ($f = 89$), GERMANY ($f = 87$), INDONESIA ($f = 85$), CHINA ($f = 70$), SPAIN ($f = 68$), MALAYSIA ($f = 56$), AUSTRALIA ($f = 46$), and UKRAINE ($f = 46$). It is recommended that the policies and practices of the top 10 most productive countries in the field be taken as an example by other countries.

As seen in Figure 1, the productivity years of the countries are distributed between 2015 and 2023. The most productive year has been determined as 2023 or later. In this context, it can be said that countries that carry out studies on the use of Chatbots in higher education will show real productivity after 2023. The list of the top 10 countries with the most citations is given in Table 6.

In the study, it was determined that the top 10 countries with the most citations were the USA, UK, CHINA, AUSTRALIA, UNITED ARAB EMIRATES, SAUDI ARABIA, GERMANY, QATAR, MALAYSIA, and HONG KONG, respectively.

3.6. Most Relevant Affiliations

The research aimed to determine the most relevant institutions for the use of Chatbots in higher education. The list of the top 10 most relevant institutions is given in Table 7.

The findings revealed that the most relevant institution in the field was the "UNIVERSITY OF GRANADA" with 20 articles. The other most relevant institutions were determined as "EAST WEST UNIVERSITY" ($n = 17$), "THE UNIVERSITY OF JORDAN" ($n = 17$), "UNIVERSITY OF LEEDS"

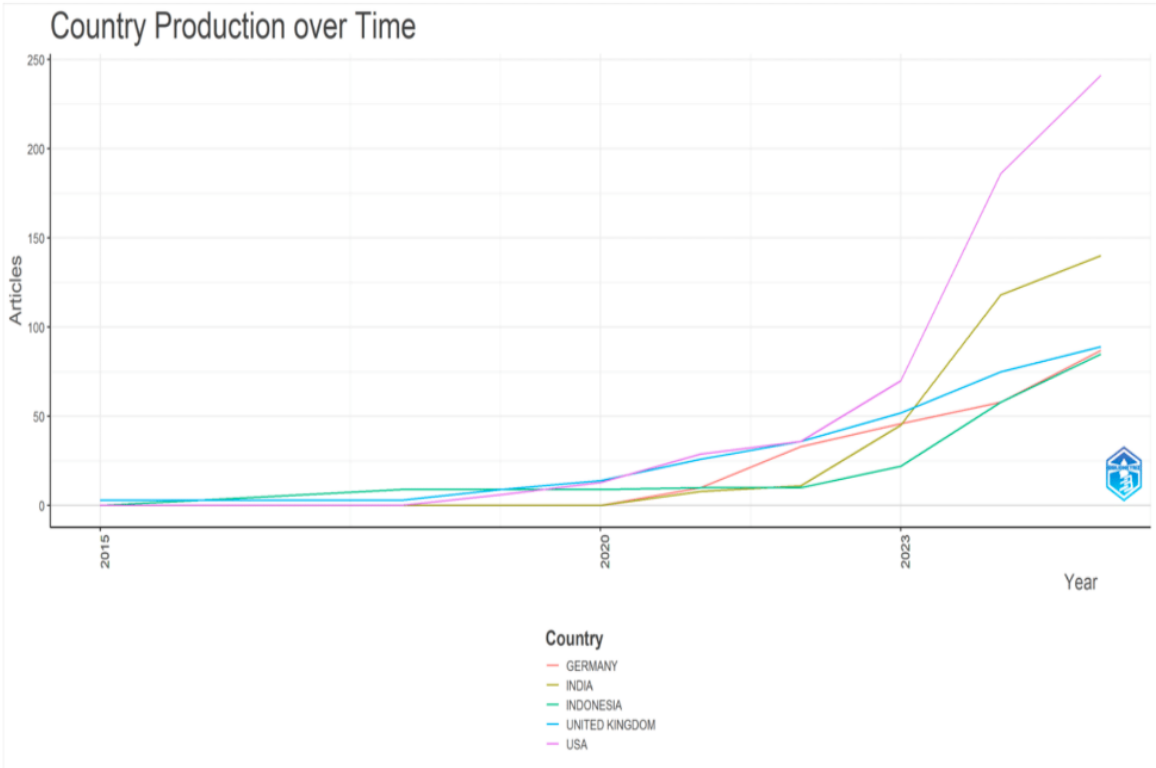

Figure 1: Example figure

Table 6
Most Cited Countries

Country	TC	Average Article Citations
USA	962	28,30
UNITED KINGDOM	595	37,20
CHINA	486	21,10
AUSTRALIA	375	53,60
UNITED ARAB EMIRATES	346	38,40
SAUDI ARABIA	286	40,90
GERMANY	271	22,60
QATAR	271	271,00
MALAYSIA	246	24,60
HONG KONG	242	48,40

Table 7
Most Relevant Affiliations

Affiliation	Article
UNIVERSITY OF GRANADA	20
EAST WEST UNIVERSITY	17
THE UNIVERSITY OF JORDAN	17
UNIVERSITY OF LEEDS	13
FERGANA STATE UNIVERSITY	11
BINA NUSANTARA UNIVERSITY	10
TECHNICAL UNIVERSITY OF DENMARK	10
UNIVERSITY OF OULU	10
SOEGIJAPRANATA CATHOLIC UNIVERSITY	9
THE UNIVERSITY OF HONG KONG	9

($n = 13$), "FERGANA STATE UNIVERSITY" ($n = 11$), "BINA NUSANTARA UNIVERSITY" ($n = 10$), "TECHNICAL UNIVERSITY OF DENMARK" ($n = 10$), "UNIVERSITY OF OULU" ($n = 10$), "SOEGIJAPRANATA CATHOLIC UNIVERSITY" ($n = 9$), and "THE UNIVERSITY OF HONG KONG" ($n = 9$). It is recommended that other institutions conducting research in this field continue to collaborate with institutions listed as "most relevant institutions" and those that have produced the most documents.

3.7. Most Cited Documents and Most Frequently Used Words Globally

The top 10 globally cited documents related to the use of Chatbots in higher education are given in Table 8.

Table 8
Most Global Cited Documents

Paper	DOI	Total Citations	TC per Year	Normalized TC
RUDOLPH J, 2023, J APPL LEARN TEACH-a	10.37074/jalt.2023.6.1.9	982	327,33	18,20
RUDOLPH J, 2023, J APPL LEARN TEACH	10.37074/jalt.2023.6.1.23	438	146,00	8,12
KING MR, 2023, CELL MOL BIOENG	10.1007/s12195-022-00754-8	405	135,00	7,51
MICHEL-VILLARREAL R, 2023, EDUC SCI	10.3390/educsci13090856	354	118,00	6,56
CHEN Y, 2023, INF SYST FRONT	10.1007/s10796-022-10291-4	307	102,33	5,69
ABULIBDEH A, 2024, J CLEAN PROD	10.1016/j.jclepro.2023.140527	271	135,50	28,45
DEMPERE J, 2023, FRONT EDUC	10.3389/feduc.2023.1206936	201	67,00	3,73
WANG T, 2023, APPL SCI	10.3390/app13116716	199	66,33	3,69
WU R, 2024, BR J EDUC TECHNOL	10.1111/bjet.13334	191	95,50	20,05
IMRAN M, 2023, CONTEMP EDU TECH	10.30935/cedtech/13605	184	61,33	3,41

As seen in Table 8, the most cited document globally was "RUDOLPH J, 2023, J APPL LEARN TEACH-a" (Total Citations = 982) with DOI number 10.37074/jalt.2023.6.1.9. The other documents in the top 10 and most cited globally are; “RUDOLPH J, 2023, J APPL LEARN TEACH, DOI: 10.37074/jalt.2023.6.1.23” (Total Citations= 438), “KING MR, 2023, CELL MOL BIOENG, DOI: 10.1007/s12195-022-00754-8” (Total Citations= 405), “MICHEL-VILLARREAL R, 2023, EDUC SCI, DOI: 10.3390/educsci13090856” (Total Citations= 354), “CHEN Y, 2023, INF SYST FRONT, DOI: 10.1007/s10796-022-10291-4” (Total Citations= 307), “ABULIBDEH A, 2024, J CLEAN PROD, DOI: 10.1016/j.jclepro.2023.140527” (Total Citations= 271), “DEMPERE J, 2023, FRONT EDUC, DOI: 10.3389/feduc.2023.1206936” (Total Citations= 201), “WANG T, 2023, APPL SCI, DOI: 10.3390/app13116716” (Total Citations= 199), “WU R, 2024, BR J EDUC TECHNOL, DOI: 10.1111/bjet.13334” (Total Citations= 191), and “IMRAN M, 2023, CONTEMP EDU TECH, DOI: 10.30935/cedtech/13605” (Total Citations= 184). These documents, which are cited worldwide, are thought to make a great contribution to the field. It is recommended that researchers take these documents into consideration and benefit from them for similar studies.

Table 9
Most Frequent Words

Words	Occurrences
chatbots	218
high educations	162
students	157
artificial intelligence	75
engineering education	54
chatgpt	46
teaching	46
contrastive learning	38
adversarial machine learning	36
curricula	36

When the most frequently used words in the documents were examined, it was determined that the most preferred word by the researchers was Chatbots (Occurrences = 218). The other words most frequently used in the documents are; “high educations” (Occurrences=162), “students” (Occurrences=157),

"artificial intelligence" (Occurrences=75), "engineering education" (Occurrences=54), "chatgpt" and "teaching" (Occurrences=46), "contrastive learning" (Occurrences=38), "adversarial machine learning" and "curricula" It was determined as (Occurrences=36) (See Table 9).

It is recommended that researchers use these words for their literature review in the field.

4. Discussions and conclusions

An examination of the study findings reveals that the use of AI-based chatbots, particularly in higher education, is increasing, and scientific productivity in this field is expected to reach its peak in 2024. The first publication of chatbot research in the SCOPUS database in 2015 demonstrates that this technology represents a new field of application in education. Early prototypes developed at the University of Warwick [1] are among the first examples of this new use case and shed light on the AI models published today.

Following the publication of ChatGPT, a significant contribution to the literature has been made in both technical and educational fields [2]. Numerous studies in the literature examine topics such as ethical concerns [5], student perceptions [4, 6], gender-based differences [7], impacts on learning processes [15], and technology acceptance models [10, 11].

Generally, when the studies are examined, it is seen that chatbots support personalized learning, consulting, and evaluation processes, but their negative aspects, especially on providing accurate information, ethical concerns, and critical thinking skills, are also discussed [4, 16]. In addition, the necessity of design adaptations according to the user profile [11] and studies on ethical use in education are also noteworthy [16].

When all the findings are examined, the most productive year was determined to be 2024. The most productive source in the field is "LECTURE NOTES IN COMPUTER SCIENCE (INCLUDING SUBSERIES LECTURE NOTES IN ARTIFICIAL INTELLIGENCE AND LECTURE NOTES IN BIOINFORMATICS) with 28 documents, and the most relevant author is "Tan, S.". The most productive countries in the field are "USA, INDIA, UK, GERMANY, INDONESIA, CHINA, SPAIN, MALAYSIA, AUSTRALIA and UKRAINE", while the most relevant institution is "UNIVERSITY OF GRANADA". The most cited document on a global scale was determined as "RUDOLPH J, 2023, J APPL LEARN TEACH-a" with DOI number 10.37074/jalt.2023.6.1.9, while the most frequently used words in the documents were determined as "Chatbots" and "higher education." It is recommended that authors researching the use of chatbots in higher education take into account the findings obtained from this research. In this context, it is important that new studies follow both technical developments and how they can be used ethically by addressing student needs. This study aims to guide students in developing strategies for the ethical use of chatbots in higher education by presenting existing studies and new research trends. Furthermore, considering the use of Bibliometrix, future studies could be enhanced by incorporating broader databases such as Web of Science (WoS) to ensure more comprehensive coverage of the literature.

Declaration on Generative AI

The authors have not employed any Generative AI tools.

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