

Self-efficacy in Online Learning: A Bibliometric Analysis

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ABSTRACT

Whether synchronous or asynchronous, online learning utilizes various digital tools that significantly differentiate it from conventional offline learning. One critical factor influencing students' success in this environment is self-efficacy, which reflects their belief in their ability to perform learning tasks effectively. Despite increasing research on online learning self-efficacy, a comprehensive overview of its development and trends is needed. This study aims to analyze the research landscape related to online learning self-efficacy over the last five years, identifying key contributors, collaboration networks, and thematic research focuses. This study employs descriptive bibliometric analysis to systematically examine the growth, distribution, and impact of research in this field. Data was collected from major academic databases, focusing on publications between 2018 and 2023. Key parameters analyzed include publication trends, country-wise research output, institutional contributions, collaboration networks, keyword co-occurrence, and citation impact. Findings indicate a growing interest in online learning self-efficacy studies, particularly between 2018 and 2021. The United Kingdom leads in publications, while United States researchers engage in the most international collaborations. The Hong Kong Polytechnic University emerges as the top institution in this field. Most studies appear in education and technology journals, with commonly associated keywords including motivation, e-learning, self-concept, and self-regulated learning. Quantitative research dominates, as 84 of the 100 most-cited publications employ quantitative methodologies, with students as the most frequently studied sample group. These findings provide insights into scholarly trends, highlighting key contributors and research directions for future studies.

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1. INTRODUCTION

We are currently in society 5.0, a super-intelligent society where the economy and technology exist so that people can enjoy life to the fullest [1], [2]. With the development of life in society 5.0, online learning is necessary, especially with the COVID-19 pandemic since 2020, which caused online learning to be one of the solutions for conducting learning at that time. Online learning is synchronous or asynchronous learning using different tools (e.g., cellphones, laptops, etc.) with internet access [3]. Through online learning, students can study anywhere and anytime without being limited by distance, space, and time [4], [5]. For teachers, online learning provides opportunities to teach anytime and anywhere. In addition, the material can be updated, and students can immediately see the changes [6].

The conditions of online learning, which are quite different from the usual learning, namely offline learning, will affect self-efficacy. This follows Bandura's opinion, which states that the assessment of one's self-efficacy most often occurs when a person encounters a new situation, something that cannot be predicted, or a demanding mandate [7]. According to Bandura, self-efficacy refers to belief in one's ability to organize and carry out the actions necessary to produce a given achievement [8]. Self-efficacy is related to individual beliefs about what can be done with their abilities [9], [10].

Several studies have explored self-efficacy in online learning environments. Zimmerman Kulikowich developed an online learning self-efficacy scale to assess students' confidence in managing online learning tasks [11]. Meanwhile, Kuo investigated the role of self-efficacy in online learning success, emphasizing its impact on students' adaptability to digital education platforms [12]. Self-efficacy in computer-based learning, revealing that students with higher self-efficacy exhibit better engagement and academic outcomes in digital learning settings [13], [14].

Several bibliometric analyses have been conducted to understand research trends in self-efficacy and technology-based learning. A study by Valencia-Vallejo reviewed self-efficacy research in computer-based learning (2006-2015), concluding that self-efficacy studies were predominantly conducted in higher education contexts [15]. However, limited research explores the trends, themes, and methodologies of self-efficacy studies in online learning post-2018—particularly during and after the COVID-19 pandemic.

Several studies regarding online learning self-efficacy have been conducted. Therefore, it is necessary to know research trends regarding self-efficacy in online learning. The trend regarding online learning has been done. Among them are Zimmerman and Kulikowich's research on developing online learning self-efficacy scales [11] and Hodges' research on self-efficacy in online learning conditions [16]. In addition, there was also research on the trend of self-efficacy in computer-based learning from 2006 to 2015, with one of the results being research on self-efficacy in computer-based learning that is most commonly found in tertiary subjects. However, no research has explained the detailed online learning self-efficacy research trend from 2018 to 2022. Therefore, this study wanted to determine which countries and institutions contributed most to research on self-efficacy online learning, journals that published self-efficacy online learning articles, trends in

publication themes related to self-efficacy online learning, and method trends in publications about the relationship between self-efficacy and online learning in 2018-2022.

This study aims to address this gap by conducting a bibliometric analysis of self-efficacy research in online learning. Specifically, this study seeks to identify the most influential countries and institutions contributing to self-efficacy research in online learning, analyze the journals that have published the most research on this topic, and Examine thematic trends in self-efficacy and online learning research. The findings of this study are expected to provide valuable insights into the global research landscape on self-efficacy in online learning. Specifically, this study will comprehensively analyze self-efficacy trends in online learning research from 2018-2022 and identify key research contributors (countries, institutions, and journals) in this domain.

2. METHOD

This study employs a descriptive bibliometric analysis method to examine publications on self-efficacy in online learning, sourced from the Scopus database. The analysis follows a structured bibliometric approach, beginning with identification, screening, eligibility assessment, and final inclusion [17].

The identification phase involves inputting relevant keywords that are aligned with the research theme. In this case, the study focuses on self-efficacy in online learning. The researcher used the "Self-efficacy online learning" keyword in the Scopus database to facilitate this. As a result, 2,091 publications were retrieved based on the predetermined criteria. The collected data were then assessed for duplicates. Since no duplicate records were found, all 2,091 publications proceeded to the next stage.

During the screening phase, publications from the identification stage were filtered based on specific criteria: (1) documents published within the last five years (2018–2022); (2) publications presented as articles in an international language (English); (3) sources originating from academic journals; and (4) studies categorized under the field of social sciences. After applying these filters, 1,400 articles were excluded, leaving 691 publications that met the selection criteria. These remaining studies then advanced to the eligibility assessment stage.

The eligibility phase involves assessing the feasibility of the selected publications. In this stage, the researcher establishes specific criteria, requiring only articles with a minimum of 20 citations to qualify for the inclusion phase. Based on this criterion, 100 publications were deemed eligible to proceed to the next stage.

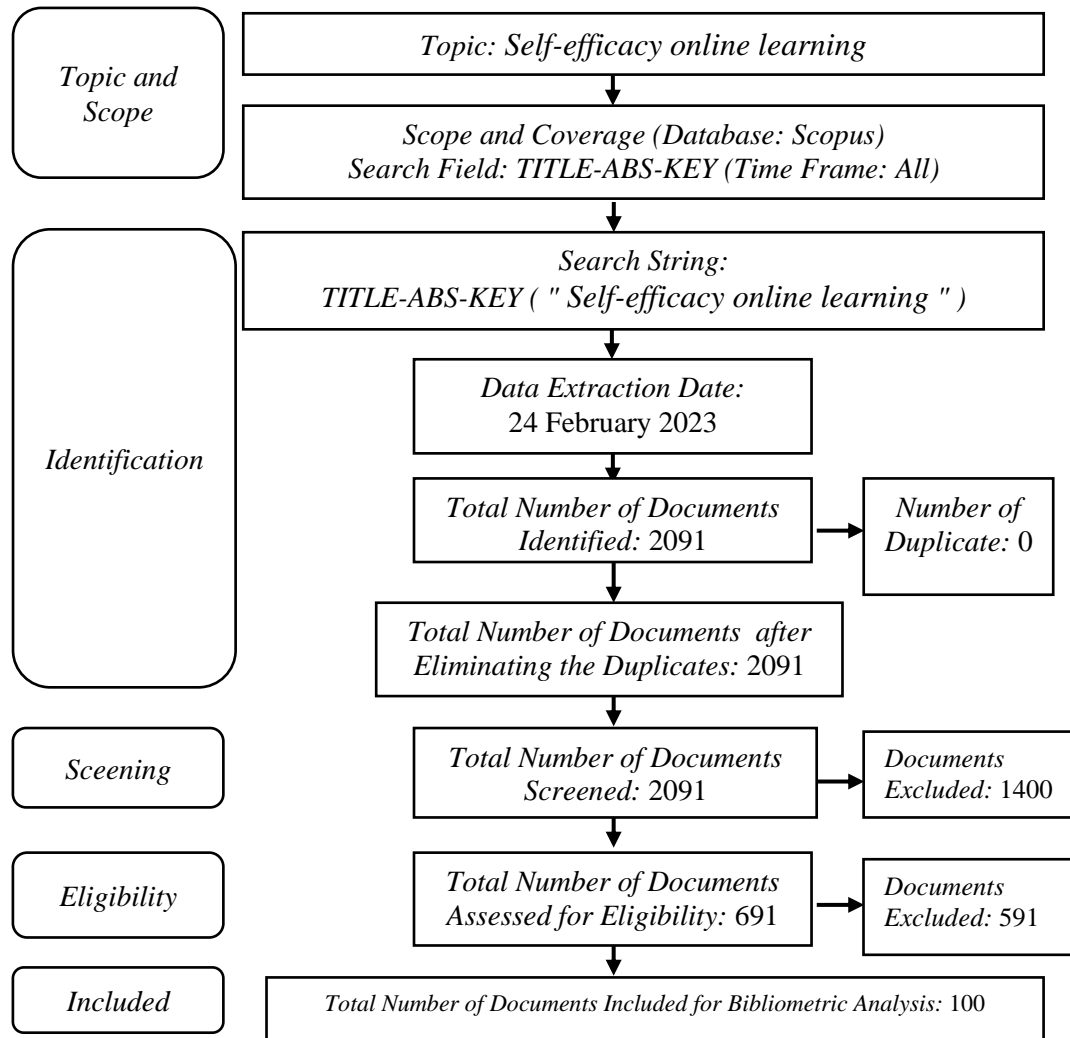


Figure 1. Data Collection Process

The data retrieved from the Scopus database is stored in two different formats. First, it is saved in CSV format and stored in RIS format. The CSV file is analyzed using VOSviewer, while the RIS file is processed through Harzing's Publish or Perish software and Mendeley for further evaluation. In displaying the number of publications and annual citations, researchers use Microsoft Excel to see the collaborative network of researchers from countries contributing to online learning self-efficacy research assisted by the VOSviewer application.

3. RESULTS AND DISCUSSION

The analysis was carried out with the help of VosViewer software [18]. The data retrieved from the Scopus database is stored in two different formats. First, it is saved in CSV format and stored in RIS format. The CSV file is analyzed using VOSviewer, while the RIS file is processed through Harzing's Publish or Perish software and Mendeley for further evaluation. In displaying the number of publications and annual citations, researchers use Microsoft Excel to see the collaborative network of researchers from countries contributing to online learning self-efficacy research assisted by the VOSviewer application.

The trends in publications about self-efficacy online learning from 2018 to 2020 can be seen in Figure 2.

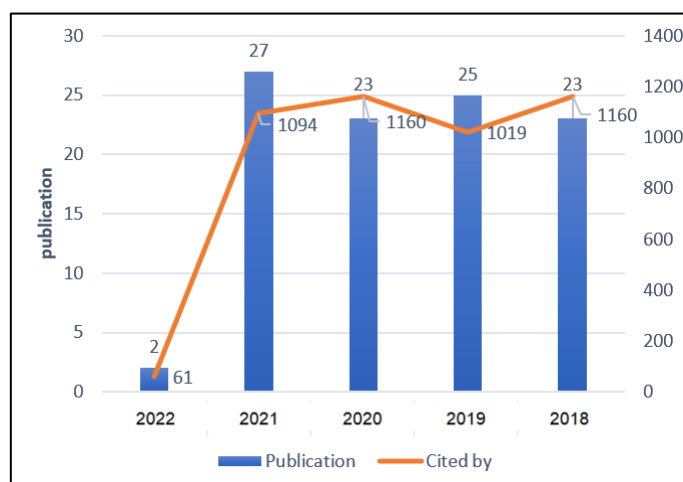


Figure 2. Publications by Year and Number of Citations

If seen in Figure 2, it can be seen that the number of publications about self-efficacy for online learning in the last five years is quite a lot. However, it can be said that publications before 2022 occurred in a high quantity of publications, but dropped dramatically in 2022. An analysis of citation patterns reveals that the number of citations closely follows the trend of publication volume, with both increasing or decreasing in parallel. This data suggests that research interest in self-efficacy for online learning, both among researchers and academic journals, experienced significant growth between 2018 and 2021. This condition is felt to be suitable with the global COVID-19 pandemic, so many researchers are interested in researching self-efficacy for online learning. However, this trend begins to disappear in 2022.

3.1. Analysis of the most contributing countries and institutions with the most publications

The relationship between self-efficacy and online learning is a primary study in current research, and countries and institutions have significantly contributed based on the total publications that have been researched. The findings are presented in Table 1, Figure 3, and Figure 4.

An analysis of Table 1 reveals that among the 100 most frequently cited publications, researchers represent a diverse range of 15 countries. Additionally, the top five countries with the highest number of contributing researchers include the United Kingdom ($f = 46$), the United States ($f = 23$), Switzerland ($f = 5$), Taiwan ($f = 5$), and Australia ($f = 3$). The country with the most publications regarding self-efficacy online learning is the United Kingdom, followed by the United States. However, the country with the highest CPP is the Netherlands. In addition, researchers from more than one country also participated in several studies.

Table 1. Number of Publications by Country Based on The 100 Most Cited Publications.

Rank	Countries	Publication	Cited by	CPP
1	United Kingdom	46	2210	48,04
2	United States	23	808	35,13
3	Netherlands	3	428	142,67
4	Switzerland	5	217	43,4
5	Australia	3	182	60,67
6	Taiwan	5	134	26,8
7	Canada	2	121	60,5
8	Austria	2	77	39
9	Turkey	2	66	33
10	Spain	1	45	45
11	Germany	1	28	28
12	China	1	25	25
13	Japan	1	25	25
14	Malta	1	23	23
15	Malaysia	1	21	21

Figure 3 shows the collaboration network of researchers from the countries that have contributed the most. In this context, scientists in the United States collaborate more with researchers from different countries.

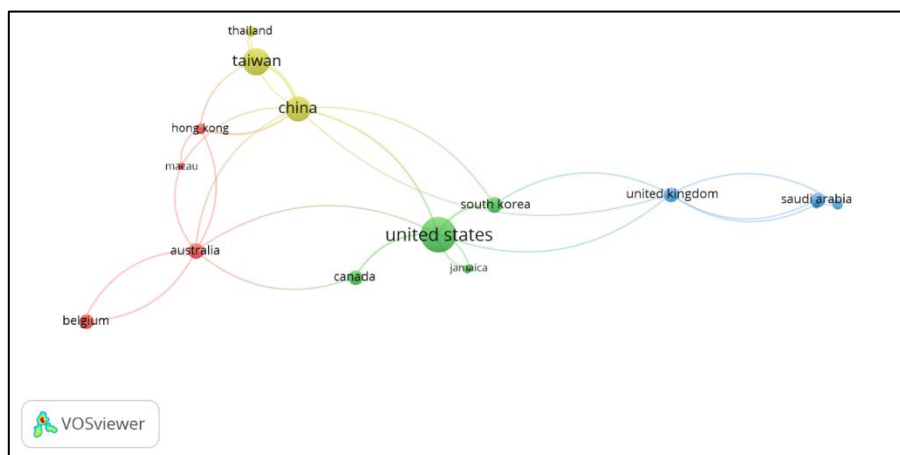


Figure 3. Collaborative Network of Researchers from Contributing Countries

The findings from the current study further reveal that scientists in the United States collaborate on more articles than researchers in other countries. From this point of view, the United States is one of the countries most interested in researching self-efficacy in online learning. However, this finding may be caused by scientists living in the United States who also work together with many foreign researchers who visit or communicate with each other online so that a community or research team is formed that has the opportunity to work together and collaborate with colleagues from their home countries and also other countries.

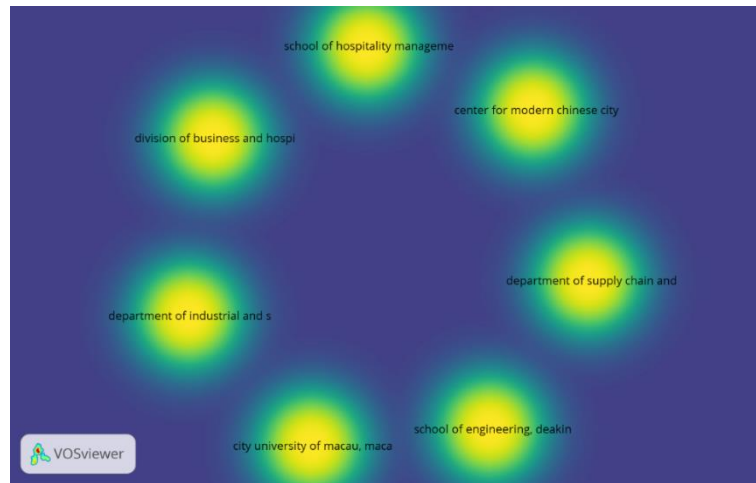


Figure 4. A Density Map Visualizing The Most Contributing Institutions

Figure 4 illustrates that the 100 most frequently cited publications are authored by researchers affiliated with 220 different universities and higher education institutions. Furthermore, the institutions with the most researchers publishing citation publications sequentially are The Hong Kong Polytechnic University, The Hang Seng University of Hong Kong, and the University of Macau.

3.2. Analysis of journals that have published articles examining the relationship between COVID-19 and Education

Table 2. Distribution of The Journals That Published The 100 Most Cited Articles

Source Title	Publication	Cited by	CPP
Computers and Education	13	731	56,23077
Education and Information Technologies	7	229	32,7
Educational Technology and Society	5	134	26,8
Journal of Computer-Assisted Learning	5	141	28,2
Australasian Journal of Educational Technology	3	182	60,66667
Sustainability (Switzerland)	3	134	44,7
BMC Medical Education	2	57	28,5
British Journal of Educational Technology	2	142	71
Computer Assisted Language Learning	2	49	24,5
Distance Education	2	337	168,5
Education Sciences	2	83	41,5
Educational Technology Research and Development	2	50	25
Eurasia Journal of Mathematics, Science and Technology Education	2	66	33
Interactive Learning Environments	2	90	45
Interactive Technology and Smart Education	2	53	26,5
International Review of Research in Open and Distance Learning	2	121	60,5
Internet and Higher Education	2	48	24
Journal of Educational Computing Research	2	44	22
Nurse Education Today	2	69	34,5
International Journal of Emerging Technologies in Learning	2	77	39
Asian Journal of University Education	1	21	21
Behaviour and Information Technology	1	30	30
British Journal of Educational Psychology	1	58	58

Source Title	Publication	Cited by	CPP
Children and Youth Services Review	1	51	51
Decision Sciences Journal of Innovative Education	1	22	22
Education and Training	1	42	42
Foreign Language Annals	1	28	28
IAFOR Journal of Education	1	25	25
Information Technology for Development	1	24	24
International Journal of Educational Management	1	62	62
International Journal of Educational Technology in Higher Education	1	380	380
International Journal of Emotional Education	1	23	23
International Journal of Information and Learning Technology	1	65	65
Journal of Academic Librarianship	1	52	52
Journal of Computers in Education	1	28	28
Journal of Experimental Education	1	26	26
Journal of Information Technology Education: Research	1	26	26
Journal of Microbiology and Biology Education	1	39	39
Journal of Psycholinguistic Research	1	73	73
Journal of Research in Innovative Teaching and Learning	1	28	28
Journal of Science Education and Technology	1	28	28
Journal of Social Entrepreneurship	1	46	46
Journal of Technology and Science Education	1	45	45
Journal of the Association for Information Science and Technology	1	30	30
Knowledge Management and E-Learning	1	25	25
Nurse Educator	1	29	29
Online Learning Journal	1	48	48
Physical Review Physics Education Research	1	57	57
SAGE Open	1	31	31
Scholarship of Teaching and Learning in Psychology	1	35	35
Technology, Pedagogy, and Education	1	41	41
Universal Journal of Educational Research	1	35	35
Vocations and Learning	1	20	20

Note: TP = Total Publications; TC = Total Citation; CPP = Citations per publication; Journals that have published at least one article.

Thus, it can be said that most of the articles are published in education and technology journals, while the rest are published in journals that focus on psychology and medicine. The journals with the most published articles are Computers and Education ($f = 13$), Education and Information Technologies ($f = 7$), Educational Technology and Society ($f = 5$), and Journal of Computer-Assisted Learning ($f = 5$). This result means that most articles were published in education and technology journals. This is supported by online learning being closely related to learning. In addition, the data in Table 2 shows that the journals that publish the 100 most cited articles have high citations.

3.3. Analysis of thematic trends in publications on the relationship between self-efficacy and online learning

This study analyzed the 100 most frequently cited publications based on topic distribution, focusing on the most commonly used keywords. These thematic trends are visually represented in Figure 5.

studies based on qualitative methods, mixed methods, and systematic reviews is less than that of quantitative studies. The most dominant method used is the quantitative method. This result aligns with a bibliometric analysis conducted by Valencia-Vallejo, who found that the most widely used method in studies regarding self-efficacy and its relationship with computer-based learning in 2006-2015 is correlation analysis with a frequency of 63% [20].

The analysis of the study populations in the reviewed publications reveals that data were collected from various countries. Some studies focused on a single country, while others gathered data from multiple regions. This research examined articles to identify the countries contributing the most data, with the United States, Taiwan, and Turkey being the top sources.

Figure 6 presents the distribution of sample/study groups from the 100 most-cited articles analyzed in this study.

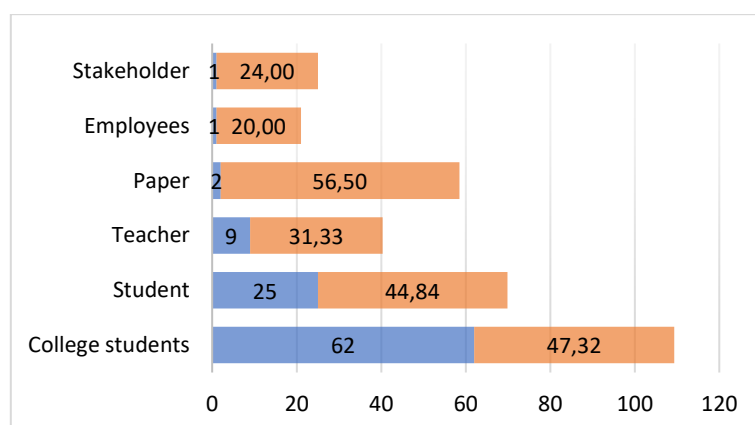


Figure 6. Distribution of research sample in 100 highly cited publications

Based on the findings described in Figure 6, it can be seen that students ($f = 62$) were mostly included in the research sample, followed by students ($f = 25$) and teachers ($f = 9$). When viewed as a whole sample, it can be said that the three different samples are preferred. The dominant sample is college students. This can happen because online learning is more widely applied to college students. This result is in line with the results of a bibliometric analysis conducted by Valencia-Vallejo, who found that the level of education that was widely studied regarding self-efficacy and its relationship with computer-based learning in 2006-2015 was higher education [20].

The conditions of online learning, which are quite different from the usual learning, namely offline learning, will affect self-efficacy. This follows Bandura's opinion, which states that the assessment of one's self-efficacy most often occurs when a person encounters a new situation, something that cannot be predicted, or a demanding mandate. According to Bandura, self-efficacy refers to belief in one's ability to organize and carry out the actions necessary to produce a given achievement. Self-efficacy is related to individual beliefs about what can be done with their abilities. Self-efficacy is important in learning. Students with strong self-efficacy tend to be more motivated to participate in learning activities. They are also more inclined to set challenging goals and stay dedicated to reaching them [21]. Self-efficacy is strongly positively related to academic success. Students with confidence in their

abilities typically achieve higher academic performance [22]. Strong self-efficacy results in increased effort and perseverance when facing challenges. Students who believe in their abilities are less likely to quit when encountering obstacles [23]. Students with strong self-efficacy are more inclined to use effective learning techniques, like thoroughly processing information and planning strategically [24]. Self-efficacy aids students in adjusting to new and challenging learning environments, like online or blended settings. It allows them to navigate various learning contexts more effectively [25], [26].

4. CONCLUSION

Based on the results and discussion, it can be concluded that research interest in self-efficacy for online learning experienced significant growth between 2018 and 2021. The United Kingdom emerged as the leading country with the most publications in this field. Regarding international research collaboration, scientists from the United States demonstrated the highest level of cooperation compared to researchers from other countries. Among academic institutions, The Hong Kong Polytechnic University had the most researchers contributing to highly cited publications.

Most of the studies were published in journals focusing on education and technology. Commonly co-occurring keywords in these publications include motivation, e-learning, self-concept, and self-regulated learning. Additionally, 84 out of the 100 most-cited publications primarily employed quantitative research methods, with students being the most frequently studied sample group.

The data for this study were retrieved from the Scopus database. For future research, it is recommended to incorporate additional databases beyond Scopus to ensure broader coverage. One limitation of this study is that the data were collected as of February 24, meaning any publications indexed after this date were not included in the analysis.

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