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A BIBLIOMETRIC APPROACH TO GLOBAL TEACHER'S TRAINING AND SUPPORT

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Abstract

Teachers are extremely important members of contemporary society because they shape the lives and careers of their students. Despite the importance of teachers in society, it is impossible for a teacher who is not adequately trained to deliver quality education because untrained teachers cannot give what they do not have. Regular teacher training will enhance the teacher's technical and technological knowledge, time management, teaching, and mentoring skills. This study employed bibliometric analysis with Biblioshiny App to describe how teachers' training and support research domain are structured and how the research domain evolved over the years. The results show that the annual article production on teacher training and support was progressing until 2017 when the publication dropped from 121 (2016) to 104. The peak publication was recorded in 2021 with 252 articles. There is still scanty academic literature on teacher training and support in Africa, and there is a gap for more intensive studies. Future researchers should focus on the trendy topics of teachers' training and support with relevant theoretical applications and trendy methodologies such as machine learning and experiments.

Keywords: Teacher, Training, Support, University, Bibliometric, Global.

1 INTRODUCTION

Teachers are extremely important members of contemporary society because they shape the lives and careers of their students. Despite the importance of teachers in society, it is impossible for a teacher who is not adequately trained to deliver quality education because untrained teachers cannot give what they do not have. Regular teacher training will enhance the teacher's technical and technological knowledge, time management, teaching, and mentoring skills. A trained teacher will add value to an institution and help students apply their academic knowledge appropriately. Sustainable teacher's training for students and societal development is a core element of UNESCO's Sustainable Development Goal (SDGs) Target 4.c on teachers that advocates for a "substantial increase of the supply of qualified teachers, through international cooperation for teacher training in developing countries, especially least developed countries and small island developing states by 2030."

Teachers must be informed to impact their chosen profession. Due to the change and different kinds of disruption in academia, such as pandemics and technology disruptions, teachers' training and retraining have become necessary. There is an urgent need for support from the university management and administrators to accomplish this goal. Teacher training combines procedures, policies, and support to provide teachers with the knowledge, attitudes, behaviours, approaches, and methodologies they need to effectively carry out their multitasking duties in the classroom and the school community.

Recent literature examined teachers' training on digital tools for formative assessment based on pedagogical experiments and discovered a gap in postgraduate teacher training in Ukraine [1]. Relatedly, [2] opines that Technical and Vocational Education and Training (TVET) is crucial in Thailand for human capital building, facilitating the implementation of methods, and processing new learning contents. [3] also contributed to teacher training and support discussion and emphasised special education training to cater for psychoeducational practices.

Similarly, [4] advocates for the professional training of future engineers-teachers for strategic human resources planning. Likewise, [5] focussed on teacher's training for online teaching and linked the teacher's training with quality teaching.

On the other hand, [6] mentioned that evaluation is the antecedent of future teacher training planning. These studies contributed empirically to the body of knowledge, but it is crucial to look at teachers' training and support bibliometrically. This study intends to analyse the global academic literature on teacher training and support to ascertain the quantity and quality of the international authors, countries, and institutions. This study provides a bibliometric review of teachers' training and support and answers the following research questions: (a) What are the significant stages in the knowledge base development

of teachers' training and support? (b) How did trendy words and topics evolve in the knowledge base developed? (c) Why are the authors' country, affiliation, and collaboration essential in the knowledge base developed? (d) What are the relative relationships between and within clusters of variables of the knowledge base developed?

A bibliometric review was conducted based on Clarivate Analytics' Web of Science (WoS) and Scopus databases using the science mapping tool bibliometrix [7] to respond to the stated questions concerning teacher's education's contribution to the teacher's training and support. The details of the methodology are followed in the next section. By providing answers to descriptive, bibliometric, and cogitative questions, this study intends to contribute to the existing literature on teacher education by focusing on the dynamism of teacher training and support. The methodology follows the introduction, and the results and conclusion follow turn after the methodology sequentially.

2 METHODOLOGY

This study followed the proposed bibliometric workflow by [8]. Two bibliometric databases were merged with the criterion of exclusion and inclusion with search strings "University Teacher Training (Topic) and Support (Topic) and 2012 or 2013 or 2014 or 2015 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 (Publication Years) and Articles (Document Types) and English (Languages)" for Web of Science and Scopus to explore the aim of this study. The search output for Web of Science and Scopus was 2,467 and 2,449. After inclusion and exclusion, Web of Science and Scopus was limited to 870 and 917. This study utilised RStudio to merge the data. The merged data totalled 1,787, and after the removal of the duplicate of 420, 1367 were used for the bibliometric data analysis.

Input

```
install.packages("bibliometrix")
library(bibliometrix)
biblioshiny()
setwd("c:/Users/Intel/Desktop/teacher")
getwd()
DigitScopus=convert2df("scopus.bib", dbsource="scopus", format="bibtex")
View(DigitScopus)
digitwos = convert2df ("wos.bib", dbsource = "isi", format = "bibtex")
View(digitwos)
CombinedData = mergeDbSources (DigitScopus, digitwos, remove.duplicated = TRUE)
View (CombinedData)
dim(CombinedDatabase)
library (openxlsx)
write.xlsx (CombinedData, file = "XlsCombinedData.xlsx")
```

Output

```
> setwd("c:/Users/Intel/Desktop/teacher")
> getwd()
[1] "c:/Users/Intel/Desktop/teacher"
> DigitScopus=convert2df("scopus.bib", dbsource="scopus", format="bibtex")
Converting your scopus collection into a bibliographic dataframe
Done!
Generating affiliation field tag AU_UN from C1: Done!
> View(DigitScopus)
> digitwos = convert2df ("wos.bib", dbsource = "isi", format = "bibtex")
Converting your isi collection into a bibliographic dataframe
```

```

Done!
Generating affiliation field tag AU_UN from C1: Done!
> View(digitwos)
> View (CombinedData)
> dim(CombinedDatabase)
> CombinedData = mergeDbSources (DigitScopus, digitwos, remove.duplicated = TRUE)
420 duplicated documents have been removed
> View (CombinedData)
> dim(CombinedDatabase)
> library (openxlsx)
> write.xlsx (CombinedData, file = "XlsCombinedData.xlsx")

```

Data	
CombinedData	1367 obs. of 29 variables
DigitScopus	917 obs. of 35 variables
digitwos	870 obs. of 53 variables

Figure 1. Merged data results.

3 RESULTS

Teachers are expected to be at the top of the game of teaching and mentoring. This development will assist them in giving their best to the academic community as they embark on the journey of moulding and shaping the future career of their students. It is pertinent for the teachers to be assisted in their professional development, and training is one way to stay updated. Continuous, high-quality training and reflective practice will make teachers relevant in their duties. Teachers must have access to training and retraining with financial and moral support from the higher education institutions' management to maintain their level of expertise. If the teachers are not motivated to improve, the most talented teachers will soon fail to impart knowledge ethically.

This study employed Bibliometrix App to visualise teachers' training and support literature from 2012 to 2022. The descriptive statistics chart in Figure 2a shows that 1367 articles were extracted from the Web of Science and Scopus with 785 sources, 4500 authors, and a 3.6 per cent annual growth rate. Also, 230 represent single authors, and international authorship accounts for 5.267 per cent, with 3.55 co-authorship per document. Overall, the author's keywords and references amount to 3981 and 53224, while the average number of citations per document was 7.439. Further, the literature gathered for nearly one decade shows consistent publication from 2012 to 2016, but the publication decreased in 2017 and 2018 and rose again in 2019. The highest publication was recorded in 2021, with 252 publications. 2022 recorded 94 publications at the time of this study. There is optimism of an increase before the end of the year. It indicates that scholars are interested in teacher training and support research (Figure 2b).

The author's keywords are essential in academic work. It facilitates seamless indexing and searches for relevant papers. It makes the author's paper visible for database search engines crawling and for the readers. Authors' keywords have direct and indirect effects on the academic community and society because it is the forerunner of publications' visibility. Out of 3981 authors' keywords, Biblioshiny generates the ten most relevant keywords according to their occurrences. Higher education has the highest occurrence of 103, followed by teacher training and education. The minor occurrence keyword is inclusive education. There are also teacher training, education, professional development, e-learning, teachers, and Covid-19 (Figure 3a).

Also, Trend Topics in Figure 3b covers 2013 to 2021. The trendy topic of mentorship has 11 frequency and span 2014 to 2016. Training is very crucial for mentorship. It will facilitate mentor communication and empower mentors to address diversity issues around teacher training. Professional development trends have 51 frequency and trends from 2015 to 2020, while training has 39 frequency and trends from 2013 to 2020. Teacher training with 88 frequency trends from 2015 to 2021, and this result shows the importance of teacher training. Higher education, the centre of teacher support, has the highest frequency of 103 and trends from 2017 to 2021. Pedagogy reflects 17 times and trends from 2015 to

2018. Covid-19 as a motivation for teacher's online training and disruption of teacher's training appears 33 times and trends from 2020 till 2021 while innovation with 13 frequency trends from 2020 to 2021. All the trendy topics showcased positively or negatively impact the teacher's training.

Figure 4a shows the relevant affiliations in teacher training and support for the research. University of Toronto, Canada, emerged as the most relevant affiliation with 27 articles and followed by Kazan Federal University, Russia, with 18 articles, University of California, USA has 17 articles. The lowest among the top ten affiliations are University Autònoma Barcelona, University Cordoba and the University of South Carolina, with nine articles each. This result shows the importance of the institutions where the authors conducted their studies. As the authors include their affiliation in their publications, there will be more publicity and visibility for the concerned institutions. The moral and financial support given to the authors by the institutions will be a motivation par excellence for authors to be more committed and perform in extreme research outputs.

On the other hand, in Figure 4b, there is evidence of the quality performance of the author's countries of research based on publication citations in teacher's training and support. The USA has the highest citations of 3170, with average article citations of 15.93. Spain also has 579 total citations with 5.959 average article citations. Among the top ten countries, Japan has the lowest citations of 190 with the highest average article citations of 31.667. The rate of citations shows the quality of the publications in these countries.

Collaboration is an essential aspect of publication, and we have intra-collaboration that brings authors within the same institutions together to work on a study of interest. Also, we have a national collaboration that attracts authors from different institutions in the same country for specific research of interest. Further, we have an international collaboration that takes place outside the comfort zone of the authors. It is a collaboration between different authors from different countries. Biblioshiny in Figure 5a generates a chart for Single Country Publication (SCP) and Multiple Country Publication (MCP).

This result shows that all the countries fall into the category of MCPs except Russia and France, which belong to the group of SCPs. The red and green colours show the intensity of the collaboration based on the chart legend. Based on the colour intensity, the USA has the highest SCPs and MCPs. Malaysia has the lowest MCPs, while Saudi Arabia, Ukraine, Brazil, Hong Kong, and Malaysia have the lowest SCPs. Figure 5b shows the factorial map that reveals the conceptual structure of teachers' training and support. Biblioshiny performs correspondence analysis and K-means clustering to showcase clusters of documents that have common concepts [7].

The factorial map generates new knowledge as the K-means clustering through unsupervised data classification into meaningful, valuable clusters. The keywords were divided into two meaningful clusters, and this study found that the more significant cluster with red colour and the small cluster with blue colour corresponds to the research on teacher training and support. Online learning, distance education, distance learning, and digital competence are in the blue cluster. The teacher's regular duties may not be disrupted while embarking on further training if they adopt online learning through distance education.

The cluster also emphasised the importance of digital competence in this 21st century. Teachers need training on digital competence and deepened knowledge of problem-solving, safety, digital content creation, communication, collaboration, information and data literacy. The red cluster spotlighted the concepts of teacher education, teacher preparation, faculty development, professional development, teacher training, support, collaboration, research, and teaching. Among the available Learning Management Systems (LMS), only Moodle was showcased in this clustering. Similarly, only professional identity has a red node. [9] defined professional identity as "the attitudes, values, knowledge, beliefs and skills shared with others within a professional group". Professionalism is essential in an academic community, and Matthews [10] opines that University programs immensely contribute to the formation of students' professional identity, and it is crucial to understand students' professional identity at the formative stage of their development.

Graph of bibliometric historiograph illustrating the historical development of the work that has received the most citations, with the parameter node value set to 30 from 2012 to 2021 (Figure 6). Bibliometrix, a mapping tool through Biblioshiny App, creates direct citations historically and the network of the most cited papers. It also visualises the author's citation network chronologically [11]. The result shows 11 distinct clusters of direct networking among the authors, and cluster 6 was the most promising. The cluster has the highest Global Citation Score (GCS) of 92 and Local Citation Score (LCS) of 2. So, S. is the most promising author of the article titled "Mobile instant messaging support for teaching and learning in higher education" in 2016. The Internet and Higher Education journal published the article, and the journal current impact factor is 8.591. Secondly, in cluster 7, Chow, J. published "Comparing trained and untrained teachers on their use of LMS tools using the Rasch analysis" in 2018, and it was published by Computers & Education with an impact factor is 11.182 at the time of this study. The author has 2 LCS and 10 GCS. GCS is valid for early

breakthrough studies discovery, while LCS reveals the citations that a published paper gets within a citation network [12]. According to [13] GCS, evidenced by influential papers in the body of knowledge.

Table 1. Inclusion and Exclusion Criteria.

	Web of Science	Scopus
Search Strings	University Teacher Training (Topic) and Support (Topic)	TITLE-ABS-KEY (university AND teacher AND training) AND TITLE-ABS-KEY (support))
Search Output	2,467	2,449
Exclusion Criteria	University Teacher Training (Topic) and Support (Topic) and 2012 or 2013 or 2014 or 2015 or 2022 or 2021 or 2020 or 2019 or 2018 or 2017 or 2016 (Publication Years) and Articles (Document Types) and English (Languages)	(TITLE-ABS-KEY (university AND teacher AND training) AND TITLE-ABS-KEY (support)) AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT-TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT-TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013) OR LIMIT-TO (PUBYEAR , 2012)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English"))
Exclusion Output	870	917
Total		1787
Duplicate		420
Final		1367



Figure 2a and b. Descriptive statistics and annual articles production.

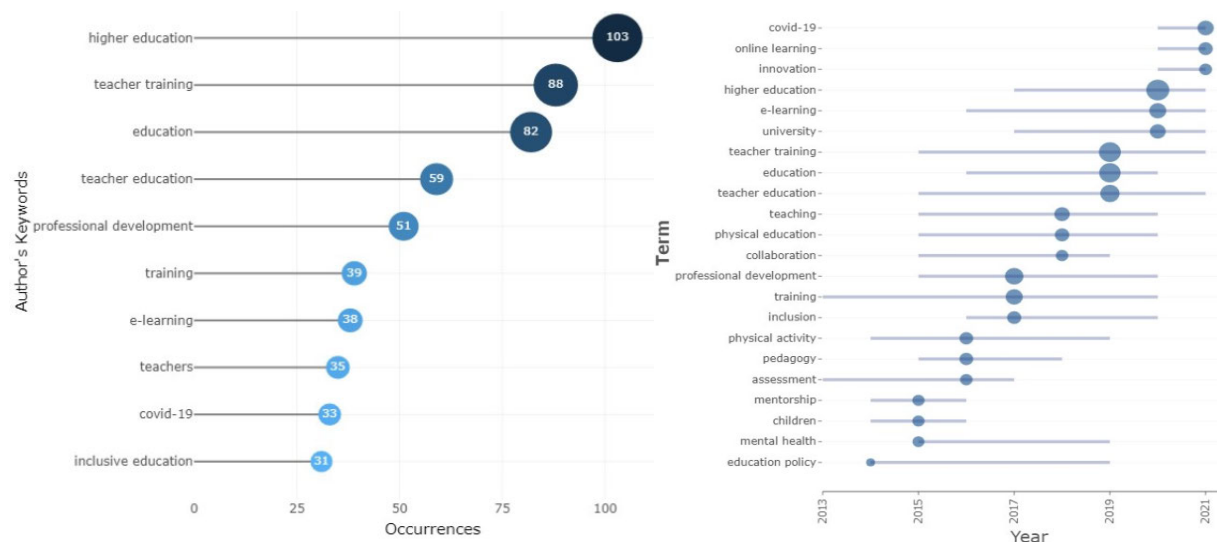


Figure 3a and b. Author's relevant keywords and author's trendy topics.

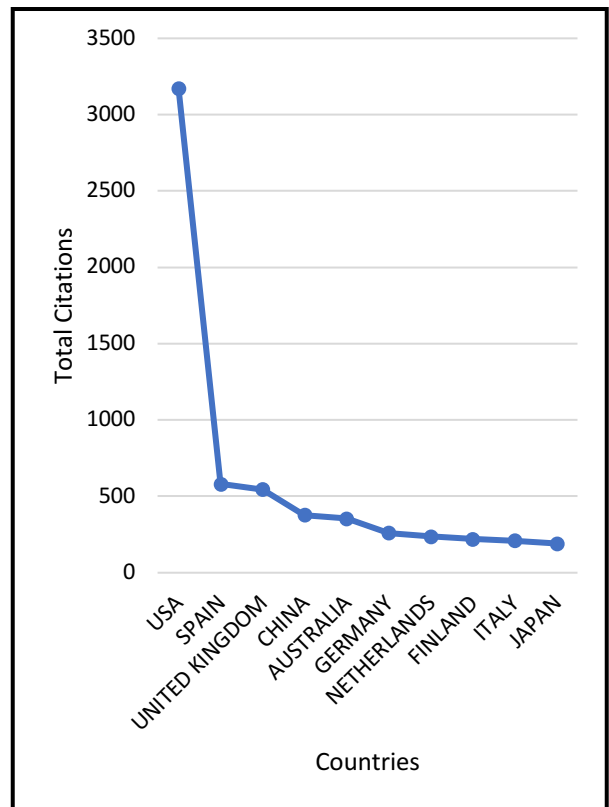
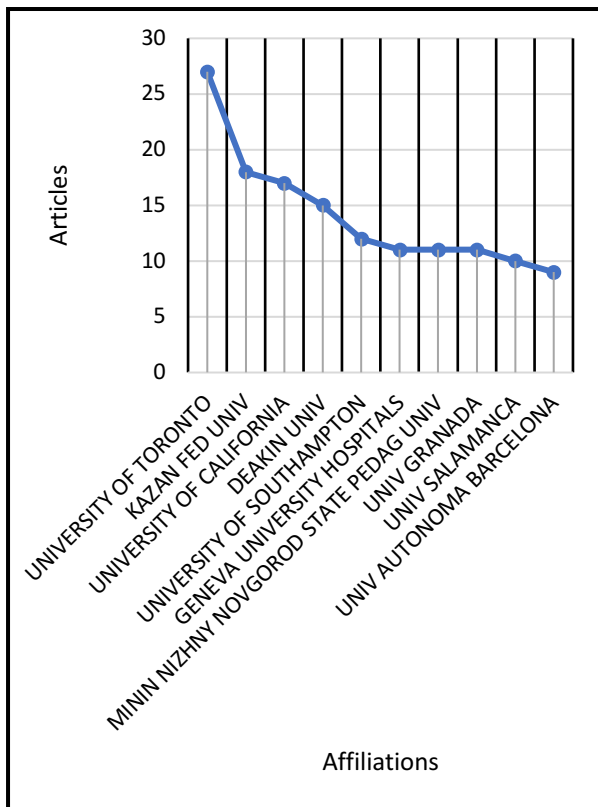


Figure 4a and b. Most relevant affiliations and most cited countries.

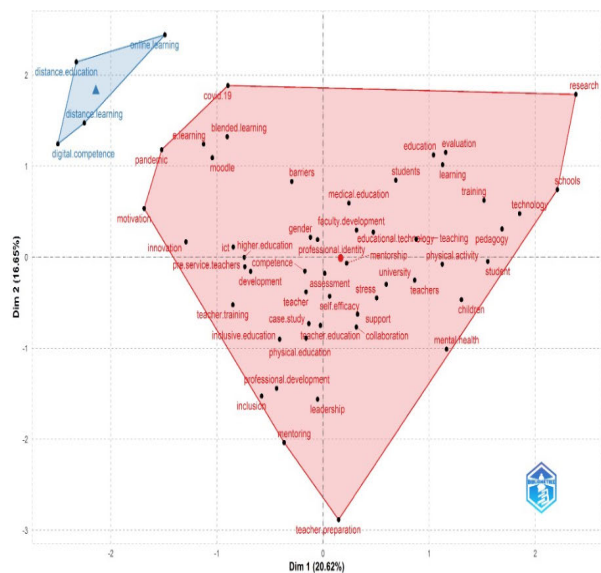
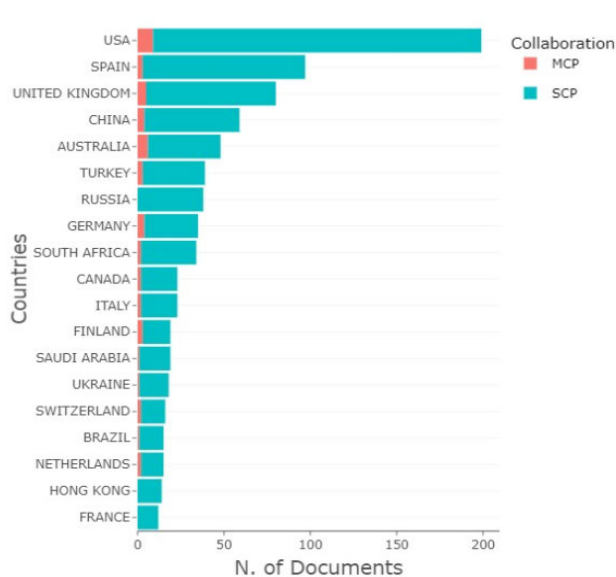


Figure 5a and b. Corresponding Author's countries and factorial map .



Figure 6. Bibliometric historiograph.

4 CONCLUSIONS

This study employed bibliometric analysis to describe how teachers' training and support research domains are structured and how the research domain evolved over the years. The results show that the annual article production on teacher training and support was progressing until 2017 when the publication dropped from 121 (2016) to 104. The peak publication was recorded in 2021 with 252 articles.

Most authors' relevant words typify higher education, teacher training, education, teacher education and professional development and the top five trendy topics are Covid-19, online learning, innovation, and online teaching. The University of Toronto in Canada is the most relevant affiliation. The United States of America had the highest country production, with 398 articles and 3170 total citations, with an average article citation of 15.93. The most relevant author is Nguyen T., with seven documents. Concerning corresponding authors' countries, the United States of America led with single country publications more than multiple country's publications. The result shows that authors within America collaborate more with themselves than with those outside America. The two clusters revealed in the study emphasised the importance of online distance education training and digital competence, while the second cluster focused on teacher training on emerging educational technology, innovation, pedagogy, collaboration, mentorship, leadership, professional development, and assessment. This study confirmed that teacher training is a global phenomenon, and academic production on this topic is not evenly distributed. The United States of America (398) led Northern America, Spain (226) led Europe, China (140) led Asia, Australia (127) led Oceania, South Africa (74) led Africa, and Brazil (30) led Southern America.

This study answered the four proposed research questions. Teachers' training and support research are progressive, but there is still room for improvement despite the advancement. Based on the production volume in this research domain, it could be concluded that teachers' training and support are trendy. The most critical stages in teacher training and support knowledge base development are 2020 and 2021. The shift from 2019 publications to 2020 is about a 43 per cent difference. Likewise, a 24 per cent difference accounts for the shift from 2020 to 2021. The year 2020 is a significant year for teacher training and support publication. This publication's progress can be linked to Covid-19 disruption.

This study shows interesting trending topics of discussion and the trendy words and topics evolved from 2013 to 2020 with diversity in trendy topics frequency and word dynamics yearly. The trendy topics that are related were clustered together. The closest cluster topics were five, and education is the focal topic in the cluster and central to teachers' education, pedagogy, teachers, and innovation. Affiliation and collaboration are essential in the knowledge base of teachers' training and support. Also, this study reveals both single and multiple country publications. Multiple country publications are more pronounced, indicating a fruitful affiliation and collaboration in teacher training and support research. Learning was conspicuous in the clustering generated by the factorial analysis, and it is the bridge between other variables that revolve around teachers' training and support.

There is still scanty academic literature on teacher training and support in Africa, and there is a gap for more intensive studies. Future researchers should focus on the trendy topics of 'teachers' training and support' with relevant theoretical applications and trendy methodologies such as machine learning and experiments.

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