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Transforming the Utilization of ChatGPT in Education: A Bibliometric Analysis

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Abstrak

ChatGPT OpenAI adalah teknologi kecerdasan buatan inovatif yang, setelah menjalani pelatihan, dapat meniru interaksi manusia melalui Pemrosesan Bahasa Alami (Natural Language Processing/NLP) dan dapat menjadi alat pendidikan yang inovatif dan efektif dalam berbagai konteks pendidikan. Penelitian ini menganalisis tren penelitian mengenai kecerdasan buatan dalam pendidikan, menggunakan analisis bibliometrik untuk memahami kondisi penelitian saat ini di bidang ini. Analisis ini dilakukan dengan menggunakan database online seperti Scopus untuk mencari artikel penelitian yang relevan tentang ChatGPT dalam Pendidikan. Hasil analisis menunjukkan bahwa 325 sumber ditemukan, dengan periode cakupan literatur mulai dari tahun 2022 hingga tahun berikutnya, yaitu 2024. Sumber-sumber tersebut berasal dari berbagai jenis publikasi, termasuk jurnal, buku, ulasan, prosiding, dan lainnya, yang semuanya telah terdaftar di database Scopus. Salah satu temuan yang mencolok adalah adanya peningkatan pertumbuhan publikasi yang cukup signifikan yaitu sebesar 73,21%. Ada tiga negara yang mendominasi sebagai afiliasi dengan jumlah artikel terbanyak, yaitu Amerika Serikat (4), Australia (3), dan Jerman (2). Thorp (2023) merupakan sumber yang paling banyak dikutip dengan 252 kutipan. Artikel ini membahas pendapat tentang ChatGPT yang memainkan peran penting sebagai alat bagi mereka yang merumuskan hipotesis dan memahami hasil yang mereka cari. Viroj Wiwanitkit dari Joseph Ayobabalola University di Nigeria adalah penulis paling produktif dengan 12 artikel yang berkaitan dengan penggunaan ChatGPT dalam pendidikan. Di antara kata kunci berwarna kuning, "Pendidikan", "Kecerdasan Buatan", dan "Pembelajaran Mesin" menonjol. Hal ini menunjukkan bahwa ada potensi besar untuk penelitian lebih lanjut dalam konteks pendidikan dengan memanfaatkan ketiga kata kunci tersebut.

Kata kunci: *Bibliometrik, ChatGPT, Pendidikan*

Abstract

ChatGPT OpenAI is an innovative artificial intelligence technology that, after undergoing training, can mimic human interaction through Natural Language Processing (NLP) and could be an innovative and effective educational tool in various educational contexts. This study analyses research trends regarding artificial intelligence in education, using bibliometric analysis to understand the current state of research in this field. This analysis was conducted using online databases such as Scopus to search for relevant research articles on ChatGPT in Education. The analysis showed that 325 sources were found, and the period of literature coverage spanned from 2022 to the following year, 2024. These sources come from various types of publications, including journals, books, reviews, proceedings, and others, all of which have been registered in the Scopus database. One striking finding is the significant increase in publication growth of 73.21%. There are three countries that dominate as affiliates with the highest number of articles, namely the United States (4), Australia (3), and Germany (2). Thorp (2023) was the highest-cited source with 252 citations. This article discusses opinions on ChatGPT playing an important role as a tool for those formulating a hypothesis and understanding the results they seek. Viroj Wiwanitkit from Joseph Ayobabalola University in Nigeria was the most prolific author with 12 articles related to the use of ChatGPT in education. Among the yellow keywords, "Education", "Artificial Intelligence", and "Machine Learning" stood out. This suggests that there is great potential for further research in the educational context by utilizing these three keywords.

Keywords: *Bibliometric, ChatGPT, Education*

INTRODUCTION

After the end of the Second World War and into the 21st century, the world has experienced impressive growth in various sectors, such as development and education. (Zafrullah, Bakti, et al., 2023; Zafrullah, Suyanto, et al., 2023; Zafrullah & Zetriuslita, 2021). Education is an essential foundation for sustainable societal, economic and cultural growth, and provides the knowledge and skills to address today's global challenges, with increased access to and quality of education supporting the development of human potential. (Alfiana et al., 2023; Kurniawan et al., 2022; Muktamar et al., 2023). Education is the foundation that enables individuals to reach their full potential and contribute to the development of society and global progress. Therefore, education is essential for every individual.

Rapid developments in education have created innovations that change the way learning is done, with one of the most significant innovations being the use of learning media, which enables a more dynamic and interactive approach to the educational process. Learning media is a modern alternative that changes the way information is delivered and understood, making it an effective tool in supporting the learning process in the digital age. (Anindhita et al., 2022; Ariani et al., 2023; Bearman et al., 2023; Kusum et al., 2023). Media

can also be defined as a tool that facilitates the delivery of information, interacts with students, and promotes deep understanding in a learning context. (Kilag et al., 2023; Muir et al., 2022). So, it can be concluded that the development of learning media has brought significant changes in modern learning approaches, facilitating interaction and deeper understanding in the educational process in the digital era. One alternative learning media that can be used is based on artificial intelligence.

Artificial Intelligence is an invented representation of intelligence that involves learning and adapting to the way computers and software behave intelligently, similar to the actions that humans can perform. (Hakim & Angga, 2023; Lie et al., 2023). Artificial intelligence technology is an essential element in making the concept of the metaverse world work according to the vision of its creators, with such technology playing an important role in following and applying predefined rules in creating virtual environments that mimic the real world (Fitriani, 2023; Hwang & Chien, 2022). The advantage of artificial intelligence is the comprehension of how computers can perform tasks that until now may have been performed better by humans, thus encouraging efforts to develop technologies that can improve the efficiency and ability of computers to perform a variety of tasks (Amrizal & Aini, 2013; Manongga et al., 2022).

One of the artificial intelligence technologies that has increased its users is ChatGPT. *ChatGPT OpenAI* is an innovative artificial intelligence technology that has gone through training to be able to mimic human interaction through the use of Natural Language Processing (NLP).(Setiawan & Luthfiyani, 2023). *ChatGPT* can also be leveraged as an innovative and effective educational tool. With its ability to understand and process human language, ChatGPT can be utilized in a variety of educational contexts. As a virtual assistant, *ChatGPT* can assist students in understanding the subject matter by answering questions, providing explanations, and providing relevant examples. *ChatGPT* is also proof that technological development in education has both positive and negative aspects, which impact the challenges faced by educators and learners. (Wibowo et al., 2023).

It is expected that the utilization of ChatGPT in education would improve the quality and availability of learning in various aspects, including providing a more efficient and personalized learning experience. The benefits of using ChatGPT in the learning process are in guiding individualized learning and identifying areas that require appropriate teaching approaches for each student. In this regard, the purpose of this study is to conduct a bibliometric analysis of ChatGPT in education.

RESEARCH METHOD

This bibliometric research was conducted with the aim of evaluating previous academic work that has been done in the context of ChatGPT utilization in education. Bibliometric analysis methods were used to investigate developments in this research domain, including topics and author contributions, with a focus on the social, intellectual and conceptual structure of the discipline. This approach is commonly used in a variety of disciplines and focuses on the quantitative analysis of journal papers, books, or other written communications. (Sidiq, 2019; Supinah & Soebagyo, 2022). A comprehensive analysis of the mapping of the articles was conducted through the R-Studio platform, which was used as a bibliometric tool. (Saifudin, 2013). In addition to R-Studio, researchers also use Vosviewer to visualize the results of bibliometric analysis.

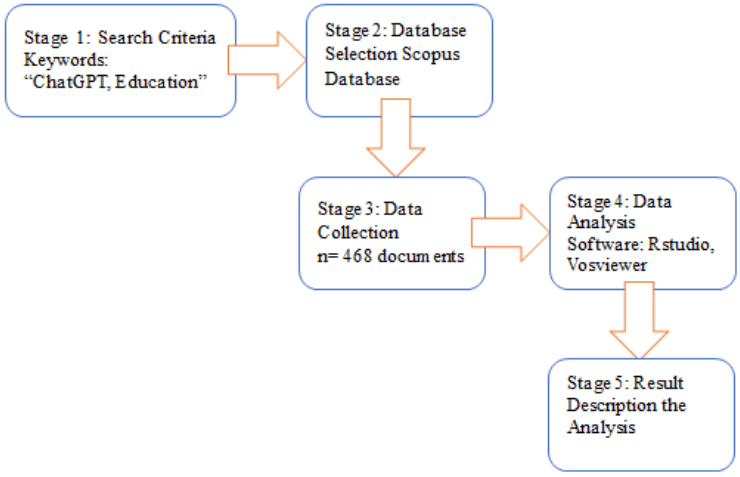

Figure 1. Research Flow of ChatGPT in Education

In the initial stages of this research, the main focus was to utilize scholarly sources relevant to the use of ChatGPT in an Educational context. The use of predefined keywords had the dual benefit of ensuring the relevance of the literature used and maintaining the focus of the research. The two main keywords used are "ChatGPT" which relates to the development of information and communication technology, and "Education" which relates to the educational environment. Furthermore, this research will continue by conducting a search in the Scopus database, which is known as one of the scientific databases with a high reputation among the scientific community. The results of this search resulted in 468 documents that will be further analyzed in the research.

After the data collection stage, the next step was to evaluate the documents that had been selected according to the predetermined method. At this stage, an assessment was made of the relevance of each study found, focusing on the key concepts contained in the

texts to assess the extent of their relevance to ChatGPT in Education. In order to facilitate bibliometric analysis, this study utilized open-source software such as the Bibliometrix R Package, which has robust bibliometric capabilities. (Amin et al., 2023). The app allows users to import data from Scopus in CSV format, and the Biblioshiny platform will process the data. In addition, Vosviewer is used to analyze research trends. Once the data has been processed and analyzed, the next stage is to present the results, conclusions, and quantitative assessment of the research, with the results section including an in-depth explanation of the findings as well as a visual representation of the research results.

RESULTS AND DISCUSSION

Main Information dan Tren Penelitian

Once the metadata has been exported to Biblioshiny, the application brings up an initial display that provides basic information about all the articles that have been imported and are ready for analysis. Key information and research trends related to the documents to be analyzed by bibliometric methods can be found in the illustration in Figure 2 and the summary data listed in Table 1.

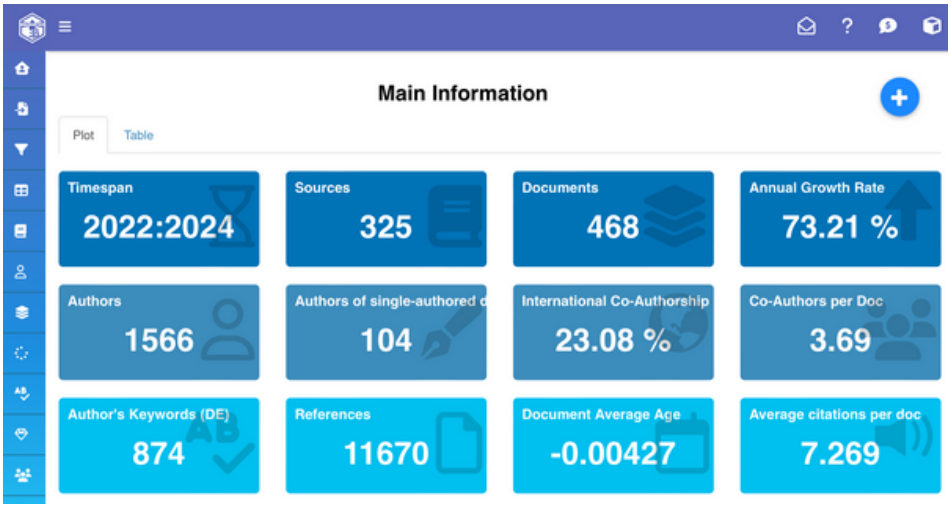

Figure 2. Key Information on ChatGPT in Education

Table 1. ChatGPT in Education Research Trend

Year	TC/A	N	TC/Y	CY
2022	125	1	62.5	2
2023	7.06	464	7.06	1
2024	1	3	-	0

Description: TC/A = Total Citation/Article
N= Jumlah Artikel
TC/Y= Total Citation/Year
CY= Citable Years

Figure 2 provides an insight into the analysis conducted in Biblioshiny of a total of 468 articles. From the data, it can be seen that 325 sources have been found, and the literature scope period covers the year 2022 to the following year, 2024. These sources come from various types of publications, including journals, books, reviews, proceedings, and others, all of which have been registered in the Scopus database. One of the striking findings is the significant increase in publication growth of 73.21%. Table 1 shows that 464 articles were published in 2023. This indicates that the interest and research related to the topic of using ChatGPT in an educational context is growing very fast. Thus, this reflects the high relevance and scientific interest in this issue, and shows how important this research is in the context of education and ChatGPT.

Affiliates with the Most Number of Articles
The affiliates with the highest article production are shown in the table 2 below.

Table 2. Affiliates with the Most Number of Articles

Affiliation	Country	Articles
The University of Melbourne	Australia	22
Charles Sturt University	Australia	16
Technical University of Munich	Germany	15
University Hospital Erlangen	Germany	14
University of Pittsburgh Medical Center	United States	13
Cedars Sinai Medical Center	United States	12
Peninsula Health	Australia	12
University of Southern California	United States	12
The University of Hong Kong	China	10
University of North Texas	United States	10

Source: RStudio

There are three countries that dominate as affiliations with the highest number of articles, namely the United States (4), Australia (3), and Germany (2). In terms of institutional

affiliation, The University of Melbourne topped the list with the highest article production with 22 articles, followed by Charles Sturt University with 16 articles. This indicates that these three countries and institutions have a significant role in research related to the use of ChatGPT in educational contexts. They are likely to be major research centers and key contributors to the development of understanding on this topic. It can be concluded that the collaboration between institutions from different countries in this study can be an important contribution to the development of knowledge and practice related to the use of ChatGPT in education.

Most Productive Sources

The citation analysis started with the top ten sources that have the most number of publications in the field of ChatGPT in education listed in the Scopus index. The aim was to focus on tracing the citations and impact of these key publications, which provide an in-depth insight into the development and relevance of ChatGPT in educational scientific literature. Related information can be found in Table 3.

Tabel 3. Most Productive Resources in ChatGPT in Education

Sources	Country	Scopus Quartile	Articles
Annals of Biomedical Engineering	Netherlands	Q2	12
JMIR Medical Education	Canada	Q1	9
Journal of Applied Learning And Teaching	Singapore	-	8
Lecture Notes in Computer Science (Including Subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)	Germany	Q3	7
Medical Teacher	United Kingdom	Q1	6
Education and Information Technologies	United States	Q1	5
Education Sciences	Switzerland	Q2	5
Journal of Chemical Education	United States	Q2	5
Radiology	United States	Q1	5
Aesthetic Plastic Surgery	United States	Q1	4

Source: Rstudio

Table 3 presents data on the most productive journals and publication sources in terms of number of publications related to the use of ChatGPT in education. From the table, "Annals of Biomedical Engineering" from the Netherlands stands out as the most productive journal with 12 articles, followed by "JMIR Medical Education" from Canada with 9 publications. This reflects the important role these journals play in disseminating the latest research and insights on the application of ChatGPT in educational contexts. This high productivity also signifies a growing level of interest among researchers regarding how artificial intelligence such as ChatGPT can play a role in improving education and learning, as well as providing innovative solutions in this domain. In conclusion, these key journals continue to be major contributors to the growing scientific literature on the use of ChatGPT in education

Most Article Citations

Table 4 presents the list of articles that have the most citations on the topic of ChatGPT in Education.

Table 4. Top 10 Most Article Citations

Title and Sources	Total Citations	TC per Year
ChatGPT is fun, but not an author (Thorp, 2023)	252	252
"So what if ChatGPT wrote it?" Multidisciplinary perspectives on… (Malik et al., 2023)	194	194
How does ChatGPT perform on the United States medical licensing examination?… (Gilson et al., 2023)	181	181
ChatGPT utility in healthcare education, research, and practice: systematic review… (Sallam, 2023)	167	167
ChatGPT for good? On opportunities and challenges… (Kasneci et al., 2023)	162	162
AI bot ChatGPT writes smart essays-should academics worry? (Stokel-Walker, 2022)	125	62.5
ChatGPT: Bullshit spewer or the end of traditional… (Rudolph et al., 2023)	109	109
Collaborating with ChatGPT: Considering the implications of generative artificial intelligence … (Pavlik, 2023)	95	95

What if the devil is my guardian angel: ChatGPT as a case study of… (Tlili et al., 2023)	91	91
Evaluating the feasibility of ChatGPT in healthcare: … (Cascella et al., 2023)	90	90

Source: RStudio and Google Scholar

Table 4 provides the authors with the highest number of citations tracked by Scopus. Thorp (2023) was the highest-cited source with 252 citations. This article discusses the notion of ChatGPT playing an important role as a tool for those formulating a hypothesis and understanding the results they seek. In addition, respectively Malik et al., (2023), Gilson et al., (2023), Sallam (2023), dan Kasneci et al., (2023) in the top five in most-cited articles. The significant contribution of this article in supporting research and understanding in the field has made it one of the most frequently cited sources in the scientific literature, reflecting its recognition and relevance among researchers and academics.

Author with the Most Articles

The authors with the most articles in the ChatGPT in Education field can be seen in table 5 below.

Table 5. Author with the Most Articles in ChatGPT in Education

Authors	Affiliation	Country	Articles
Viroj Wiwanitkit	Joesph Ayobabalola University	Nigeria	12
Amnuay Kleebayoon	Private Academic Consultant	Cambodia	11
Geoffrey Currie	Charles Sturt University	Australia	4
Turgut Karaköse	Dumlupinar University	Turkey	4
Harjit Singh	Deemed University	India	4
Samson Tan	Institute for Adult Learning Singapore	Singapore	4
Murat Demirkol	Fırat Üniversitesi	Turkey	3
Francesco M. Egro	University of Pittsburgh Medical Center	United States	3
Seongyong Lee	Hannam University	South Korea	3
Bai Li	Hunan University	China	3

Source: RStudio and Google Scholar

In Table 5, it can be seen that Viroj Wiwanitkit from Joseph Ayobabalola University in Nigeria is the most prolific author with 12 articles related to the use of ChatGPT in education. This is followed by Amnuay Kleebayoon from Private Academic Consultant in Cambodia who ranks second with 11 articles. This data indicates that these two authors have made significant contributions to research related to ChatGPT in educational contexts. Their productivity in producing publications reflects active engagement and meaningful contributions in advancing the understanding of the application of ChatGPT technology in education.

Research Focus and Novelty of Keywords

The novelty of keywords in ChatGPT research in education is presented in Figure 3 and Figure 4 below.

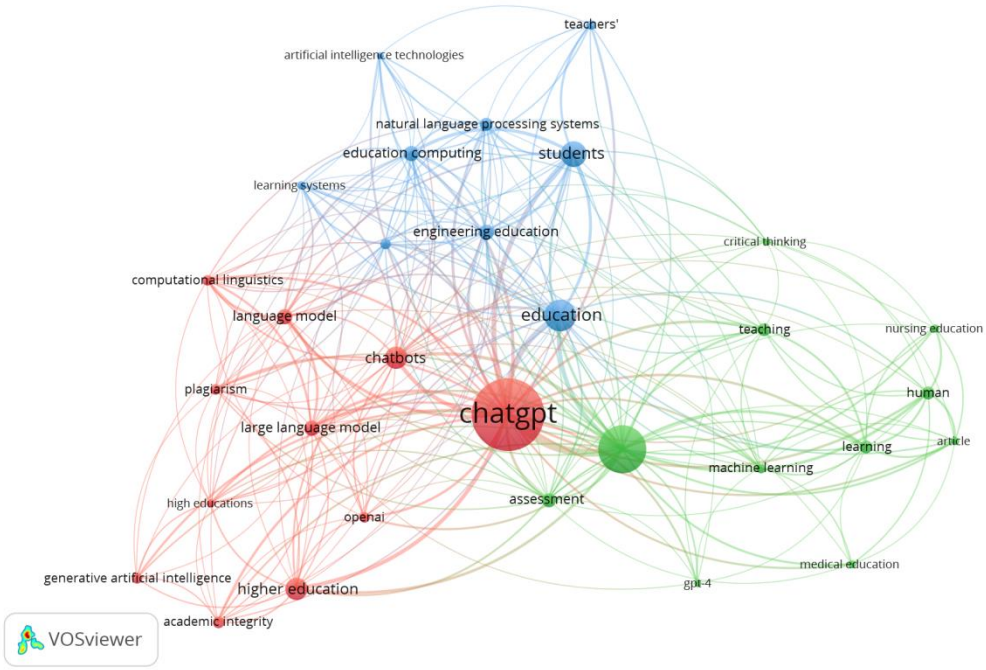

Figure 3. Co-occurrence of Keywords

The network visualization results in Figure 3 show the existence of three clusters with the following explanation: 1) The red cluster consists of 10 items, with Chatbots as the largest circle, meaning that in the red cluster Chatbots is the focus of the first research; 2) The green cluster consists of 11 items, with Artificial Intelligence as the largest circle, this indicates that Artificial Intelligence is the focus of the second study; 3) The blue cluster consists of 9 items, with education being the largest circle, this can be interpreted as the word education as the focus of the third study..

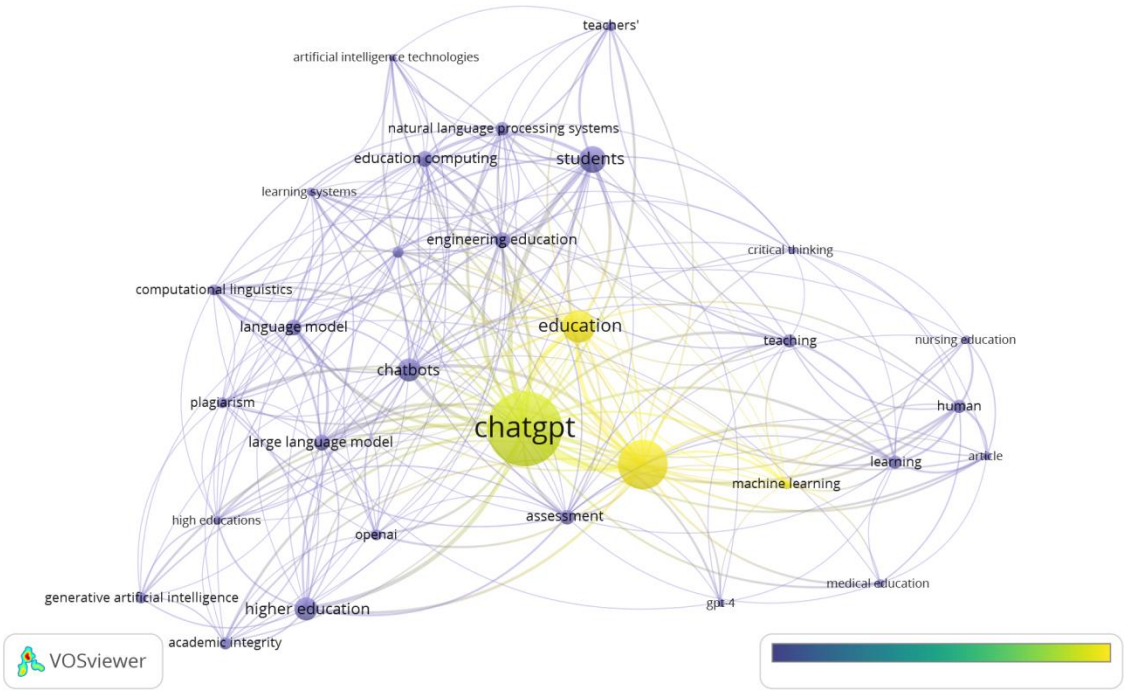

Figure 4. Overlay Visualization

From the analysis with Vosviewer of the keywords that have been used, two colour categories show different trends. The purple colour reflects keywords that have been widely used in research, indicating that these topics have received significant attention from previous researchers. Meanwhile, the yellow colour represents keywords that are rarely used or less common in research. Among the yellow keywords, "Education", "Artificial Intelligence", and "Machine Learning" stand out. This indicates that there is great potential for further research in the context of education by utilizing these three keywords. By focusing on less commonly used keywords, future research can explore and develop new understanding in the use of artificial intelligence in education, as well as provide relevant research recommendations for the future.

CONCLUSION

From the analysis, 325 sources were identified, and the time span of this literature covers the period from 2022 to the following year, 2024. These sources vary, including journals, books, reviews, proceedings, and more, all listed in the Scopus database. Another significant finding is the 73.21% increase in publication growth. There are three countries that dominate with the highest number of articles, namely the United States (4), Australia (3), and Germany (2). One of the highly cited articles was by Thorp (2023), who highlighted the role of ChatGPT as an important tool in formulating hypotheses and understanding research results. Viroj Wiwanitkit from Joseph Ayobabalola University in Nigeria recorded

the highest productivity with 12 articles related to the use of ChatGPT in education. In addition, there were keywords that stood out in yellow, such as "Education," "Artificial Intelligence," and "Machine Learning," indicating great potential for further research in an educational context using these keywords.

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