

Online Continuous Professional Development (CPD) for Educators: A Bibliometric Analysis of the Scopus Database

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Abstract

Purpose : This study aims to provide a descriptive analysis of research findings on online Continuous Professional Development in the field of education, to deepen researchers' understanding of trends in this research field. Additionally, it is hoped that this research work will further stimulate researchers' enthusiasm for conducting research in the field of online Continuous Professional Development. **Methods :** A descriptive analysis of research outcomes on online Continuous Professional Development will be conducted using the R statistical software package, Biblioshiny, for data visualization. A systematic literature search will be performed on the Scopus database. The review will focus on English publications from 1996 to 2023. **Results :** Through a systematic search, we identified a total of 461 records, and after the selection process, we analyzed 30 articles specifically addressing online Continuous Professional Development for teachers. The research findings reveal a lack of substantial funding support in this particular research field. Judging from the publication timeline, there has been an increased research interest in this field after 2019. Furthermore, the number of collected documents has been consistently growing at an average annual rate of 3.36%. **Implications :** This study can improve comprehension of the dynamic environment of research on online CPD for teachers, which is a theoretical research component. In terms of implementation, the findings can serve as a guide for institutions and governments as they develop plans to support the long-term expansion of online CPD. Finally, this study will most likely be a valuable resource for future research.

Keywords: Online Continuous Professional Development, Continuous Professional Development, CPD, Educators, Bibliometric.

Introduction

Education is a pivotal factor for societal progress, and the quality of education hinges on the capabilities and professional development of teachers. In this ever-evolving educational landscape, there is an increased demand for educators to possess the ability for lifelong learning, to keep pace with the continuous advancements in socioeconomic and technological

realms. Teacher development is viewed broadly in Continuous Professional Development (CPD) as “a planned, continuous and lifelong process whereby teachers try to develop their personal and professional qualities, and to improve their knowledge, skills, and practice, leading to their empowerment, the improvement of their agency and the development of their organizations and their pupils” (Padwad & Dixit, 2014). CPD can be initiated by school administrators, education authorities, or individual teachers. It is widely believed that CPD is important for improving student performance and enhancing learning outcomes (Powell & Bodur, 2016). The professional development of teachers plays a crucial role in enhancing the quality of education. CPD programs enable teachers to improve their knowledge and skills, thereby positively impacting their teaching effectiveness (Njenga, 2023). Additionally, Borg (Borg, 2013) points out that when teachers perceive CPD as relevant to their own needs and those of their students, it can have a positive and sustained impact on teachers, learners, and organizations. One of the most significant changes in CPD in recent years has been the shift from face-to-face to online CPD. This shift has expanded opportunities for teachers to engage in professional development through easily accessible online resources. Nowadays, teachers are fortunate to have a wide range of online professional development opportunities available to them.

Previous studies have focused on the improvement of CPD for teachers’ development and framework design (T.-L. Chen & Chen, 2002; Davies, 2022; Ibrahim et al., 2020; Meyer et al., 2023; Razak et al., 2016; Van der Merwe et al., 2010a). However, the outbreak of the COVID-19 pandemic in 2019 had a significant impact on the global education system. To maintain the stability of the education system, countries around the world also attempted to transition from traditional modes to online modes (Perry, 2022). This online education model has also provided new ideas for the development of teacher CPD. Traditional modes of CPD services often impose limitations on teachers in terms of training time and financial requirements. With the continued development of the internet and online platforms, online CPD offers potential advantages such as ease of use, reduction in teacher travel and financial constraints, and wide availability of information resources, which can effectively compensate for the shortcomings of traditional CPD services (Cox et al., 2022; Friedman et al., 2002). The online CPD may become a more accessible and practical pathway for teacher CPD development (Lander et al., 2022). In light of this, it becomes imperative to undertake a thorough examination of pertinent studies pertaining to online CPD. Such an endeavor aims to elucidate the contemporary advancements in research concerning online CPD, the scholarly impact of investigators, and the extent of dissemination of research outcomes.

The primary aim of this study is to conduct a descriptive analysis of research findings in the field of Online CPD in education, with the goal of deepening researchers’ understanding of trends in this area; and the author seeks to inspire interest and enthusiasm among researchers in the education field, encouraging their participation in further research within the realm of online CPD, thus providing a solid foundation for future research endeavors. Furthermore, the results of this bibliometric study are expected to assist educational institutions and government agencies in formulating policies and teacher training programs, thereby contributing to the ongoing improvement and refinement of the entire field of professional development in education

Methodology

Analysis Methods

In this article, bibliometric analysis was applied by researchers. Because of the ease of access to internet databases encompassing practically all published literature; with its foundations in philology, informatics, mathematics, and statistics, the interdisciplinary field of bibliometrics can be utilized to do quantitative statistical analysis on the body of extant literature (Tchangalova, 2023). The background and patterns of the evolution of a discipline can be thoroughly referenced by academics through quantitative study of the literature utilizing scientific statistical methodologies (Zhang et al., 2023). Bibliometric analysis has been applied in many fields of research, such as economics, medicine, nursing, and library management (Cant et al., 2022; Horvatinović & Matošec, 2022; Shonhe, 2020). Online CPD is the topic of this paper's discussion of the research. In numerous fields, including medicine, nursing, education, and so on, the use of online CPD has been studied and explored (Glogowska et al., 2011; Nyiringango et al., 2023; Van der Merwe et al., 2010b). Based on the relevance of the issues discussed in this topic, this article narrows the scope of analysis to a specific topic (i.e., the field of education). Then it narrows the topic to a specific research object (i.e., teachers). This study primarily employs a bibliometric analysis method to examine the research conducted on a specific type of organization, namely online CPD for educators. This approach facilitates a comprehensive understanding of the research progress within this specific field and provides valuable insights into the trends, patterns, and advancements concerning online CPD for educators for researchers.

Data Sources and Extraction

In the article, data were taken from the Scopus database to analyze research for online CPD for educators. Because it was easier for the researcher to access, Scopus was preferred. All article types are covered by Scopus, which also indexes all authors, institutional addresses, and bibliographic references for each piece of writing. Through the network of libraries at Universiti Putra Malaysia, the database was publicly available. Researchers in this paper have limited their database searches to only one. According to Dwivedi et al. (Dwivedi et al., 2011), "restricting the search activities to a single publication database removed many of the potential problems of duplication inherent in the use of multiple data sources"(p.45). However, the researcher is aware of Scopus's shortcomings, including its incomplete indexes for the sciences.

The study's research methodology is shown in Table 1 below. As shown in Table 1, the researchers started the data retrieval work according to Step 1 shown in the table; the data were retrieved from Scopus. The earliest articles that can be searched by the Scopus system are from 1996, A broader search phase was utilized to examine the breadth of research relevant to Online CPD in all domains. The search criteria were set to find documents from 1996 through July 2023 that were authored in English. Due to the large range of article categories covered in Scopus, researchers made a choice, to focus on research articles and conference proceedings.

During the document retrieval process, according to the method shown in Step 1 in the table1 below. Since this article focuses on research that is online CPD for teachers in the education field. A broader search phase was utilized to examine the breadth of research relevant to Online CPD in all domains, and researchers retrieved a total of 461 items were retrieved from Scopus. Hence it is necessary to further screen the retrieved items. In the retrieval progress, it is necessary to open and study a document's abstract to ascertain whether it is pertinent to

the research topic. The authors extracted 461 papers between 1996 and 2023, and did an abstract and text analysis, only 30 documents which are journal articles and conference papers, were judged to be the most pertinent to this study following title and abstract screening. Then, these 30 documents were saved in the marked list for the next step of the study. R software version 4.3.1, notably the Biblioshiny utility, was used to analyze the data.

Table 1

Data Extraction

Data Retrieval From Scopus	
Step1: Data extraction	Formulate a search string using relevant keywords.
Step2: Inclusion and Exclusion Criteria	Boolean operators used: "AND", "OR" Wildcard used: "*";
	Publication year: 1996-2023 (Deadline July 7, 2023) ;
Step3: Topic & abstract Analysis	Document type: Articles, Conference Proceedings; Achieve the highest level of desired content relevancy;
	Select the most relevant documents and save them in the marked list;
Step4: Export data	Select all bibliographic details to be exported

The adoption of this technique distinguishes this study from other bibliometric studies that make use of large samples without assessing the content relevance using abstract screening. This is mostly due to how broad the subject under consideration is. It's not always the case that large data sets mean all of the sampled articles are relevant to the subject under study. As a result, abstract screening is necessary to ensure content relevancy. In this study, screening and extracting article abstracts was also very difficult and time-consuming, and this step was also a prerequisite for success in the entire study.

Table 2

Data analysis

Data Analysis	
Step1: Descriptive analysis	Run bibliophily package on R (R-4.3.1), upload data on Biblioshiny, retrieve descriptive statistics;
Step2: Descriptive visualization	Download images from Biblioshiny R

After obtaining the paper data from Scopus, we can go on to the next stage of research, data analysis (see Table 2). A review of the data as a whole, 30 publications on teachers' online CPD research in the field of education were published in the 27 years between 1996 and 2023. There aren't many studies on online CPD based on the number of papers that have been published, which implies that there hasn't been much of an emphasis on the research on teachers' online CPD. This may be because there are fewer opportunities in the sector or financing available for projects. An in-depth review of the 30 publications that had been gathered showed that three research papers were funded by the nations, specifically the Kingdom of Saudi Arabia, Hungary, and Indonesia.

Results and Discussion**Characteristics of the Data Sample**

The retrieved records' bibliometric analysis reveals that the data samples are mainly research-oriented journal papers and conference proceedings; the data sample includes journal articles

(n=21, 70%) and conference papers (n=9, 30%). Numerous researchers found that journal articles are the primary means of disseminating research findings in their domains (Shonhe, 2020). As indicated in Table 3, the 30 records in the sample were written by 83 writers and published in 29 different sources. Each document, on average, receives 5.367 citations. Although the search criteria specified a period from 1996 to 2023, it is obvious that the first publication about online CPD for educators was indexed on Scopus in 2002. In addition, the number of documents in the collection has been increasing at an average rate of 3.36% per year. This indicates that, since 2002, research on online CPD for educators in the field of education has attracted the attention of relevant researchers.

Table 3

Main characteristics of the collection

Description	Results
Main Information About Data	
Timespan	2002 - 2023
Sources (Journals, Books, etc)	29
Documents	30
Annual Growth Rate %	3.36
Document Average Age	4.97
Average citations per doc	5.367
References	1
Document Contents	
Keywords Plus (ID)	165
Author's Keywords (DE)	122
Authors	
Authors	83
Authors of single-authored docs	9
Authors Collaboration	
Single-authored docs	9
Co-Authors per Doc	2.77
International co-authorships %	16.67
Document Types	
Article	21
conference paper	9

Source: R-tool for Bibliometrix: Bibiloshiny 2023.

The sample consists of a total of 122 unique author keywords (see Table 3). Figure 1 below illustrates a map highlighting the most frequently used phrases by researchers conducting online CPD (Continuing Professional Development) research. This co-occurrence map further reinforces the authors' use of commonly occurring additional keywords to enhance the discoverability and applicability of their work in the field of online CPD. According to Chen (X. Chen et al., 2016), "the size of nodes can reflect the frequency of keywords: the higher frequency of keyword, the larger size of the node. The thickness of the line is proportional to the closeness of connections between two keywords, the thicker line between two words, the closer relationship is" (p.522). As can be seen from Figure 1, "e-learning" and "career development" are frequently mentioned in numerous articles. From the connection status of

the lines, clearly shows that the terms "e-learning" and "career development" are closely related. Further observation reveals that online CPD and PD are examined as two relatively distinct sections to study, with a weak correlation between both; and the research on online CPD is mainly regarded as a subcategory of the field of e-learning Investigate and discuss.

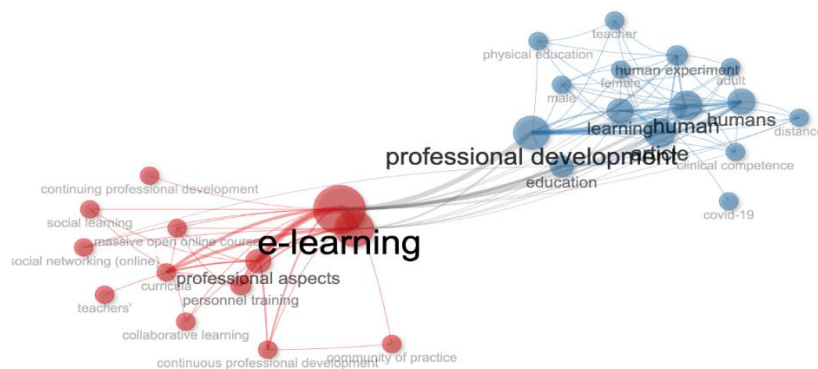


Figure 1. Co-occurrence of Keywords Plus

Source: R-tool for Bibliometrix: Bibiloshiny 2023.

This article also shows the factor analysis diagram, see Figure 2 for details; Figure 2 demonstrates how to create a conceptual structure of the field using the function conceptual structure to find groups of papers that use the same concepts. The outcomes are displayed as a two-dimensional map.

From the specific details outlined in Figure 2, we can identify keywords linked to online CPD, education, and the learning domain. This projection enables us to endeavor to elucidate the underlying significance of these clusters and dimensions. Our observations on Dimension 1 (Dim.1) show that certain keywords, such as "learning," "professional development," "article," and "human," express higher positive projections. This finding suggests a strong connection between these phrases and the ideas of learning, professional growth, and humanism. The keywords "COVID-19" and "pandemic," which have higher favorable projections, are what catch our attention in Dimension 2 (Dim.2). This implies that there is a reasonable relationship between these keywords and concepts like COVID-19 studies, disease control methods, and pandemic scenarios. The keywords have been systematically categorized into distinct clusters, potentially revealing underlying interrelationships or thematic associations. For example, Cluster 1 encompasses keywords related to learning, education, and professional development, while Cluster 2 involves keywords linked to subjects such as epidemics, disease control, and pandemics. This clustering approach offers insights into the interconnected themes present within the research landscape.

There may be a link between the growth of Online CPD research and the COVID-19 epidemic, according to indirect evidence. Keywords like "online CPD," "COVID-19," and "pandemic" have positive projections along Dimension 2 (Dim.2). This alignment suggests a connection between terms associated with online CPD and subjects like pandemics and disease control techniques. This inconspicuous relationship might point to the pandemic's impact on online CPD. It's important to point out that further information and in-depth study are needed to validate or further explore the results reached from this analysis, which are still just preliminary. Despite being indirect, this inference points towards a compelling direction for subsequent research that should be thoroughly investigated and supported.

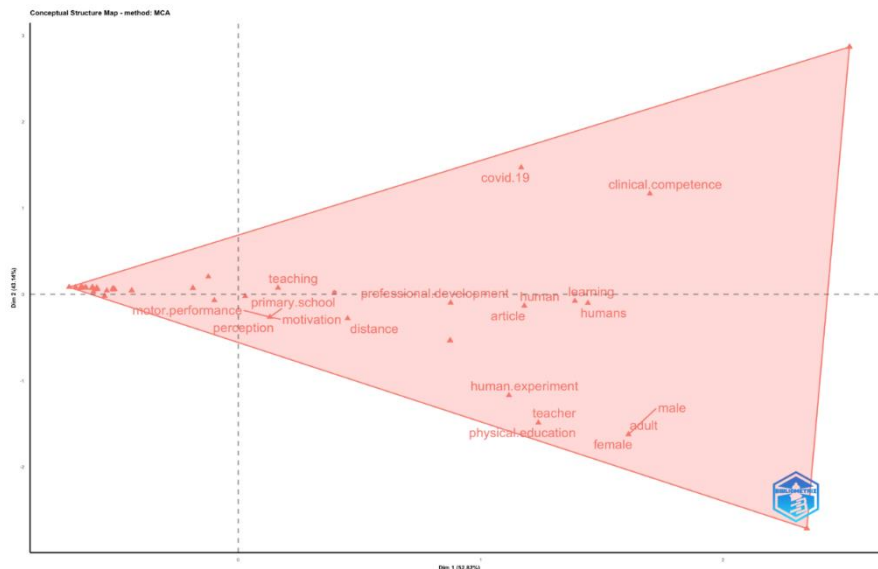


Figure 2. Factors analysis –method: MCA
 Source: R-tool for Bibliometrix: Bibiloshiny 2023.

Overview of Research Productivity

As mentioned earlier, over 27 years from 1996 to 2023, a total of 30 articles have been published on the topic of online CPD for educators. This relatively small number underscores the notable scarcity of research endeavors within the realm of education regarding the utilization of online CPD by teaching professionals. Based on the findings depicted in Figure 3, the period delineated for the scope of this study encompasses the years 1996 to 2023. The inception of the first scholarly article about online CPD for teachers dates back to 2002. Notably, no research output concerning teachers' engagement in online CPD was documented between 2003 and 2007. In the years spanning 2008 to 2010, an annual publication rate of one paper per year was sustained. However, a notable shift occurred in 2013, with the publication of two articles. A significant juncture transpired in 2019, as the number of research papers addressing teachers' online CPD surged within the timeframe spanning from 2019 to 2023, however, there is only one article published in 2021. It is plausible to hypothesize that this trend may have been influenced by the disruptive impact of the global COVID-19 pandemic on the educational system, but further inquiry is indispensable to substantiate this conjecture. Cumulatively, the annual growth rate is calculated at 3.36%, indicating a gradual but steady increase in research interest in the area of online CPD for educators.

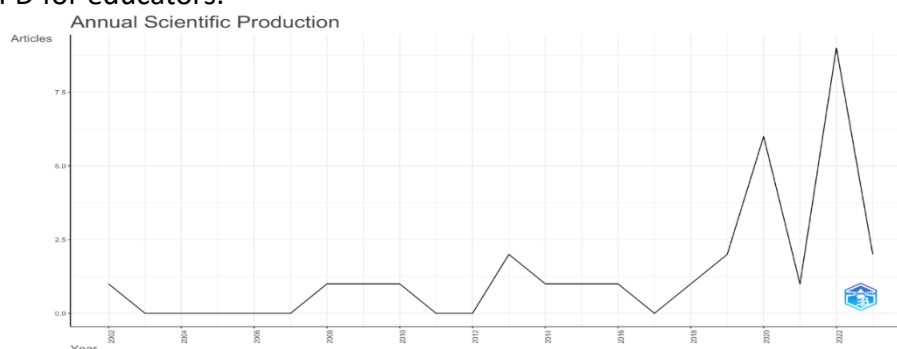


Figure 3. Year-wise distribution of publications
 Source: R-tool for Bibliometrix: Bibiloshiny 2023.

Table 4 provides an overview of the contributions made by different countries to the field of science. The data for this table were gathered using the R-tool for Bibliometrix, allowing for an insightful analysis of the publication trends. The frequency of scientific publications from various areas or nations is displayed in the table. As Table 4 shows The United Kingdom (UK) stands out with a substantial contribution, boasting the highest frequency of scientific publications, totaling 14; following closely, the United States of America (USA) has made a noteworthy impact with 12 publications. Australia's involvement in the scientific discourse is evident through its four publications. While Malaysia, Rwanda, Saudi Arabia, and the United Arab Emirates have each contributed three, two, and two publications. The dataset contains one article for each of Belgium, Canada, China, and Hungary. These figures show the frequency of scientific publications from each nation in the given dataset.

Table 4

Countries' scientific production.

Region	Frequency
UK	14
USA	12
Australia	4
Malaysia	3
Rwanda	2
Saudi Arabia	2
Belgium	1
Canada	1
China	1
Hungary	1

Source: R-tool for Bibliometrix: Bibiloshiny 2023.

Figure 4 illustrates that, the top ten affiliations that have contributed significantly to the publication of journal papers in the field of online CPD for educators. The findings show that Deakin University was the most productive organization in the area of online CPD for educators with four publications. In addition, the University of South Africa was also highly interested in this field with a cumulative publication count of three research papers. These are then followed by the Chinese University of Hong Kong and the University of Derby with two publications. A manual count conducted during abstract analysis revealed that developing countries have a higher interest in research focused on teachers' online CPD compared to developed countries. In addition, noteworthy is the presence of three African research institutions in the top ten list. This suggests that scholars in Africa are likewise interested in this area of study, which is essential for accomplishing sustainable development objectives that rely largely on information availability. Surprisingly, it is only one Chinese research institution made it to the list. This result can be attributed to the limited comprehensiveness of the Scopus index and the fact that the search criteria for this study were limited to English publications.

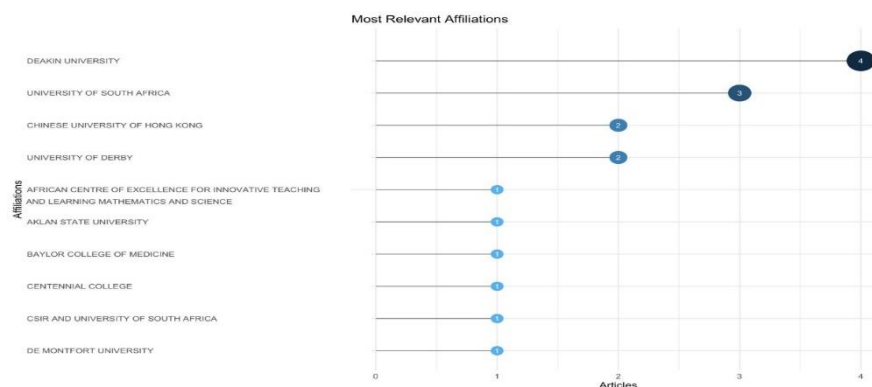


Figure 4. Most Relevant Affiliations.

Source: R-tool for Bibliometrix: Bibiloshiny 2023.

Below Table 5 provides a concise overview of the publication and citation patterns of the top 15 authors in the research field of online CPD for educators. Analyzing the data, certain trends and observations emerge.

Among the authors, CASEY A emerges as the most cited, with articles published in 2019 amassing a total of 48 citations (as detailed in Table 5). Following closely are ARAIN AA and BATHER JD, each with 11 citations, followed by AMSBURY K and BARNETT LM with 7 citations. This substantial citation count underscores the impact of their works within the academic community, indicating a significant level of recognition and reference by fellow researchers. Additionally, noteworthy is the fact that CASEY A maintains the highest average citations per year (TCpY) of 9.6; ARAIN AA and BATHER JD also maintain an impressive average citation per year (TCpY) of 3.667, indicating a consistent and enduring influence of their research over time. This suggests that their contributions have maintained relevance and continue to attract attention even beyond their initial publication; and authors such as AMSBURY K and BARNETT LM, who recently published in 2022, have already accumulated a noteworthy number of citations within a relatively short timeframe. This rapid citation uptake likely reflects the timeliness and pertinence of their research in the current educational landscape. Conversely, others like CHUKUMARAN SR, CHEN TJ, and CHEN TL have lower total citation counts, possibly because their papers were published earlier or because the research focus of the papers was weakly linked to the online CPD's research field.

Table 5

Authors' production over time.

Author	year	Total Citations (TC)	TCperYear (TCpY)
CASEY A	2019	48	9.6
ARAIN AA	2021	11	3.667
BATHER JD	2021	11	3.667
AMSBURY K	2022	7	3.5
BARNETT LM	2022	7	3.5
ABRAHAMS I	2020	6	1.5
BINMOHSEN SA	2020	6	1.5
BOLTON-KING RS	2022	5	2.5
BRYSON D	2020	4	1
CHUKUMARAN SR	2015	3	0.333
CHEN TJ	2002	3	0.136
CHEN TL	2002	3	0.136
BAILEY JM	2022	2	1
BERRY A	2022	2	1
CHEN W	2022	2	1

Source: R-tool for Bibliometrix: Bibiloshiny 2023.

Limitations and Implications for Research

This article has two distinct limitations. Firstly, the choice of the database used for data collection poses a constraint. As previously stated, only publications listed in Scopus served as the basis for this analysis. However, it is important to acknowledge the inherent limitations associated with Scopus. Notably, Scopus has its limitations, though. Its preference for research in the arts and social sciences is one drawback. This restriction may prevent a thorough retrieval of research findings on online CPD for instructors. Consequently, this may be the cause of the study's limited output of 30 outcomes. Future studies should take into account using additional citation databases like Web of Science and Google Scholar to assure thoroughness. Regarding research trends and results about instructors' online CPD, this would validate and update the study's conclusions. The research gaps are also a result of this restriction. Future scholars will therefore have the chance to compare Scopus and WoS, which will further highlight the strengths and flaws of the databases. However, this is not the main goal of the current investigation. Secondly, it's important to acknowledge that the criteria for article selection were primarily centered around English-language publications. This approach introduces a potential limitation. The study's sample is consequently confined to documents published in English, which presents another drawback. The emphasis on English-language materials might unintentionally disregard valuable insights and contributions available in languages other than English. As a result of this language-focused criterion, it's conceivable that publications are addressing related subjects that were inadvertently excluded from our study. This language-based restriction has the potential to result in the omission of pertinent studies, thereby restricting the overall comprehensiveness and inclusivity of the analysis.

For future research endeavors, researchers should broaden their data collection approach by including alternative databases like Web of Science and Google Scholar. This strategy will help mitigate the potential research gaps arising from the existing limitations associated with using only Scopus data. Additionally, addressing the language restrictions could involve adopting a more flexible language criterion, enabling the incorporation of studies published in languages beyond English. To foster a more comprehensive understanding of the subject, researchers could explore opportunities for cross-regional collaborations among scholars. Such collaborative efforts could contribute to a more diverse and inclusive analysis, considering research findings from various linguistic and cultural backgrounds. By adopting these measures, future studies can strive for a broader, more nuanced perspective on online CPD for educators, enhancing the validity and applicability of their research findings.

Conclusion

This study employs bibliometric analysis to provide a descriptive analysis of research outcomes in the field of online Continuing Professional Development (CPD) for teachers in the education sector. A descriptive review of papers published in the Scopus database from 1996 to 2023 was conducted. To achieve this objective, a sample dataset comprising 30 records was retrieved from the Scopus database, and the results were visualized using the R-tool. The survey results indicate limited funding support for research in the field of online CPD for teachers. This can potentially be attributed to the constrained funding support for research in the domain of teachers' online CPD. Upon a thorough examination of the collected 30 publications, it was discovered that three research papers had received funding from various countries, notably including the Kingdom of Saudi Arabia, Hungary, and Indonesia. Furthermore, a detailed analysis of the annual publication count shows sustained growth in the number of publications at an average rate of 3.36% per year. Notably, a significant surge

in research activity is observed after the year 2019. Factor analysis, as indicated by R-studio, suggests that this notable increase in 2019 might be linked to the impact of the COVID-19 pandemic. However, the exact nature and implications of this observed change require further investigation. There are two implications for online CPD from this article. Through bibliometric analysis, this study can improve comprehension of the dynamic landscape of research on online CPD for instructors, which is a theoretical research component. Regarding the application of the study, the findings can serve as a guide for organizations and governments as they establish strategies to support the long-term growth of online CPD. Finally, this research will probably be a useful source for future studies.

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