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Trends in Plagiarism: A Bibliometric Approach

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ABSTRACT

In recent days, there has been a lot of discussion about plagiarism in higher education. Students may utilise Artificial Intelligence (AI) technologies like ChatGPT (Chat Generative Pre-trained Transformer) and chatbots to produce answers to use in their academic writing. The growth of artificial intelligence (AI) chatbot technology and its impact on education is a trending topic, and especially ChatGPT has sparked worries among scholars. The main objective of this study is to discover publication trends and to realise the network visualisation of the co-occurrence of keywords, co-authorship of countries, citation and co-citation of authors and countries, and bibliographic coupling analysis in the context of plagiarism. This study used the bibliometric analysis method. The Web of Science was used to extract publication data. The word "plagiarism" is used to search the literature, and we found 3282 publications published between 1989 and 2023. VOSviewer software is used to visualise bibliometric networks of publications. Results show that the highest amount of research was produced in 2019, and the number of publications increased rapidly. The United States of America (USA), the United Kingdom (UK), China, Australia, and Canada contributed the most publications. Elsevier, Springer, Taylor & Francis, Wiley, and Sage are top publishers that produce a large number of publications on plagiarism. This analysis gives a comprehensive perspective on plagiarism research for scholars, which will also be useful for educators, educational institutions, and publishers.

Keywords: Plagiarism; Bibliometrics; ChatGPT; Network analysis; Citation analysis; VOSviewer; Research output

1. INTRODUCTION

The Internet provides greater opportunities for learners and researchers to explore and gain knowledge[1]. Correspondingly, more opportunities for students to plagiarise using the Internet also arise[2]. People are increasingly contributing to open access by sharing their work online and engaging in social interaction on the Web[3-4]. With the current expansion of higher education and the increased availability of literature accessible through the Internet, educators are concerned about academic integrity, research ethics, and plagiarism[5]. The wide use of the Internet may have increased the problem[6-7]. Without a doubt, so much information being available in digital form makes it easier to misinterpret the proper way to utilise information, whether intentionally or unintentionally[8-9].

Plagiarism is regarded as a kind of dishonesty, particularly in education. It is a situation that has become increasingly common in education in recent years as technology has grown more accessible[10]. Plagiarism will have a strong negative impact on education[11]. The trend of "copy and paste" behaviour without giving credit to the original author has been noticed by academicians and this academic dishonesty must be addressed seriously[9]. Plagiarism is still a problem in modern education[12]. Educators are facing an increasing problem in establishing pedagogies that would build a strong foundation for active learning that is free of plagiarism[13]. It is now time to implement worldwide editing guidelines and establish a systematic anti-plagiarism strategy by assisting all academic communication stakeholders[14]. As a result, universities are enacting tighter rules and stronger sanctions to prevent plagiarism and maintain academic integrity[15]. Preventive methods are becoming more reliant on advanced digital technologies.

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2. LITERATURE REVIEW

The term 'plagiarism' originates from the Latin word "plagiarius" which means kidnapper[16]. According to the Webster's New World College Dictionary[17] plagiarism is "the act of plagiarizing" which means duplicating or using somebody's idea or work and claiming to be the creator. Plagiarism is an intentional act of dishonesty; however, it may also happen accidentally due to factors such as inappropriate referencing of publications and failure to provide copied information in the proper way[18]. Educators should be aware of the factors that affect students' plagiarism[9]. Self-plagiarism, paraphrasing, verbatim

plagiarism, mosaic plagiarism, image plagiarism, and cyber plagiarism are the different types of plagiarism[19]. The types of plagiarism have changed due to the advancement of Information Communication Technology[20]. Data falsification or fabrication and plagiarism are the most serious forms of misconduct. The problem of misconduct in research is growing rapidly[21]. Any research article may contain plagiarism, but publishers are employing anti-plagiarism technologies to identify instances of plagiarism[14].

Plagiarism is well-known in the academic world and a growing issue[4, 22]. Normally it is difficult to detect plagiarism but it is easy to detect it with the help of technology[19]. The key purpose of plagiarism detection technologies is to reduce plagiarism[23]. Plagiarism detection combines clone identification and similarity detection algorithms[24]. The thought that Internet plagiarism by students has begun to increase has disturbed educators, prompting them to implement electronic plagiarism detectors, along with other solutions[25]. The possible advantages of using technological instruments for detecting plagiarism can assist in strengthening academic integrity policy frameworks for academic institutions[26].

Understanding plagiarism, paraphrasing by giving proper citations using reference tools and similarity-checking skills help to reduce student plagiarism[13]. Throughout the last decade, the introduction of plagiarism detection software has aided in the discovery of basic kinds of textual recycling among publications. Yet, such a technique is ineffective in detecting complicated types of plagiarism[14]. Turnitin is used for similarity detection and plagiarism detection tools should serve as a platform for students to develop and achieve academic integrity[27].

The problem of plagiarism is growing bigger for education institutions because of increased access to electronic access and there is a necessity to develop plagiarism detection frameworks to deal with plagiarism[28]. Internet plagiarism will pose a great difficulty in achieving quality in higher education[9]. The best way to address plagiarism concerns is to reform institutional plagiarism regulations and combine them with real education based on knowledge of new media[29]. Essential guidelines should be provided in the initial stage of the programme or course[30]. Inter-collegial cooperation, comprehensive plagiarism guidelines, and training programs are required[31]. Library professionals can help prevent plagiarism by creating awareness[7]. Awareness training or programs should greatly focus on avoiding plagiarism and ethical research practices[32]. A study was done to test university students' awareness, and attitudes of regarding, plagiarism as well as their ability to spot plagiaristic writing[31].

Plagiarism is dangerous to original scientific research[18], and it is an ethical violation that must be avoided if pupils' attitudes and honesty are to be consistent with ethical values and virtues[18]. Plagiarism is considered an ethical violation and academic dishonesty[19]. In recent years, student plagiarism in higher education institutions has grown into a controversial topic[33]. Lack of interest in education, ignorance, a lack of consistency in styles among subject domains, and situational ethics are the factors that influence students' behaviour towards plagiarism[7]. Teaching, pride, and, accessibility factors significantly influence plagiarism[10]. Confusions among learners about their peers' Internet plagiarism are concerning, considering the importance of perceived peer behaviour on learners' inclinations to plagiarise[25]. Many studies indicated that plagiarism is a major problem in education[6] and the literature has investigated the extent and nature of student plagiarism[26]. 93.75 % of the research candidates are aware of plagiarism, 79.46 % are aware of plagiarism detection tools and 56.25 % of them gain knowledge through seminars/workshops/conferences[34].

Discussion on plagiarism in higher education is a trending topic[32]. Students may be able to utilise ChatGPT to cheat on writing assignments by giving particular prompts to the chatbot and then copying and pasting the produced answers onto their essays[15]. The growth of AI chatbot technology and its impact on education is a trending topic and especially ChatGPT sparked worries among scholars[35]. Plagiarism in scholarly content writing is an intellectual dishonesty that garnered a great deal of interest during this study, and very few students know what plagiarism is. To avoid plagiarism, universities should take a systematic approach towards the academic dishonesty issue[27].

Pritchard[36] defined 'bibliometric' as "the application of mathematical and statistical methods to books and other media of communication". Curtis & Vardanega reported the plagiarism trends during the years 2004 to 2014[37]. Foltynek[11], *et al*. reviewed 239 research articles on academic plagiarism detection which were published between 2013 to 2018 and identified it as a very active research field. Discussed trends, different types of plagiarism and plagiarism detection methodologies[38]. 582 PubMed publications between 1997 and 2017 on plagiarism were analysed, 28.3 % and 27.3 % are editorials and letters to the editors respectively author says that there is a requirement for all journals to establish a plagiarism policy[12]. By using bibliometrics in the field of medicine, it is possible to examine both macro and micro-level patterns in the production of enormous numbers of publications[39]. Namdeo & Khaparde[40] studied the research output of plagiarism in India based on a scientometric analysis and the study discovered that in the authorship pattern, solo research predominates over collaboration research and major contributors for the plagiarism research are universities. Another study on academically dishonest research trends using bibliometric analysis, utilised the Web of Science database to gather data, 1798 scholars contributed 829 studies on plagiarism, which is an average of 2.2 authors for each paper and according to the study, Richard L. Marsh ranks as the most prolific writer on plagiarism he contributed 15 publications[41]. Bhakta and Bhui[42] conducted a bibliometric study using Web of Science data from 2000-2018, there are 2561 documents found on plagiarism. According to the study most documents were published in 2017 and English was the most popular publication language.

Bibliometric analysis was used to find out the current trends and future opportunities in higher education academic misconduct, and the author analysed 779 Scopus-indexed studies which are published in the English language from 2000-2020. The analysis also includes plagiarism studies and plagiarism was the most frequently co-occurring keyword[43]. Global plagiarism studies trends were analysed using a scientometric approach. Data was collected for the publications during 2011-2021 from Scopus. The author Wiwanitkit K. has received 57 citations for his 37 publications. The "Accountability in Research Policies and Quality Assurance" journal was the most productive journal[44]. Plagiarism publications between 2002 and 2016 were extracted from Scopus, and 385 papers were found and analysed. Science landscape and a multi-dimensional facet presented in a study will be helpful to the researchers who are studying machine learning[45]. The beginning phase of the research saw a higher prevalence of individual authorship, but this has been changing quickly with each passing year as the degree of author collaboration has increased in recent years[46].

3. OBJECTIVES OF THE STUDY

- To discover the yearly progression of plagiarism publications.
- To identify the top influential authors and publications in plagiarism research.
- To find out the top journals that produced the highest publications and their citations.
- To realise the network visualisation of co-occurrence of keywords, co-authorship of countries, citation and co-citation of authors, countries and bibliographic coupling examination in the context of plagiarism.

4. METHODOLOGY

The study used the bibliometric analysis method as it will help to analyse and explore large volumes of data. Scopus and Web of Science are the largest citation databases. Web of Science was used to extract the publication data for this study. The keyword "plagiarism" was used to retrieve the data that was collected on 15th March 2023. The data was collected from the Web of Science database, covering the years 1989 to 2023. In total, we retrieved 3282 documents from those years. The limitation of this research is that it only covers the list of publications that contain the keyword "plagiarism" and it does not cover any synonyms or terms that are close to the term "plagiarism". The publication details were downloaded in text form including keywords, abstract, bibliographic information and citation details. Scimago Journal and country rank were used to gather H-Index data. Journal Citation Indicator (JCR) 2021 was used to get the impact factor data. Further MS Excel was utilised to create tables and graphs. Data was analysed using VOSviewer software to visualize bibliometric networks of publications.

5. ANALYSIS OF THE STUDY

Web of Science indexed research publications on "plagiarism" covered from the year 1989 and there are 24 publications published on plagiarism in the year 1989. Figure 1 shows that the publications on plagiarism are increasingly growing and the largest number of papers (228) were published in 2019 and there are 14 publications published this year.

There are nineteen different types of documents which were published and 62 % of the publications are articles (2129), followed by 526 editorial materials which

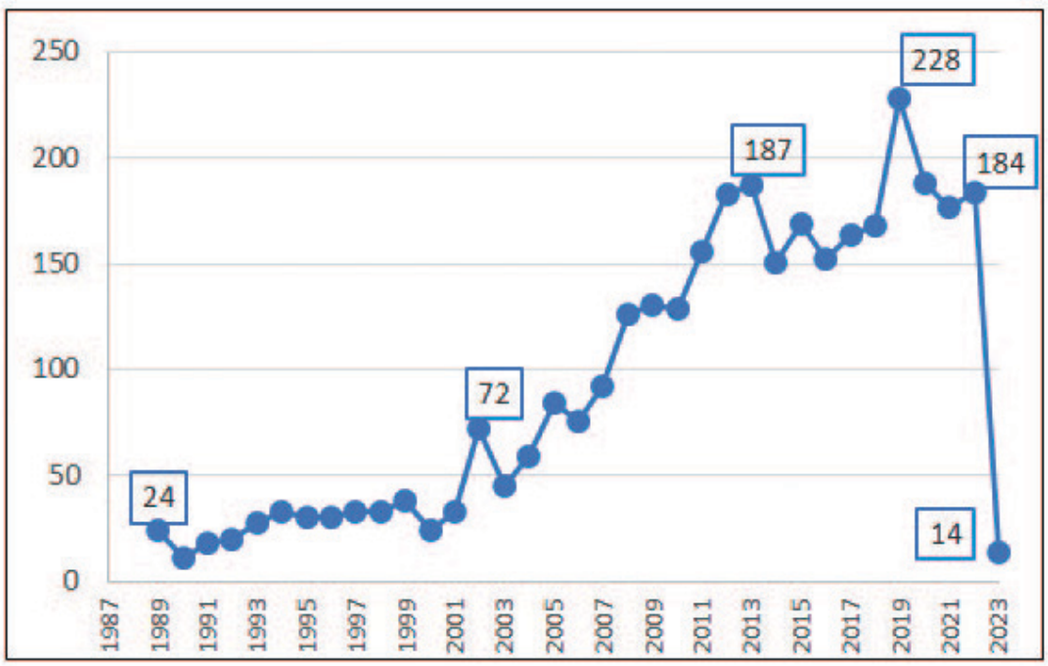

Figure 1. Year-wise documents published.

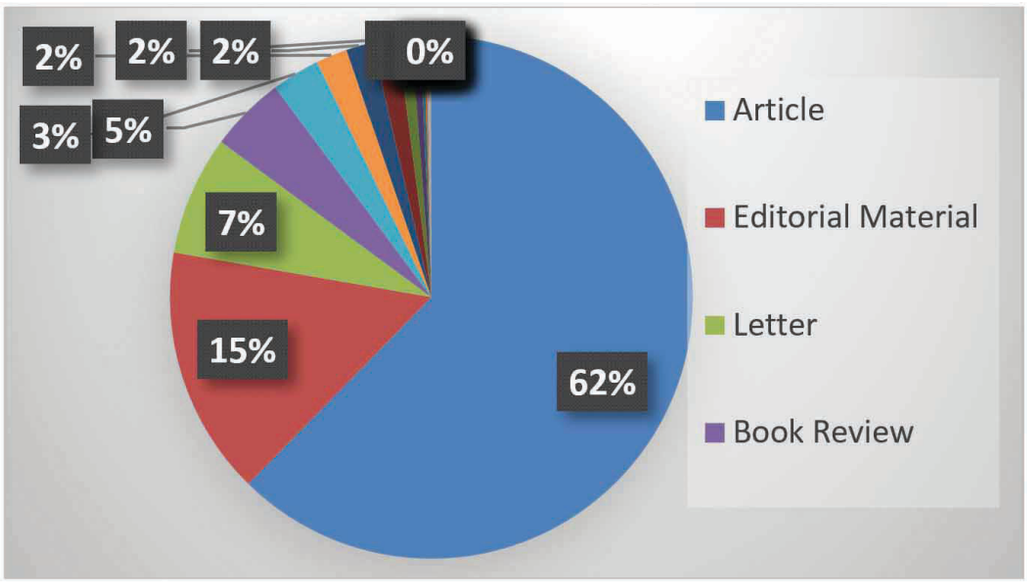

Figure 2. Type of published documents.

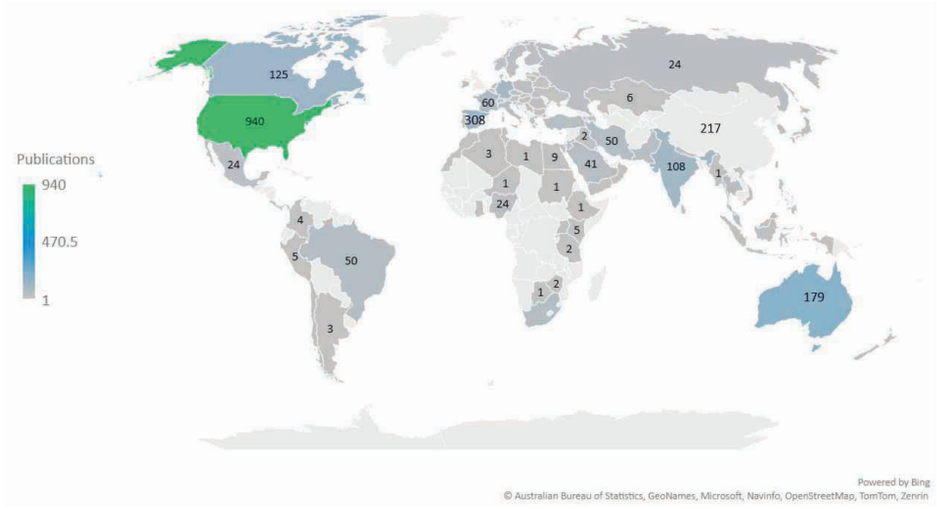

Figure 3. Country-wise publications.

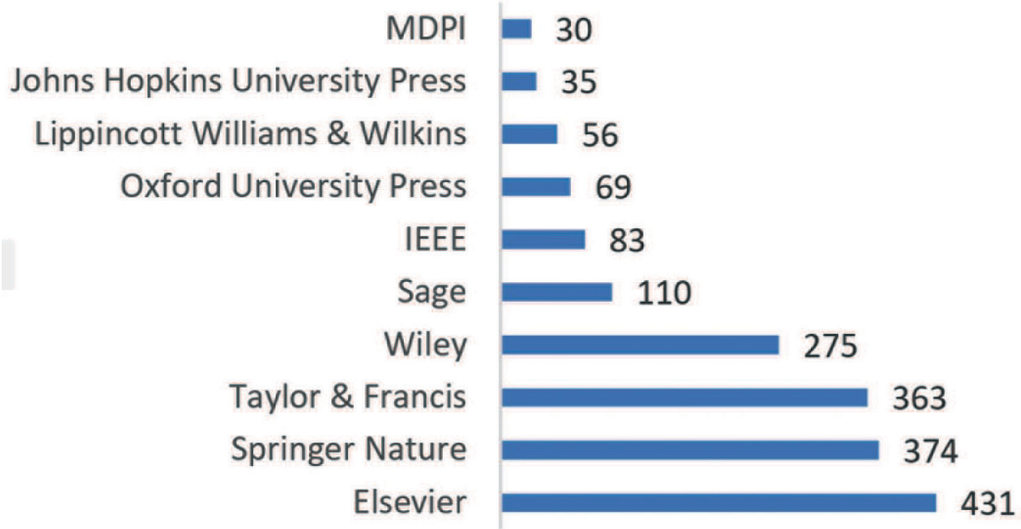

Figure 4. Top 10 publishers produced plagiarism research.

Table 1. Top 10 productive journals on plagiarism research

Rank	Journal	TP	TC	AC	h-Index	JCR-IF	Country	Publisher
1	Science and Engineering Ethics	65	926	14.24	59	3.25	Netherlands	Springer Netherlands
2	Accountability in Research-Policies and Quality Assurance	62	480	7.74	31	0.82	UK	Taylor & Francis
3	Nature	47	309	6.57	1276	10.86	UK	Nature Publishing Group
4	Ethics & Behavior	44	947	21.5	46	0.72	USA	Routledge
5	Assessment & Evaluation in Higher Education	37	874	23.6	89	2.86	UK	Taylor & Francis
6	Current Science	31	36	1.16	124	0.22	India	Indian Academy of Sciences
7	Studies in Higher Education	29	1469	50.67	112	2.23	UK	Routledge
8	Journal of Second Language Writing	28	1332	47.57	88	2.55	UK	Elsevier
9	Scientometrics	28	251	8.96	123	0.91	Netherlands	Springer Netherlands
10	Journal of English for Academic Purposes	26	378	14.53	63	2.26	UK	Elsevier
	Total Publications in Top 10 Productive Journals	**397**						

TP = Total publications; TC= Total number of citations; AC= Average citations; IF= Impact factor

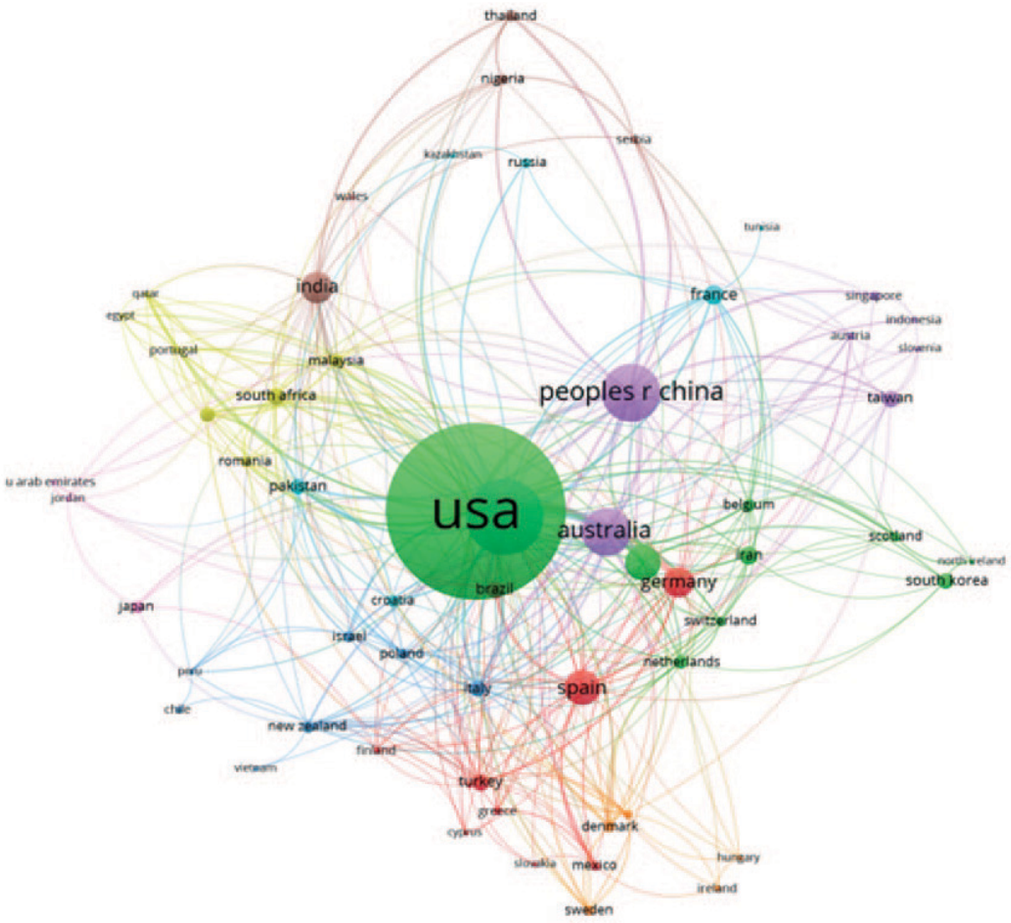

Figure 5. Association network of nations on co-authorship.

Table 2. Top 10 influential papers in plagiarism

Rank	Title	Author	Source title	Total citation	Publisher
1	Ethical authorship and publishing	Coats, Andrew J. S. (2009)	International Journal of Cardiology (Editorial Material)	2043	Elsevier Ireland Ltd
2	Ethics in the authorship and publishing of scientific articles	Shewan, Louise G.; Coats, Andrew J. S. (2010)	International Journal of Cardiology (Editorial Material)	740	Elsevier Ireland Ltd
3	How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data	Fanelli, Daniele (2009)	PLOS One (Article)	667	Public Library Science
4	Misconduct accounts for the majority of retracted scientific publications	Fang, Ferric C.; Steen, R. Grant; Casadevall, Arturo (2012)	"Proceedings of the National Academy of Sciences of the United States of America" (Article)	595	National Academy of Sciences
5	Reporting ethical matters in The Journal of Physiology: standards and advice	Drummond, Gordon B. (2009)	Journal of Physiology-London (Editorial Material)	539	Wiley-Blackwell
6	Borrowing others' words: Text, ownership, memory, and plagiarism	Pennycook, A (1996)	TESOL Quarterly (Article)	327	TESOL
7	The relationship of analogical distance to analogical function and preinventive structure: The case of engineering design	Christensen, Bo T.; Schunn, Cmustian D. (2007)	Memory & Cognition (Article)	272	Springer
8	Good and original: Plagiarism and patchwriting in academic second-language writing	Pecorari, D (2003)	Journal of Second Language Writing (Article)	262	Pergamon-Elsevier Science Ltd
9	Guilty in whose eyes? University students' perceptions of cheating and plagiarism in academic work and assessment	Ashworth, P.; Bannister, P.; Thorne, P. (1997)	Studies in Higher Education (Article)	237	Carfax Publishing Co
10	Good Publication Practice for Communicating Company-Sponsored Medical Research: GPP3	Battisti, Wendy P. *et al.* (2015)	Annals of Internal Medicine (Article)	232	Amer Coll Physicians

account for 15 % of all the records, and 7 % letters, 5 % book reviews, 3 % review articles, 2 % proceeding papers, 2 % news item, 2 % early access, and 1 % meeting abstracts (Fig. 2).

Figure 3 demonstrates country-wise document contribution to the plagiarism research in numbers. The United States of America (USA) contributed 25.5 % of publications followed by the UK 9.3 %, China 6.5 %, Australia 5.4 %, Canada 3.7 %, Spain 3.5 %, India 3.2 %, Germany 3.1 % and 95 other countries contributed 1338 publications.

Figure 4 shows the top 10 publishers in the plagiarism research, 13.1 % of the publications publish by Elsevier followed by Springer Nature 11.36 %, Taylor & Francis 11.03 %, Wiley 8.35 % and 3.34 % of publications by Sage publishers.

Table 1 shows the top 10 journals which are published the highest number of articles on plagiarism. "Science and Engineering Ethics" (65), "Accountability in Research Policies and Quality Assurance" (62), and "Nature" (47) journals published articles on plagiarism. There are 397 publications produced by the top 10 productive journals which are 12.1 % of the total publications. "Studies In Higher Education" journal (1469) got the highest citations for its 29 publications and the average citations per publication is 50.65, the "Journal of Second Language Writing" got 1332 citations for 28 publications and 47.57 average citations per publication. The "Nature" journal has 1276 H-Index and a 10.86 impact factor as per Clarivate Journal Citation Reports 2021; it is published by Nature Publishing Group, UK. Current Science published by the Indian Academy of Sciences has a 124 H-Index with a 0.22 impact factor. Out of the top 10 journals, there are 6 journals published in the UK, two are from the Netherlands and one each from the USA and India.

Table 2 shows that two of the top ten articles were published as editorial material in the International Journal of Cardiology in the years 2009 and 2010. There are three articles published by Elsevier. "Ethical Authorship and Publishing" by Coats, Andrew J.S. (2009) and "Ethics in the Authorship and Publishing of Scientific Articles" by Shewan, Louise G.; Coats, Andrew J.S. (2010) are highly cited articles both of which were published in International Journal of Cardiology. Followed by article number 3 by

Fanelli, Daniele (2009) 667 citations, article number 4 by Fang, Ferric C.; Steen, R. Grant; Casadevall, Arturo (2012) 595 citations and so on.

Figure 5 shows that, 60 out of 102 countries have at least 5 publications. The largest group of related countries consists of 60 countries divided into ten clusters. Figure 5 illustrates the association network of nations on co-authorship. The countries are represented by nodes. A node's size is related to the number of publications produced by the country. Authorship collaboration was highest in the USA, UK, China, Australia, Canada, Spain, and India. Tunisia, Vietnam, and Chile, on the other hand, reported the lowest levels of collaboration.

The primary research hotspots in this area were measured scientifically using the co-occurrence keyword map for plagiarism research. Each node in Figure 6 signifies a keyword. Added lines and a larger node imply a greater frequency of keyword co-occurrence. 8 clusters and 8793 links were revealed during analysis. Keyword co-occurrence link strength overall was 19499. The keyword plagiarism has the highest frequency of occurrence with 3951 overall link strength followed by academic dishonesty and ethics with 926 and 888 total link strength respectively.

The network of authors' citations is shown in Figure 7. The study reported that 59 out of 5918 authors have at least 5 papers. In the investigation, a total of 7 clusters with 223 links were found. A total of 987 link strengths were recorded for the authors' citation analysis. The authors Wiwanitkit Viroj, Hu Guangwei, Rosso Paolo, and Marsh R.L. have reported a strong association with citations.

The Country-wise analysis of citations is illustrated in Figure 8. The study reported a total of 60 out of 102 countries to have at least 5 publications. There are 5 clusters in total, with 1143 links and a link strength of 11687, emphasising additional inter-county citation analysis. The top five positions secured by total link strength-USA (3931), UK (2370), China (2020), Australia (1524), and Canada (986) show a close association.

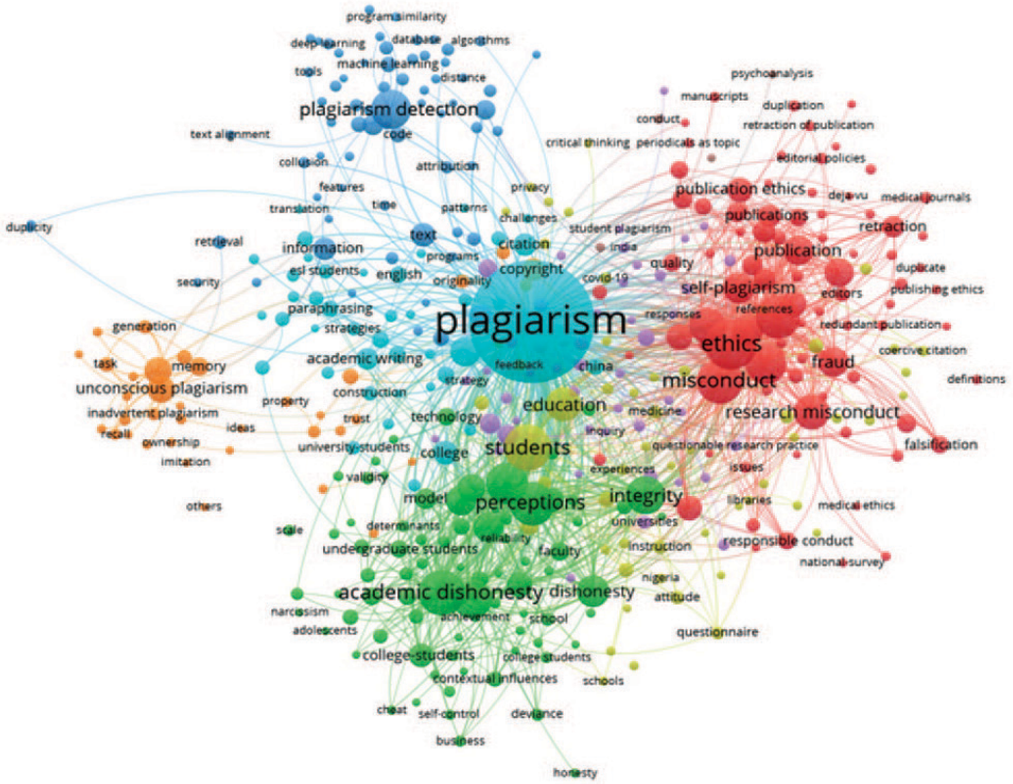

Figure 6. Co-occurrence of all keywords-network visualisation.

Figure 7. Citation analysis of authors.

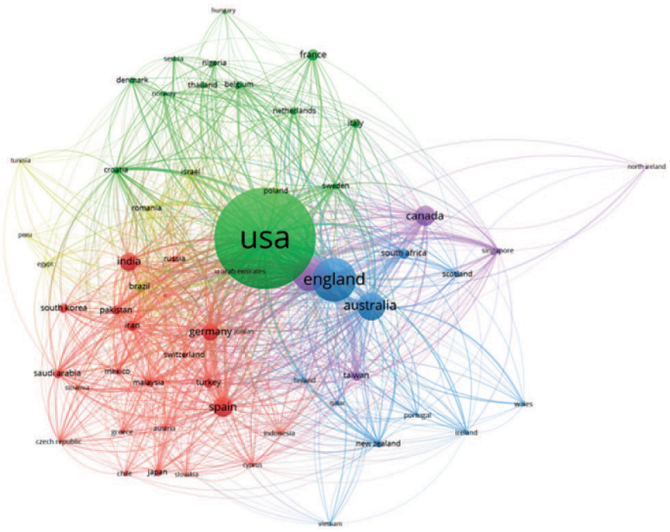

Figure 8. Country-wise citation analysis.

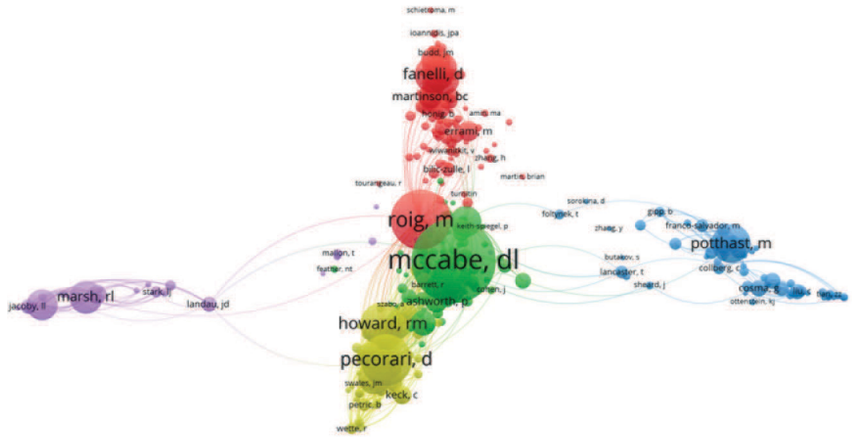

Figure 9. Author-wise co-citation analysis.

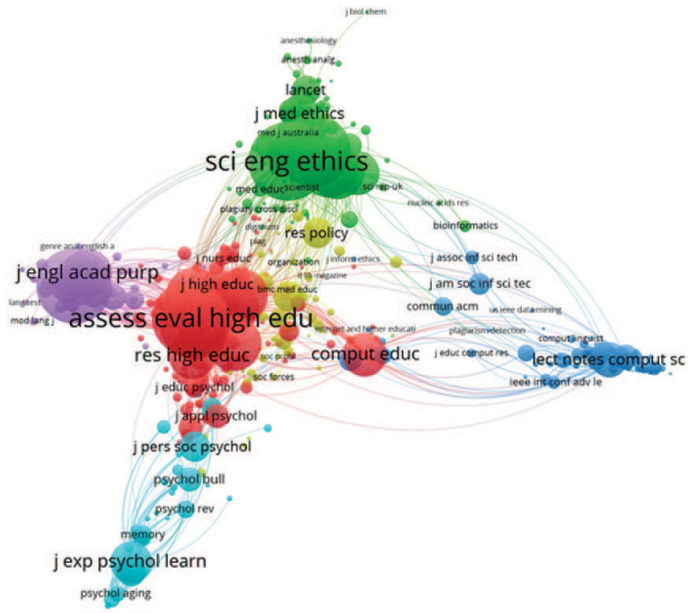

Figure 10. Visualisation of source title and co-citation analysis.

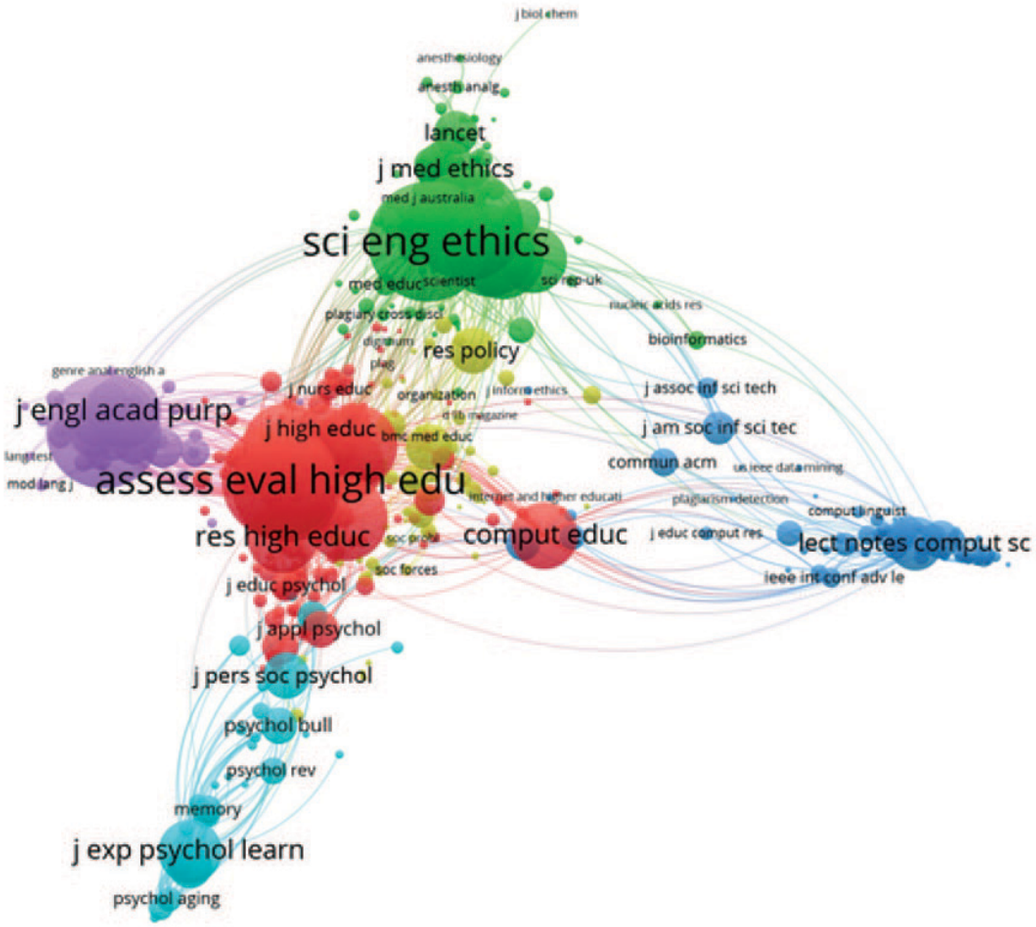

Figure 11. Bibliographic coupling of countries-visualisation.

Co-citation analysis of cited authors reveals a stronger association, as shown in Figure 9, with a total of 5 clusters, 24630 links, and 145211 total link strength. Mccabe D.L., Roig M, and Pecorari D obtained the highest link strength in the top three positions.

Figure 10 depicts the cited source title co-citation visualisation. The research shows that all the 6 clusters have 44995 links and 495299 total link strength, emphasising the importance of source citation in the visualisation network analysis. According to the study, Science and Engineering Ethics has the strongest links with other sources.

According to the network visualisation image shown in Figure 11, a total of 60 countries are associated with each other in 4 clusters and 1750 links. The study found a total of 383165 link strengths. Again, the USA, China, the UK, Australia, and Canada are at the top of the bibliographic coupling in the field of plagiarism.

6. FINDINGS

The literature on plagiarism published between 1989 and 2023 which is indexed in the Web of Science was analysed and there are 3282 publications found during the period. In the year 2019, the highest number of publications (228) were produced and the number of publications increased rapidly during the years (Fig. 1). An increased number of Internet users may be one reason[47], and another reason may be the accessibility of online resources as well as free online publications as the primary causes of plagiarism in modern students, educators, and researchers across all fields of endeavour[48]. King[15] discussed that students may be able to utilise recent technologies like ChatGPT to write assignments and these may encourage the researchers to write and produce a number of publications on plagiarism. The study found that 62 % of the publications are articles and 15 % are Editorial Materials, which means that more publications are produced by journal publications (Fig. 2). The USA contributed the highest number of publications (940), the UK, China, Australia and Canada and 93 other countries contributed to the plagiarism research (Fig. 3). Elsevier, Springer, Taylor & Francis, and Wiley and Sage are top publishers which produced a large number of publications on plagiarism (Fig. 4).

The "Science and Engineering Ethics" journal from Springer Netherlands, "Accountability in Research Policies and Quality Assurance" journal from Taylor & Francis UK and "Nature" journal from Nature Publishing Group UK are the top three journals that produced the most publications. "Studies In Higher Education" from Routledge UK and "Journal of Second Language Writing" from Elsevier UK have got highest citations for their publications on plagiarism (Table 1). The title "Ethical authorship and

publishing" by Coats, Andrew J.S. published in the year 2009 by Elsevier as editorial material is a highly influential paper in plagiarism research and the top 10 highly influential papers are listed in Table 2.

Academics will benefit from network visualisation keywords for in-depth analyses of plagiarism research. According to the results of the VOSviewer, more research has been undertaken by utilising the keywords "academic dishonesty" and "ethics". "Students", "perceptions", "integrity", "misconduct", "scientific misconduct", and "education". Other keywords show that less research has been conducted using them (Fig. 6).

7. CONCLUSIONS

This study is focused on bibliometric analysis to evaluate the trends and growth of publications on plagiarism based on Web of Science data and VOSviewer provides an in-depth visualisation of plagiarism research. Based on the bibliometric studies and results, plagiarism research has a greater scope. The USA has a remarkable position for producing the most cited papers. The "Science and Engineering Ethics" and "Accountability in Research Policies and Quality Assurance" journals produce the most publications. Highest research was produced in the year 2019. This study will contribute to the academic as well publishing sector. This analysis gives a comprehensive perspective of plagiarism research for scholars, which will be useful for those who are studying plagiarism and related fields. It will also be helpful for educators, educational institutions and publishers. The study gives an overview of the current status and trends in plagiarism research. The limitation of the study is that it covers only the list of the publications that used the term "plagiarism" and it does not cover the content of the publications. The bibliometric analysis is only based on Web of Science data and it does not cover publications from other databases.

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