JOLLS: Journal of Language and Literature Studies
Website: https://journal-center.litpam.com/index.php/jolls/index
Email: jolls@litpam.com
DOI: https://doi.org/10.36312/xb2dnq65

December 2025 Vol. 5, No. 4
e-ISSN: 2808-1099
pp. 967-981

Trends in Google Docs Application for Collaborative Academic Writing: A Bibliometric Analysis of Research Publications

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Received: September 2025; Revised: October 2025; Accepted: November 2025; Published: December 2025

Abstract

Using Google Docs for collaborative writing has grown more important in many locations worldwide. Prior studies have demonstrated that classroom collaboration obstacles stem from team members having disparate proficiency levels with the required platform and challenges faced while implementing collective tasks. This study gathered data from the Scopus database to evaluate the scientific outcomes of articles about using Google Docs in collaborative writing. Scopus indexed a collection of data, A total of 173 selected publications have been collected during the inclusion phase, covering the last decade from 2012 to 2024. Starting at 10 publications in 2012, the number fluctuated slightly in the early years, reaching a low point of 5 in 2015. After 2016, the trend consistently increased, with notable growth after 2018. The publications rose sharply from 14 in 2019 to 25 in 2022, followed by a slight dip to 17 in 2023. In 2024, the number rebounded to 24 publications. Data sources in the form of conferences accounted for 29.49% and journal publications with a total of 70.51%. Overall, the data indicates growing research interest and academic engagement with Google Docs in collaborative writing over time, particularly in recent years. The quantitative study findings reveal a substantial rise in study results on using Google Docs in the United States over the last five years. A descriptive Scopus database and bibliometric review were conducted to find publishing patterns related to Google Docs in collaborative academic research. The entire average number of citations that have been published is calculated using Microsoft Excel technology. The trend of research collaboration utilizing Google Docs for collaborative writing is somewhat restricted, and the study subjects are significantly diverse. This study has several limitations, mainly that data were only selected and filtered from the Scopus database, making our analysis reliant purely on the reliability of the provided input source.

Keywords: Bibliometric analysis; Google docs; Collaborative writing; Vosviewer application; Scopus indexs

How to Cite: Sukmojati, E., Rahma, S.A., Ummah, H., Putra, R.D., & Attabik, M.H. (2025). Trends in Google Docs Application for Collaborative Academic Writing: A Bibliometric Analysis of Research Publications. *Journal of Language and Literature Studies, 5*(4), 967-981. doi: https://doi.org/10.36312/xb2dnq65

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INTRODUCTION

Teaching and learning methods have significantly changed due to the swift expansion of information and communication technology in the contemporary digital age. Due to the rapid development of technology and its integrity in education, educational institutions in almost all parts of the world must adapt to new management and teaching methods (Nurtayeva et al., 2024). With these advances, students can now use technological devices quickly and easily in their daily lives (West, 2019). Integration of digital technology presents authentic learning opportunities through experiential learning or active and meaningful exploratory experiments. (Maussumbayev et al., 2022). Integrating online communication and computer-based learning platforms into the student

writing process is a logical pedagogical approach to implement because today's generation of students grows up in a digital environment with the internet (Özgür Küfi, 2023).

Writing skills are essential for students to become professionals in facing academic challenges; incredibly collaborative writing because it can develop communication and cooperation. According to Chang et al. (2024), collaborative writing effectively improves students' writing ability and is beneficial for less proficient students because they can learn from more proficient friends. This may be due to the evolution of Web 2.0, the presence of collaborative writing platforms and the development of opportunities for interactivity and cooperation in the writing process (Svenlin & Sørhaug, 2023). Meanwhile, Wahyuningsih et al. (2023) stated that writing collaboratively can not only produce learning that supports students in learning to appreciate and work together with their friends but also allows students to learn without the help of lecturers. Therefore, Li (2023) has said that for EFL students, in order to generate popularity for collaborative and interactive writing environment tools, it is necessary to use online platforms such as podcasts, blogs, wikis, and Google Docs.

Google Docs is a platform that offers features that help collaboration, such as writing editing, comments, and feedback, making it easier for students to write collaboratively. Feedback on Google Docs features allows students to learn words and structures (Pham, 2022). According to AbuSa'aleek (2022), Google Docs is a tool EFL students use to edit and create documents online, and it is available for free Alwahoub et al. (2022) said that Google Docs has been proven to be a new social synchronous web-based tool in online collaborative writing effective in English learning and teaching in L2 and F.L. settings. In addition, according to Kazemi et al. (2022), a distinctive pedagogical feature of Google Docs is that it serves L2 learners with automated media triggered by errors in their language. On the other hand, Woodrich et al. (2017) affirming web-based writing tools help students work on collaborative writing assignments efficiently and quickly.

However, Google Docs and collaborative writing also have some process challenges. Woodrich et al. (2017) stated that strategies are ineffective in facilitating improved written expression and academic language development. Stoudt (2022) also explained the challenges faced by collaboration in the classroom: team members with different levels of experience with the required platform and the obstacles faced when doing tasks together. In addition, some students felt embarrassed or even reluctant to contribute because they were uncomfortable with their lack of language proficiency and writing skills (Akato 2021). Therefore, it can be said that not all research conducted on collaborative writing has a positive impact or significant difference. In his research, Alwahoub et al. (2022) showed that students lack accuracy in grammar and did not correct the mistakes they made when writing collaboratively.

Google Docs emerged as a prevalent subject of examination across diverse literary disciplines. Consequently, Google Docs has been the subject of various research studies in evaluating its feasibility and benefits and has attracted considerable attention in recent years (Ali, 2021). In the realm of Education, Google Docs has garnered significant attention over the past decade, yielding a wealth of scholarly resources and a multitude of public and commercial implementation projects (Olson et al., 2017).

Google Docs provides a complimentary digital platform that enables L2 learners to efficiently create, modify, share, and publish multi-draft papers (Kazemi et al., 2022). Google Docs is an interactive tool promoting teacher and student engagement (Alqefari, 2022). Neumann et al. (2019) demonstrated that Google Docs, a novel social synchronous web-based tool, is an excellent online collaborative writing instrument for English instruction and acquisition in L2 and F.L. contexts when employed synchronously in collaborative writing activities. EFL students use Google Docs as a collaborative tool to structure and proofread peer writing assignments, including narrative, descriptive, and

process essays (AbuSa'aleek, 2022). Google Docs enables collaborative writing by permitting participants to observe one another's efforts, amalgamating individual inputs into a cohesive final document (Zioga et al., 2020).

Various literature reviews showed that this approach can help gain contemporary knowledge (Suseelan et al., 2022). These findings from previous studies can be summarized with a comprehensive literature review (Xiao et al., 2019). Based on several predetermined research questions, using a qualitative approach, the researcher can conduct a manual analysis of the content of the literature (Funa et al. 2021), which includes a limited portion of the previous research that can represent a systematic review of the Literature (Angraini et al., 2023). The research conducted by Suseelan et al. (2022) has shown that quantitatively, meta-analysis consolidates empirical information from previous researchers. It is not like a systematic fist of Pustaka. Meta-analysis is one of the techniques that can be used to consolidate findings from several studies on a particular subject, which can help reconcile inconsistencies in this study (Dettori et al., 2022). Nonetheless, Meta-analysis is still relatively weak because it depends on the original research design and the availability of covariate data, and it cannot overcome the refraction (Bocconi et al., 2016). In analyzing data, this meta-analysis literature is generally still less varied (Aguinis et al., 2011).

Moreover, bibliometrics is included in the category of statistical methods because this program can be a tool to examine a study published by Scopus (Phoong et al., 2022). Zyoud et al. (2023) revealed that the most relevant and significant research in a particular field can be found using bibliometrics. Moreover, Zhang et al. (2019) argued that producing comprehensive information by analyzing ideas quantitatively and combining quantitative concepts can be done using bibliometric research methods. Bibliometrics has evolved into a widely utilized tool for evaluating and delineating published thoughts and information across several fields (Rana et al., 2024). Moreover, bibliometric analysis closely parallels meta-analysis since it facilitates the incorporation of a significant amount of the literature in the procedure for reviewing (Suseelan et al., 2022). Consequently, a bibliometric examination will significantly aid academics in identifying gaps in research and focal areas (Chen et al., 2019). Consequently, this study would like to perform bibliometric analysis by examining the research landscape of prior works on Google Docs in academic collaborative writing from 2012 to 2024.

This study aims to provide an overview of research on Google Docs in academic collaborative writing during the past decade. Based on the background of the study above, the research question of the study is as follows:

What are the general information and annual growth trends of publications related to Google Docs in academic collaborative writing?

What are the contemporary research publication tendencies concerning Google Docs in academic collaborative writing?

What study citation trends are associated with Google Docs in academic collaborative writing?

How is the international cooperation network between countries and affiliation in this research field?

What are the most important and popular research topics for academic writing collaboration with Google Docs?

What is the study's emphasis on Google Docs for scholarly writing collaboration?

RESEARCH METHOD

Study Design

Bibliometric analysis is an applied research methodology. Bibliometric analysis evaluates published works, including articles, books or conferences, with a quantitative approach (Phoong et al., 2022). Scholars could map the academic field of a particular topic or problem by analyzing the quality and quantity of publications, sources, significant

contributors, and data linkages, all of which could be done with this technique. Analysis of trends in the field and comprehensive analysis of contributions could be done by utilizing the technological features in Biblioshiny/R.4.4.1 program, Vosviewer and Microsoft Excel. All retrieved bibliographic records were exported and organized in an Excel format to facilitate structured data management. The dataset was then imported into the Biblioshiny interface within the R 4.4.1 environment for comprehensive bibliometric analysis. However, certain variables were not fully detected or available through Biblioshiny's automated functions; therefore, VOSviewer was used as a complementary analytical tool to extract and visualize additional bibliometric indicators. This combined methodological approach ensured a more complete and accurate representation of the research landscape regarding the use of Google Docs in collaborative academic writing. The methodological framework in this study used descriptive qualitative analysis. Taking relevant bibliometric data sources and collecting the required sources, such as publication titles, years, authors and institutions, requires significant and accurate identification analysis.

Data Collection

Researcher utilized Scopus database to locate data sources of "Google Docs in academic collaborative writing" because of its extensive interdisciplinary coverage—the refinement of the acquired data involved multiple phases. The stages include verification, testing, qualifying assessment, and admission (Moher et al., 2009). The first stage was identifying relevant articles using defined search parameters and removing equivalent or duplicated publications. The topic pertained to "Google Docs in academic collaborative writing." The investigation into "academic collaborative writing" was restricted to English, as Google Docs is the primary platform for collaborative writing. 247 publications were detected without duplicates, indicates that only publications that have specific criteria can be included as primary data in the extensive collection.

The second stage, screening, entails the identification of publications in pertinent languages and document types. English, the most prevalent language for global scientific communication, must fulfil the researcher's criteria. Only journals and proceedings are permissible for the documentation required for this investigation. Following the screening process, 47 papers were eliminated from the dataset for failing to match the criteria, resulting in 200 publications remaining.

At the end of the session, 200 publications were qualified. The researchers analyzed and assessed the title and abstract to find publications that met the inclusion criteria. The main criterion was publications that discuss using Google Docs in collaborative academic writing. Publications that meet the requirements could be included in the analysis that are relevant to the research discourse. After qualification, 27 publications have been removed for not being relevant to Google Docs in the criteria for collaborative academic writing. In this third phase, 173 publications were left. In this study, the researcher seeks to analyze the landscape and research pattern of Google Docs in collaborative academic writing, which consists of 173 publications that are guaranteed to be impartial in their interpretive results. These data have been collected during the inclusion phase on September 13, 2024.

Data analysis

A descriptive Scopus database and bibliometric review were conducted to find publishing patterns related to Google Docs in collaborative academic research. The entire average number of citations that have been published is calculated using Microsoft Excel technology. In this study, the researcher used the R.4.4.1 program, a bibliometric tool, to find the h-index until g-index data of publications.

The rankings journal publication derived from quartiles were significant data displayed using Microsoft Excel software. The data that has been sourced from Scopus'

database, with includes 173 articles, further categorized into classifications (Q1), (Q2) and (Q3). This data also showed that the publications had been written by researchers published in journals and conferences.

Researchers use Microsoft Excel to visualize the geographical spread of articles by country and visualize this distribution on a global map. The researcher obtained the h-index and g-index from the publications using the R.4.4.1 program and bibliometric tools, like citation trends. The VOS viewer software generates network visualizations that depict the relationships among countries. A study of Google Docs keywords in academic collaborative writing is conducted to ascertain the research emphasis. The data for analysis is sourced from the Scopus database and requires preliminary processing. The purpose of the study could be discerned through the terms provided using the VOS Viewer application.

RESULTS

2012 to 2024. Data sources in the form of conferences accounted for 29.49% and journal publications with a total of 70.51%.

Publication Trends

The publication frequency during the last decade, depicted in Figure 2, ranges from 2012 to 2024. The most significant number of publications occurred in 2022, with 25 articles or 14.49%, whilst publications in 2023 and 2024 accounted for 23.66%. A notable surge in publications transpired between 2020 and 2021. In 2020, 16 publications were published. However, in 2021, the number increased markedly to 21 documents. The number of articles in 2021 significantly increased compared to the previous year, indicating a growing interest or significance in Google Docs for academic writing collaboration. The substantial rise in publications from 2020 to 2021 indicates a notable shift in the methodology of collaborative writing education.

This indicates that Google Docs is gaining significance in scholarly collaborative writing within the educational sphere. A burgeoning acknowledgement of the importance of Google Docs was evident, which could facilitate problem-solving and analysis in daily life and the progressively digital work environment. An alternative was the incorporation of Google Docs for collaborative composition in lesson plans since numerous schools and educational institutions have started to adopt Google Docs for academic collaboration. Research and development significantly contribute to this growth since scholars are increasingly focused on investigating the potential of Google Docs inside educational settings. It is also essential to know that the minimum number of publications is one every year, as has been observed in 2013, 2014 and 2015.

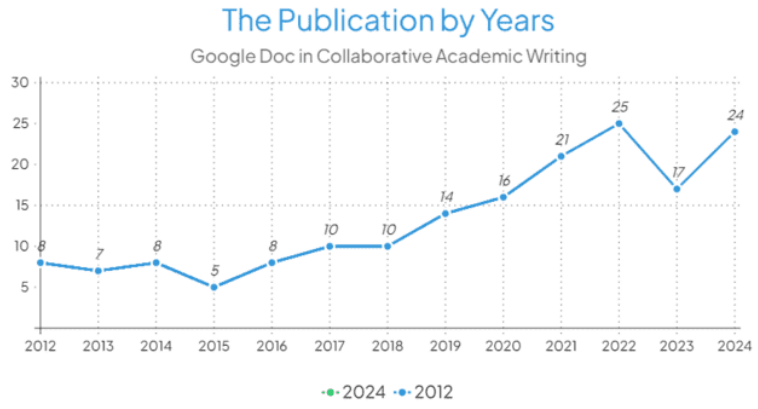

Figure 2. The publication by years (2012 to 2024)

Citations Trends

The table above displays academic publication data, including local and global citations, citation ratios, and normalization. Each now contains essential information such as the author, year of publication, DOI (Digital Object Identifier), and citation metrics that indicate the influence of each article on the academic community.

Table 1. Overview the citation trens

Document	*Year*	*Local.Citations*	*Global. Citations*	*Ratio*	*Normalized. Local.Citations*	*Normalized. Global.Citations*
Kessler G, 2012, Lang Learn Technol	2012	17	184	9.23913043	7.15789474	4.47416413
Ebadi S, 2017, Comput Assisted Lang Learn	2017	15	75	20	3.94736842	1.68918919
Suwantarathip O, 2014, Turk Onl J Edu Tech	2014	12	67	17.9104478	6.4	4.87272727
Wang D, 2015, Conf Hum Fact Comput Syst Proc	2015	12	73	16.4383562	3.33333333	2.82945736
Li M, 2018, Comput Assisted Lang Learn	2018	11	105	10.4761905	6.875	4.88372093
Cho H, 2017, J Second Lang Writ	2017	10	82	12.195122	2.63157895	
Abrams Z, 2016, Comput Assisted Lang Learn	2016	9	51	17.6470588	4.8	
Birnholtz J, 2013, Conf Hum Fact Comput Syst Proc	2013	9	37	24.3243243	4.5	2.00775194
Yim S, 2017, Proc Acm Cont Comput Support Coop Work Cscw	2017	9	51	17.6470588	2.36842105	1.14864865
Alharbi Ma, 2020, Innov Lang Learn to Teach	2020	7	50	14	14	4.21052632

The initial document referenced is Kessler's 2012 publication, which has 17 local and 184 global citations. The global-to-local citation ratio was 9.24, signifying that the work was widely recognized beyond its local context. The normalized local and global citations were 7.16 and 4.47, respectively, signifying substantial acknowledgement on both levels. Ebadi's 2017 work demonstrates 15 local and 75 global citations, yielding a ratio of 5.00, which signifies considerable relevance in both local and global contexts. The normalized local and global citations were 3.95 and 1.69, respectively, suggesting that although this publication was highly regarded, its global impact was marginally inferior to that of Kessler's

Additional documents, including Suwantaratip's 2014 study, noted 12 local and 67 global citations, resulting in a ratio of 5.58. The normalization of his local and global citations was 6.40 and 4.87. signifying that while his global citations were commendable, his local impact was notably robust. Conversely, Wang D's 2015 paper generated 12 local and 73 global citations, resulting in a ratio of 6.08, signifying substantial recognition of his work. In 2018, Li had 11 local and 105 global citations, demonstrating a substantial impact on a broader scale. The ratio of global to local citations was 9.55, with normalized local

and global citations at 6.88 and 4.88, respectively, demonstrating that this work garnered local and global recognition.

Additional studies, including those by Cho, Abrams, and Birnholtz, exhibit comparable patterns of favourable citations, but Abrams and Birnholtz's study recorded 9 local and 9 local citations, with 51 and 37 global citations, respectively. Their citation ratio and normalizations indicate that their local recognition was commendable, but their global effect fluctuates. Alharbi's 2020 publication received 7 local and 50 global citations, resulting in a ratio of 7.14. the normalization of local and global citations demonstrates favourable values, suggesting this work could get further recognition locally and internationally. This table elucidates the impact and contribution of each text within the academic community, locally and internationally.

Most Cited Countries

The table above illustrates the average citations per article and the total citations (T.C.) for various countries. The data provides a concise summary of the influence and contribution of research from each nation within the global academic framework.

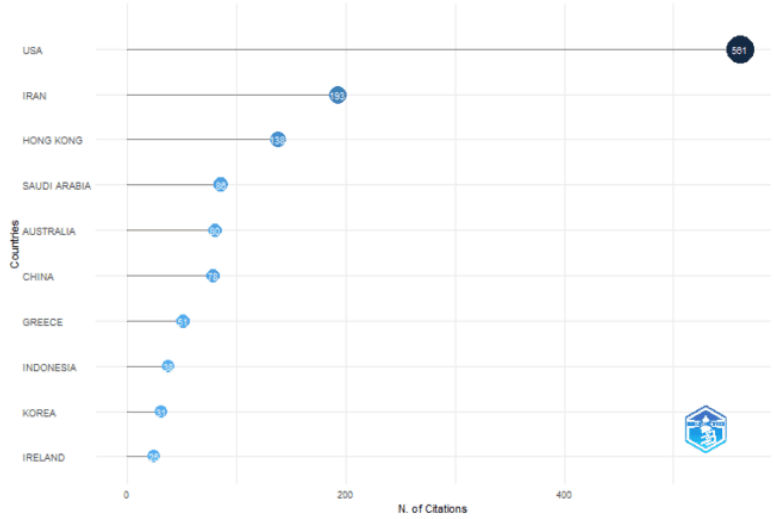

Figure 3. The most cited countries

The highest level of the citations documented in total 561 by the United States, with an average of 24.4 per document. The United States' substantial research and innovation capabilities were illustrated by the significant number of citations that articles from the country acquired. Iran has 193 citations, with an average of 19.3 citations per article. Iran's academic publications were internationally recognized and noteworthy, as evidenced by their average citations per article, despite having a lower citation count than the United States. Hong Kong ranked as the third most mentioned entity, accumulating 138 citations and averaging 27.6 citations per article.

This signifies that, regardless of its lesser total citation count, researchers emphasize each publication from Hong Kong. In addition, Saudi Arabia had 86 total citations, an average of 12.3, indicating its citation significance is relatively modest compared to other nations, regardless of its research achievements. While Australia's research activity was admirable, with an average of 16 citations per publication and 80 total citations, it was not equivalent to other countries ranked higher. China has many publications; the citations per article are comparatively low, with an average of 13 per item. This was indicated by the 78 total citations accrued. In contrast, Greece recorded 51 citations with an average of 25.5, demonstrating that research from this country was also comparatively appreciated.

Despite its research endeavours, Indonesia's influence regarding international acknowledgement remains constrained, as evidenced by its 38 total citations and an average of 4.8. Korea identified 31 total citations, with an average of 31 per piece. This indicates that, despite the low total citation count, each published item had a significant impact. In conclusion, Ireland's research was recognized within the academic community, even though it only received 25 citations, with an average of 12.5.

Most Relevance Affiliations

The table summarizes the quantity of publications published by different academic affiliations, emphasizing their research achievements.

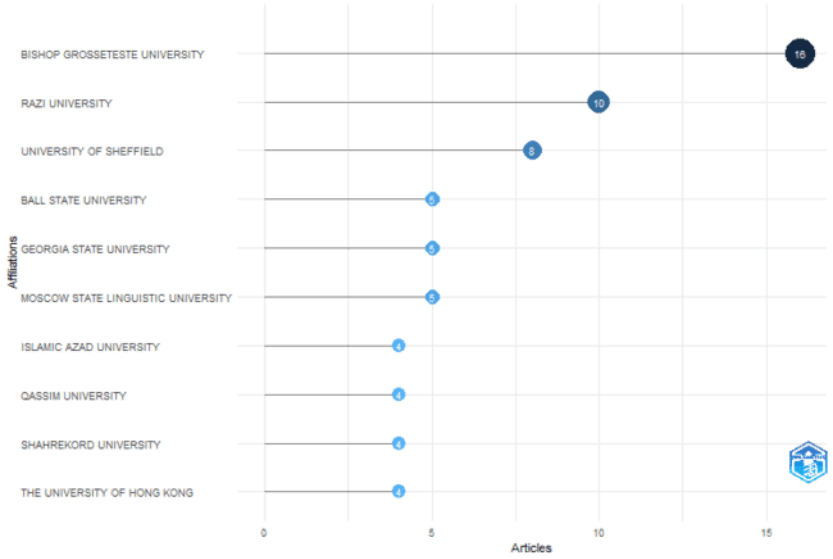

Figure 4. The most relevant affiliations

Bishop Grosseteste University distinguishes itself with 16 publications, reflecting a substantial dedication to academic output. The substantial volume indicates that the university is actively involved in research activities, presumably promoting an environment favourable to academic inquiry. They were following Bishop Grosseteste. Razi University has published ten articles highlighting its significant academic community contribution. The University of Sheffield has published eight articles affirming its position as a premier research university. The findings illustrate the universities' dedication to advancing understanding and engaging with contemporary issues within their fields.

Global Collaboration Patterns

Among the 47 countries, the centre of the network is the United States, shown by the largest blue circle in the middle. This indicates that the U.S. has a central role in the international relations depicted. Other countries are connected to the U.S. through coloured lines, indicating the existence of relationships or interactions. The width and hue of the lines signify the strength or nature of specific links. Some countries closely connected to the U.S. include Canada, Iran, Greece, and other European countries such as Sweden and Switzerland. There are clusters of countries that appear close to each other, such as Hong Kong, South Korea, and the United Arab Emirates, indicating a cooperative relationship between them. Mexico is isolated in the right corner, connected only by a thin line to the U.S., indicating a special or limited relationship. Some countries, such as Australia, Spain, and Brazil, appear on the network's periphery but are still connected to the centre (the U.S.).

Contribution by Authors

The data elucidates academic papers authored by several individuals, emphasizing two principal metrics: total citation (T.C.) and citations per year (TCpY). These criteria were essential for assessing the influence and significance of scientific research. Every table row contains the author's name and publication years. Moreover, DOI (Digital Object Identifier), which uniquely identifies the document. This data assists researchers and academics in locating and accessing pertinent work within their discipline.

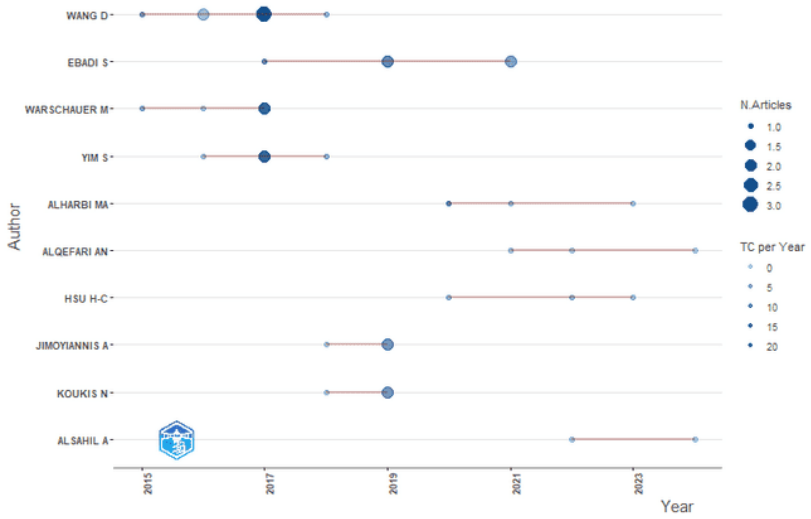

Figure 5. Authors' production over time

The total citations (T.C.) directly measure the frequency with which the work had been referenced in other publications. Wang. D's 2017 publication garnered 68 citations, signifying its substantial influence recognition among peers. Conversely, certain recent publications, such as those by Alqefari. A.N and Alsahil. A exhibits poor citation rates, with Alqefari AN earning no citation in 2024. This indicates that despite being newly published, these publications may not have garnered significant attention from the academic community. Besides citation counts, TCpY offers a more dynamic view of a publication's relevance. This measure indicates the frequency of work citations over time, aiding in identifying patterns and researcher interest. Ebadi S' 2019 publication documented a TCpY of 10.33, signifying that the work was exceptionally pertinent and often referenced shortly after its release. This statistic indicates that authors such as Ebadi. S and Yim. S could generate work extensively referenced and rapidly acknowledged in nascent research domains.

The trend in authorship was distinctly evident from this data. Wang. D exhibits numerous publications, demonstrating significant consistency and production in his domain. This accomplishment was evidenced by citation count and the fluctuation of TCpY, indicating that his work retains its relevance over time. Conversely, authors Koukis. N and Jimoyianis A exhibit a comparable trend with multiple publications that have garnered substantial citations, affirming their contribution to the same field of research. In this perspective, it is crucial to acknowledge that recent papers frequently require time to accrue adequate attention and citations. This elucidates why certain recent publications by writers like Alharbi MA and Hsu Hc exhibit low citation rates despite their possible future relevance. This table reflects the current situation and outlines future research dynamics and the anticipated contribution of new writers to the academic community.

Most Importance and Popular Research Topic

The table summarizes several educational terminologies, their frequency of use, and their corresponding years of importance.

Table 2. The Most Important and Popular Research Topic

Term	*Frequency*	*Year (Q1)*	*Year (Median)*	*Year (Q3)*
Teaching	11	2014	2015	2018
Human-Computer Interaction	6	2014	2015	2016
Human Engineering	7	2015	2016	2019
Education	6	2014	2016	2017
Collaborative Writing	38	2015	2017	2020
E-Learning	12	2015	2017	2019
Students	30	2014	2018	2021
Google Docs	25	2015	2018	2022
Engineering Education	6	2016	2018	2020
Academic Writings	9	2019	2020	2021
Digital Literacies	6	2019	2020	2021

"Collaborative Writing" is the predominant theme, with a frequency of 38, underscoring its substantial emphasis in research conducted from 2015 to 2020. The term "Students" demonstrates significant relevance, occurring 30 times between 2014 and 2021. The phrase "Google Docs" signifies an increasing interest in digital technologies, particularly from 2015, with a notable peak extending until 2022. Alternative phrases like "Teaching," "Human-Computer Interaction," "Human Engineering," and "Education" exhibit a reduced frequency (between 6 and 11) yet continue to signify persistent academic interest from 2014 to 2019. Emerging concepts such as "Academic Writing" and "Digital Literacies," introduced in 2019, indicate novel focal points regarding educational study. The table demonstrates evolving trends in the fields, highlighting the increasing significance of specific concepts and reflecting changes in research objectives within learning.

The focus of Research

Keyword analysis has been conducted to understand the research focus on Google Docs in collaborative academic writing. The researcher has decided on the requirement, namely a minimum of 2 papers containing identical keywords. As a result, from 415 keywords to 50 keywords.

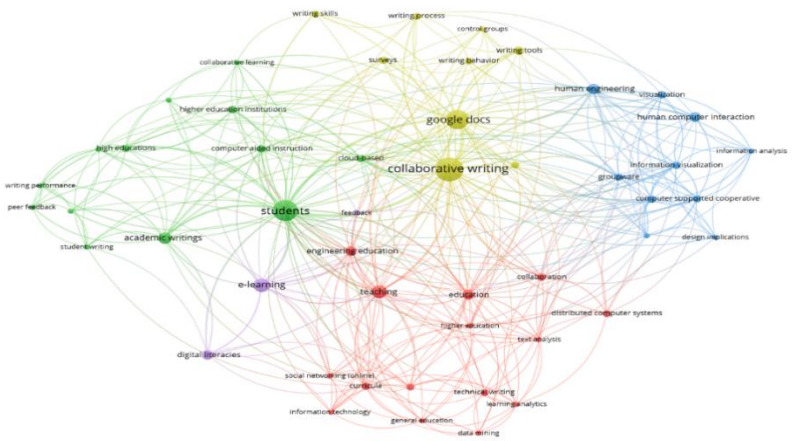

Figure 6. The Keywords connected (occurrence threshold ≥ 2)

Co-occurrence illustrated seven clusters with 50 components associated with Google Docs in academic collaborative writing. The initial cluster (yellow) is the most extensive, with eight elements: collaborative writing, Google Docs, writing habits, writing tools, surveys, control groups, writing process, and writing skills. The terms "collaborative writing" and "Google Docs" possess the most incredible circle within the initial cluster of keywords, indicating a shared research focus on academic collaborative writing. The second cluster (green) consists of nine elements, with the keyword's students, academic writings, and higher education depicted by larger circles, this keyword focuses on research that is comparable to collaborative writing. The third cluster (dark blue) was connected by 9 items, with the most significant circle showing the keyword human engineering, human-computer interface, and groupware, signifying a common study emphasis alongside Google Docs. The fourth cluster (red) comprises 13 items, with the keywords "engineering education" and "teaching and education" represented by larger circles, signifying their prominence in the research focus and collaborative writing within academia. The fifth cluster (purple) has two keywords: e-learning and digital literacies, signifying that these terms denote the research focus with Google Docs in collaborative academic writing.

Discussions

In the prior decade, there have been 173 publications regarding Google Docs in academic collaborative writing, with 70.51% derived from journal articles and 29.49% from conference proceedings. The peak of publishing occurred in 2020 with 25 articles, succeeded by a significant increase from 16 documents in 2020 to 21 in 2021. This phenomenon reflects the increasing interest in Google Docs in the educational sector (Figure 2).

The top 10 articles highlighted their significance and contribution to the academic community locally and worldwide. Kessler's 2012 publication received 17 local and 184 global citations, resulting in a global-to-local citation ratio of 9.24. Furthermore, Ebadi's 2017 publication garnered 15 local and 75 global citations, resulting in a ratio of 5.00. Suwantaratip's 2014 work garnered 12 local citations and 67 global citations, while Wang D's 2015 paper received 12 local citations and 73 global citations. Subsequently, Li's (2018) publication received 11 local and 105 global citations. Cho (2017), Abrams, and Birnholtz each earned 9 local citations, with 51 and 37 global citations, respectively. Alharbi's (2020) most recent paper garnered 7 local and 50 global citations (see Table 1).

Meanwhile, the United States achieved the most citations among countries, totalling 561, signifying its substantial contributions to research and innovation. Conversely, Iran garnered 193 citations, while Hong Kong obtained 138 citations. Saudi Arabia garnered 86 citations, whereas Australia obtained 80 citations. China garnered 78 citations, but Greece obtained 51 citations. Indonesia garnered 38 citations, and Korea obtained 31 citations. Publications from Ireland are acknowledged in the academic community; however, they collected only 25 citations. Despite the comparatively low citation count, each article exerts a substantial impact. (refer to figure 3).

Bishop Grosseteste University achieved 16 publications, reflecting substantial advancements in academic output within the institutional setting. Simultaneously, Razi University, Sheffield University, Ball State University, Georgia State University, Moscow State Linguistic University, Islamic Azad University, Qassim University, Shahrekord University, and Hong Kong University successfully published five publications, reflecting diverse degrees of research involvement and its influence on academia (refer to figure 4).

Furthermore, the United States was at the centre of the international relations network in global relations, as indicated by the largest blue circle in the middle. In addition, other countries are connected through coloured lines, such as Canada, Iran, Greece, and European countries, such as Sweden and Switzerland, which appear closely

connected. On the other hand, countries like Hong Kong, South Korea and the UAE have cooperative relations; however, Mexico appears very isolated. Finally, Australia, Spain, and Brazil are on the periphery but remain connected to the U.S. (see Figure 5).

Table 2 also presents research on the most popular topics, namely collaborative writing, students, and digital technology, which has shown a significant increase in frequency from 2015 to 2020. The topic of "Google Docs" was also increasingly well-known. Other topics, such as "Academic Writing" and "Digital Literacy," also appear, which means a change in learning objectives (see Table 2).

The research emphasizes the visualization of seven cluster networks with 50 elements related to Google Docs in academic collaborative writing. The largest cluster comprises eight keywords, with the primary keywords being collaborative writing and Google Docs. The second cluster has nine keywords: students, academic writing, and higher education. The third cluster yielded 9 terms of human engineering, human-computer interaction, and collaborative software. The fourth cluster yielded 13 keywords, encompassing engineering education, pedagogy, and education. The sixth cluster yielded two keywords: e-learning and digital literacy (refer to Figure 7).

This study has several limitations; initially, relying just on bibliometric data from the Scopus database may not encompass all publications in the literature of Google Docs for academic writing collaboration. Secondly, authors endeavoured to exclude irrelevant publications across multiple Scopus categories manually; nonetheless, this filtration may not be flawless, and omissions may arise. Third, forms of information within the Scopus database exhibit an apparent absence of consistency, particularly regarding author names and institutions. Manually correction was unattainable, potentially affecting our conclusions as the study relies entirely on the quality of the input data obtained from the Scopus database. Fourth, specific evaluations, such as the statistical evaluation of scholars by gender, were impossible in this study due to the technological limitations of the Biblioshiny and VOSviewer tools.

CONCLUSION

This study utilizes bibliometric data from the Scopus database to examine the development of publications related to using the Google Docs application for collaborative academic writing. The main conclusions of this article are as follows: The volume of publications is consistently increasing, particularly over the 2020–2021 timeframe; simultaneously, the rate of citations has also risen markedly during this time. The United States wields the most significant impact in this field of study. Research collaboration in this domain is not particularly weak; it predominantly involves the United States and numerous other nations, including Canada, Iran, Greece, and various European countries such as Sweden and Switzerland. This study recognizes the collaboration among affiliate groups with the 10 most significant connections and the 10 leading authors. The quality of publications in this domain is comparatively elevated, as numerous articles are disseminated in journals with prestigious indexing.

Despite these contributions, this study is limited by its reliance on the Scopus database and manual screening process, which can introduce the potential for human error in selecting and reviewing articles. Furthermore, non-English publications may limit the completeness of the format. Future research could expand its scope by using additional databases, such as Web of Science or Dimension. Practically, these results highlight the growing importance of digital collaborative platforms in academic settings, suggesting that educators and researchers could leverage Google Docs more strategically to support collaborative writing, enhance peer feedback, and foster broader scholarly communication practices.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this paper.

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