Research Trends on Teaching Ability: A Bibliometric Perspective

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Abstract

Research Purpose: This study maps teaching ability knowledge to provide a visual perspective on the challenges of adapting to evolving teaching practices and address the gap in the bibliometric analysis. This quantitative study employed bibliometric analysis to review 697 publications from the Web of Science Core Collection for the years 2019-2024. Utilizing VOSviewer and SCImago Graphica software's, a knowledge graph was co-constructed to depict research dynamics on teaching ability to present the visualization map, including co-authorship, co-occurrence, and co-citation networks. The findings underscore China's significant contribution to the volume of publications in teaching ability, alongside the leadership of the USA in research institutions and collaborations. Future scholarly attention could prioritize teaching-effectiveness, teaching practice, professional development, organizational support, self-efficacy, and fostering national and institutional partnerships.

Keywords: Teaching ability, Bibliometric analysis, VOSviewer, SCImago Graphica, Research Trends

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Introduction

Teaching ability is a crucial area of educational research, impacting students' academic success, institutional reputation, and national competitiveness. Accordingly, studies increasingly emphasize the assessment and enhancement of teaching competencies (Kasli et al., 2022; Fu & Qi, 2022). Teaching ability encompasses not only comprehensive knowledge and skill transmission but also dynamic adaptability to diverse classroom challenges (Beijaard et al., 2004; Elena, 2018). Effective teaching requires more than subject-specific knowledge; it demands skillful management and application in complex educational settings (Jeschke et al., 2021).

Studies suggest that teaching effectiveness significantly influences student performance and educational success (Kasli et al., 2022), with empirical data from over 6,000 Chinese students affirming teaching ability as pivotal to positive learning environments (Zhu et al., 2022). Teaching quality assessments, including "Student Evaluation of Educational Quality" are widely used to measure effectiveness (Marsh, 1987). Teacher self-efficacy—affecting

motivation, resilience, and perseverance—is also essential for success in modern educational contexts (Snyder & Fisk, 2016).

To address evolving teaching demands, new competency frameworks have emerged, including questioning techniques, reinforcement, explanation, classroom management, and individual/group teaching skills (Irawati, 2020). The COVID-19 pandemic has also intensified research into digital teaching strategies, shifting focus from individual effectiveness to professional development programs (Pozo-Rico et al., 2020; Tamsah et al., 2021; Moorhouse, 2024). Thus, teaching ability is multifaceted dynamic, integrating skills development, efficacy assessments, and teacher development programs aimed at enhancing teaching quality (Steinert et al., 2016).

Although existing studies address the elements of effective teaching, they lack a cohesive knowledge framework for teaching ability. Regular knowledge mapping and bibliometric analysis are essential for understanding recent developments, emerging trends, and research gaps in this field (Mengrong, 2023). This paper presents a visual analysis and critical review of high-quality papers on teaching ability from the Web of Science Core Collection (WoSCC) for the period 2019 to 2024. The study identifies key authors, countries, and institutions contributing to this research, explores keyword hotspots, and suggests new research trends. Using VOSviewer and SCImago Graphica, this analysis offers scholars, especially newcomers, insights into the literature structure and trends in pedagogical competencies, guiding future research directions.

In this regard, the study is organized as follows: Section 2 outlines the research design, methodology, and approach; Section 3 presents the knowledge mapping and research findings; Section 4 discusses about the research findings; Section 5 summarizes the current state of teaching ability.

Methodology and Approach

Data Sources

The database of Web of Science Core Collection (WoSCC) contains over 22,000 peer-reviewed, high-quality journals (2024, clarivate.libguides.com), which is widely respected in academia for its authoritative and selective nature, making it a preferred database for tracking impactful research (Singh et al., 2021; Liu, 2021). Its comprehensive coverage and selectivity make it particularly suitable for bibliometric studies, a field that has grown steadily as researchers seek reliable data on scholarly trends (Fang et al., 2018; Liu et al., 2024). WoSCC was therefore selected for this study to ensure access to high-quality, relevant articles.

Data Collection

Data collection for this study commenced on June 30, 2024. According to WoSCC records, annual publications in the field exceeded 200 from 2019 to 2023, peaking at over 320 in 2022 and dropping to 277 in 2023, likely due to the impact of the COVID-19 impacts. This 2019–

2024 study period was chosen to capture post-pandemic trends in teaching ability. Identifying target papers was the first step, establishing a foundation for the subsequent analysis. The data collection strategy is summarized in Table 1.

Screening Criteria and Records

Establish keyword screen criteria to ensure the inclusion of relevant peer-reviewed publications in the target database. Additionally, to avoid missing literature, synonyms were considered during the data collection process, using Boolean operators TS="teaching ability" OR "teaching competence" OR "teaching skill" OR "teaching effectiveness". 3710 related references were retrieved. Access to high-quality data, research articles, and review articles listed on the Web of Science Index (SSCI/SCI-EXPANDED/A&HCI) are employed as data sources. After excluding early access (n=48), the retracted publication(n=26), the publication with an expression of concern(n=1), and proceedings papers (n=3). Finally, 697 high-quality documents were retrieved, which involved articles (n=659), and review articles (n=38). The detailed screen criteria description and results are summarized in table 1.

Table 1. Screening Criteria/Description and Records

Screening Criteria	Description and Records
Database	Web of Science Core Collection
Searching String	TS ="teaching ability" OR "teaching competence" OR "teaching skill" OR "teaching effectiveness"
Years	January 2019–June 2024 (n=1365)
Language	English (n=1244)
Document Type	Articles +Article reviews (n=1108)
Web of Science Index	SSCI /SCI-EXPANDED /A&HCI (n=697)
Inclusion Criteria	Articles (n=659), Article reviews (n=38)
Exclusion Criteria	Early access (n=48), Proceedings papers (n=3), Retracted publication (n=26), Publication with expression of Concern (n=1)
Sample Size	n= 697
Records Identified	n=3710

Knowledge Mapping

Bibliometric analysis quantitatively assesses the impact of published articles and their citations through statistical methods (Goyal et al., 2021). Knowledge mapping, frequently used in bibliometric studies, facilitates visual representation of academic relationships (Zhang et al., 2024). As such, this study employs a collaborative network diagram to illustrate the frequency and scope of academic collaborations among authors, countries, and institutions.

Two primary tools were used for analysis and visualization: VOSviewer and SCImago Graphica. Developed by Van Eck and Waltman (2010), VOSviewer is popular for its user-friendly interface and clear visualization of bibliometric networks and text mining data (Ren & Abdullah, 2024). In VOSviewer, each node (circle) represents a term, with node size indicating term activity—the larger the node, the more frequently the term appears. The proximity between nodes reflects the strength of their association, with high-frequency nodes clustered toward the center (Markscheffel & Schröter, 2021). SCImago Graphica complements this by supporting effective visual communication and exploratory data analysis (Yusef et al., 2022).

These tools offer more than data presentation; they enable researchers to explore network structures, enhancing the interpretation and dissemination of bibliometric data (Chhtrapati et al., 2023). Given these capabilities, VOSviewer and SCImago Graphica were selected to fulfill this study's analytical objectives (Wei et al., 2024)

Analysis and Findings

A total of 697 high-quality articles and reviews were identified based on the screening criteria. These data were imported into VOSviewer and SCImago Graphica for in-depth analysis.

Research Outputs

The 697 selected articles were analysed for publication and citation trends related to "teaching ability" from 2019 to 2024, as illustrated in figure 1. This period shows an upward trend in research activity, with a significant increase in 2022—a likely response to COVID-19-driven educational reforms that heightened interest in teaching and learning adaptation (Daniel, 2020). Although publication numbers dipped in 2023, citation rates remain high, underscoring the enduring relevance of recent studies. Future trends suggest continued expansion in teaching ability research, particularly in adapting education to post-pandemic needs.

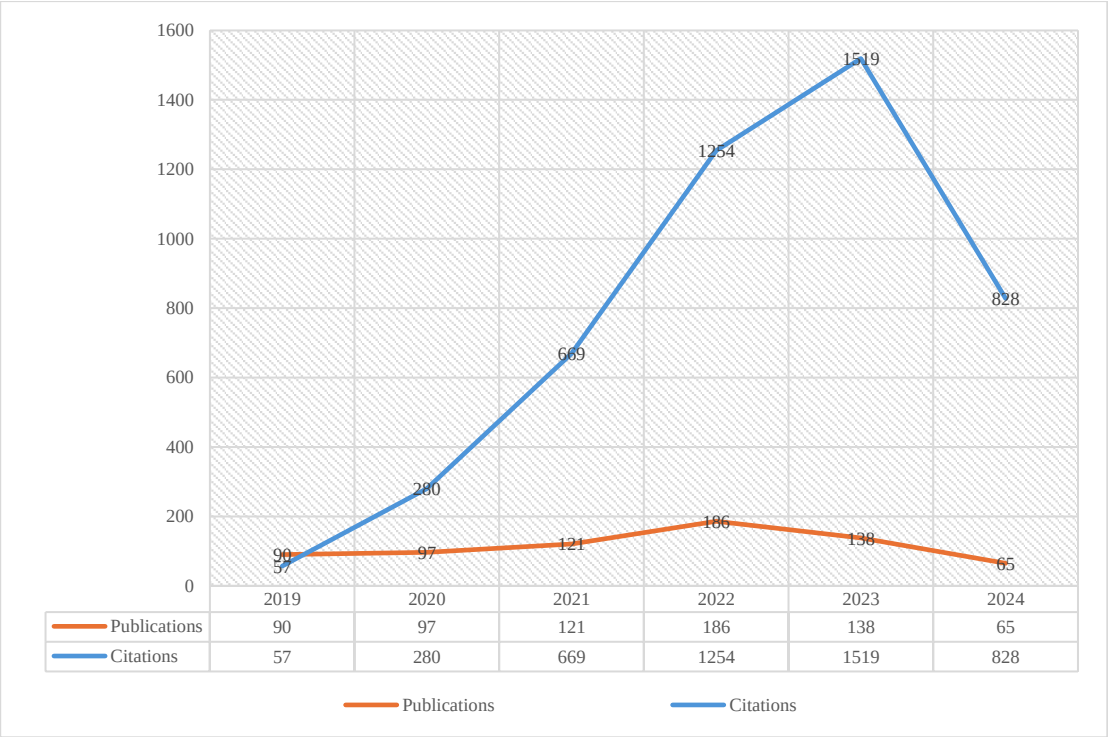
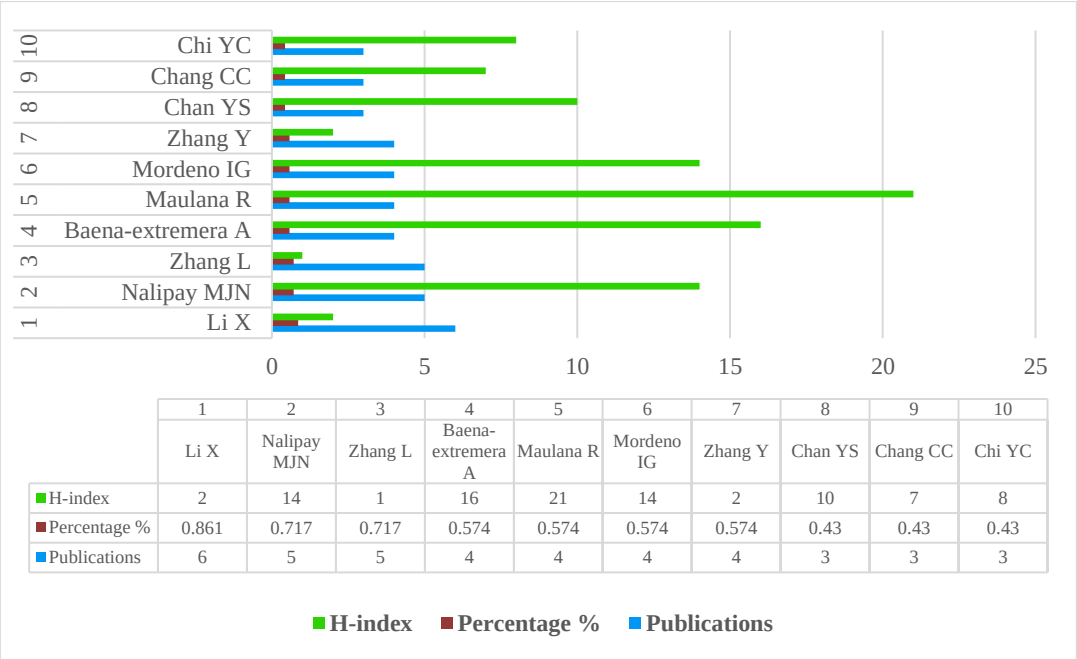


Figure 1. Publications and Citations Trends

Analysis of Collaboration Networks

Prominent Authors

The ten most productive authors in research on teaching ability are Li, X, Nalipay MJN, Zhang, L., Baena-Extremera A, Maulana R, Mordeno IG, Zhang Y, Chan Y.S., Chang, C.C., and Chi, Y.C. Maulana, R. emerges as the most indexed author, boasting 21 indexes and the highest impact in this domain. An analysis of Maulana R.'s publications reveals a strong focus on learning environments, effective teaching practices, and teacher development, demonstrating a substantial and sustained contribution to these fields. Baena-Extremera A. follows, with an index score of 16, while Nalipay M.J.N. and Mordeno I.G. each have an index score of 14, as shown in figure 2.



	1 Li X	2 Nalipay MJN	3 Zhang L	4 Baena-extremera A	5 Maulana R	6 Mordeno IG	7 Zhang Y	8 Chan YS	9 Chang CC	10 Chi YC
H-index	2	14	1	16	21	14	2	10	7	8
Percentage %	0.861	0.717	0.717	0.574	0.574	0.574	0.574	0.43	0.43	0.43
Publications	6	5	5	4	4	4	4	3	3	3

Figure 2. Top 10 Prolific Authors

Excellent Countries/Regions

Over 70 countries are represented in the collaboration network, with 11 countries publishing at least 13 articles each. Figure 3, generated by SCImago Graphica, visualizes the top 10 contributing countries by publication count, differentiated by colour. China leads with 297 articles on teaching ability, closely followed by the USA (183), Spain (34). This disparity underscores China's significant recent focus on theoretical research in teaching competence, reflecting its strong commitment to advancing the field.

Figure 3 presented by SCImago Graphica shows the significant contributions of countries and regions according to the number of research papers on teaching ability. This visual representation underscores the global emphasis on teaching excellence, highlighting the varying levels of commitment and focus on teaching competencies across different nations. The graph effectively communicates the significance of research in this field and its diverse geographic distribution, illustrating the importance of fostering teaching competencies worldwide.

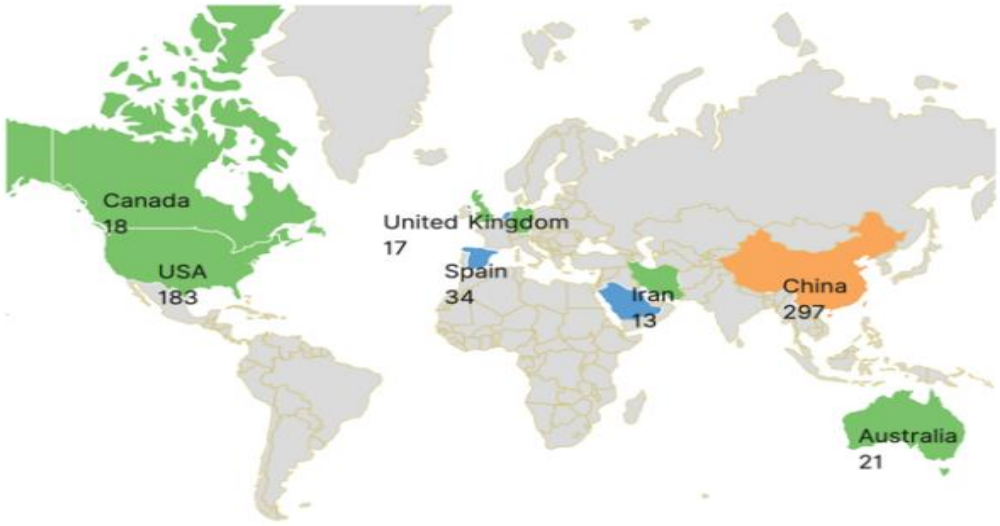


Figure 3. Contributions of Countries and Regions

Prominent Institutions

The institutional cooperation network includes 1,061 institutions, each contributing at least one article. As shown in table 2, the top 10 performing institutions, each with a minimum of seven publications, are predominantly located in the USA. Analysing the publication volume and proportion of collaborative institutions as presented by VOSviewer, the top ten institutions are as follows: University of California System（Publications=15), University System of Ohio (11), Beijing Normal University (10), Education University of Hong Kong Eduhk (10), Pennsylvania Commonwealth System of Higher Education Pcshe (Publications=9), Harvard University (Publications=8), Nanjing Normal University (7), State University System of Florida (7), University of Alabama System (7), University of Alabama System (7).

The USA leads with six institutions collectively contributing 57 articles (8.18% of the total), followed by China with three institutions producing 27 articles (3.87%). Norway's University of Oslo ranks 10th, with seven articles (1.00%). This concentration highlights the intensive research efforts in these countries to advance teaching ability.

Table 2 reveals that China and the USA lead research on teaching ability, with Norway also making notable contributions (7 publications). The USA dominates with 57 publications, more than twice the 27 from China, highlighting both countries' strong focus on enhancing teaching competencies. The top ten institutions, play a key role in driving research and could further promote cross-institutional cooperation. However, as shown in figure 4 (VOSviewer), illustrates the sparse inter-institutional connections. Filtering for institutions with at least four publications results in a network of just 44 institutions, grouped into five clusters, with a total link strength of only 17. This indicates that most research is concentrated within individual countries, emphasizing the need for stronger international and multi-level collaborations. Strengthening these partnerships could yield more comprehensive insights and foster global advancements in teaching ability.

Table 2. Top 10 Performing Institutions Publication Description

Rank	Affiliations	Publications	Percentage	Location
1	University of California System	15	2.152	USA
2	University System of Ohio	11	1.578	USA
3	Beijing Normal University	10	1.435	China
4	Education University of Hong Kong Eduhk	10	1.435	China
5	Pennsylvania Commonwealth System of Higher Education Pcshe	9	1.291	USA
6	Harvard University	8	1.148	USA
7	Nanjing Normal University	7	1.004	China
8	State University System of Florida	7	1.004	USA
9	University of Alabama System	7	1.004	USA
10	University of Oslo	7	1.004	Norway

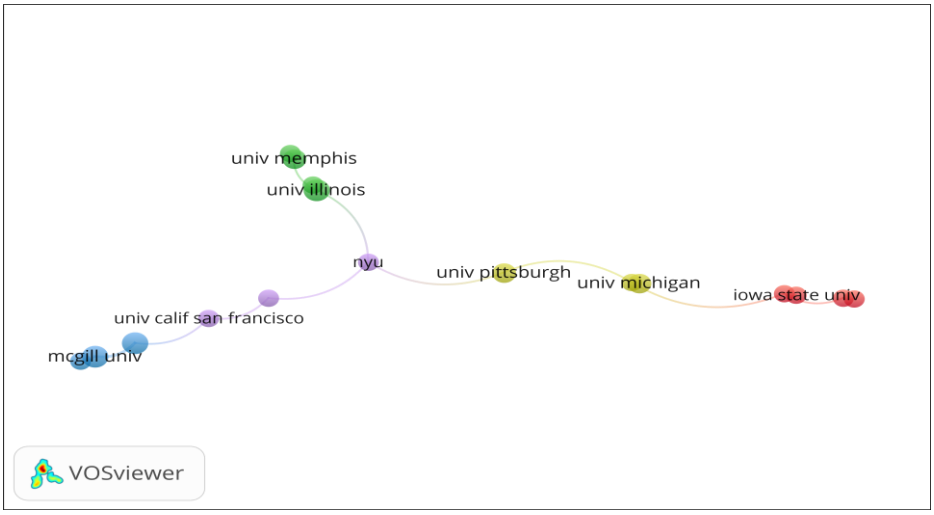


Figure 4. Institutions Collaboration

Outstanding Documents

In the co-citation network, 38 articles formed five distinct clusters, identified from a set of 29,734 articles with a minimum of 10 citations. Figure 5 visualizes this collaborative network, using five colours to represent each cluster, with larger nodes indicating items with higher prominence. The largest cluster (cluster 1) contains 13 items, with Uttl et al. (2017) as the most influential article. Closely followed by cluster 2 includes 9 items, Cluster 3 contains 6, and Clusters 4 and 5 each contain 5 items as detailed in table 3.

The co-citation network visualization (figure 5) utilizing layout parameters of attraction (2) and repulsion (-2), highlighting Steinert et al. (2016) in cluster 4 (total link strength (TLS)=61, citations=38) as a significant work, closely followed by Hu& Bentler (1999) in cluster 2 (TLS=59, citations=30), and Uttl et al. (2017) in cluster 3 (TLS=79, citations=23) . Upon further review of their areas of research and the most cited articles and abstracts, Steinert et al. (2016) centers research on teaching effectiveness and professional development, exploring strategies to enhance teaching effectiveness and extended into teacher development. Hu & Bentler (1999) emphasized the impact of self-efficacy on both teachers' and students' motivation, highlighting its importance for effective teaching. Additionally, Uttl & Gonzalez (2017) argued that students' teaching evaluation ratings are not a criterion for improving teaching effectiveness.

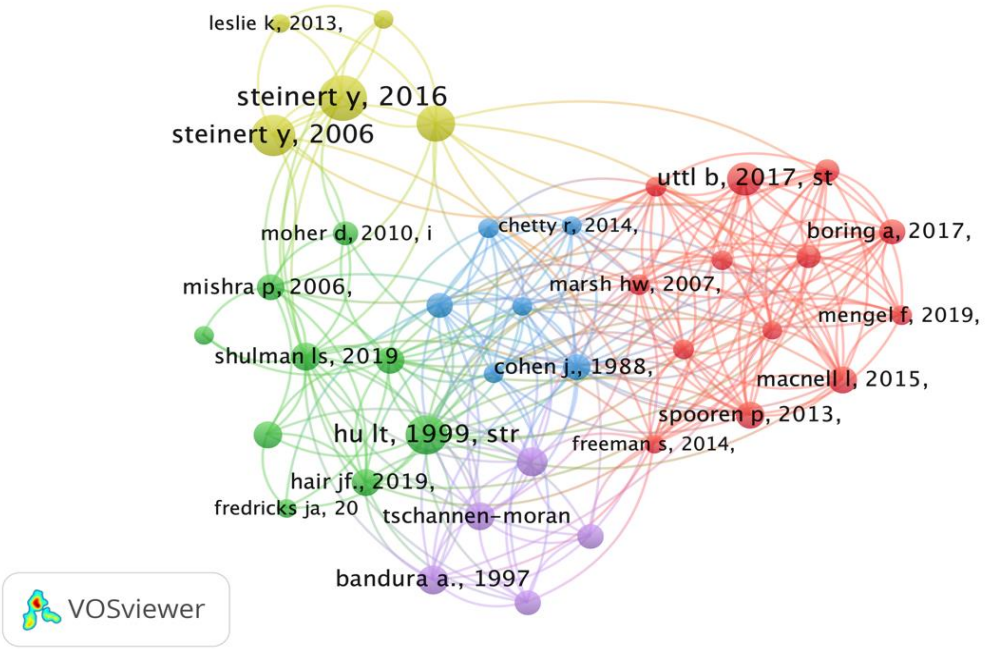


Figure 5. Co-Citation Network Visualization

Table 3. Typical Cited Document for Each Cluster

Rank	Cluster	Items	Top-performing Cited Documents Information
1	4	4	Steinert, Y., Mann, K., Anderson, B., Barnett, B. M., Centeno, A., Naismith, L., … Dolmans, D. (2016). A systematic review of faculty development initiatives designed to enhance teaching effectiveness: A 10-year update: BEME Guide No. 40. Medical Teacher, 38(8), 769–786. https://doi.org/10.1080/0142159X.2016.1181851. DOI
2	2	9	Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural equation

			modelling: a multidisciplinary journal, 6(1), 1-55. https://doi.org/10.1080/10705519909540118. DOI
3	1	13	Uttl, B., White, C. A., & Gonzalez, D. W. (2017). Meta-analysis of faculty's teaching effectiveness: Student evaluation of teaching ratings and student learning are not related. Studies in Educational Evaluation, 54, 22-42.https://doi.org/10.1016/j.stueduc.2016.08.007. DOI
4	5	5	Klassen, R. M., & Tze, V. M. (2014). Teachers' self-efficacy, personality, and teaching effectiveness: A meta-analysis. Educational research review, 12, 59-76. https://doi.org/10.1016/j.edurev.2014.06.001. DOI
5	3	6	Cohen, J. (1992). Statistical power analysis. Current directions in psychological science, 1(3), 98-101. https://doi.org/10.1111/1467-8721.ep10768783. DOI

Keyword Analysis

Keyword analysis reveals research hotspots in a field, helping scholars understand its evolution and guide future studies (Meng et al., 2020). In the co-occurrence analysis using VOSviewer, both "author keywords" and "keywords plus" were analysed. Figure 6 shows the resulting network, where 44 out of 2,954 keywords met the threshold of 15 occurrences. After merging synonyms, 36 keywords formed five clusters, each represented by a different color. Most keywords relate to teaching ability, highlighting the field's central focus.

Cluster 1 (Red)- This cluster, consisting of 10 items, focuses on teaching competence. Key terms include "perceptions" (total link strength (TLS)=123, occurrence=48), "impact" (TLS=105, occurrence=44), "self-efficacy" (TLS=113, occurrence=43), "technology" (TLS=76, occurrence=30), and "beliefs" (TLS=85, occurrence= 29). These terms emphasise the factors that influence self-efficacy include attitude, beliefs, perceptions and professional development.

Cluster 2 (Green)- Comprised of 10 items, this cluster highlights terms such as "education" (TLS=199, occurrence=118), "student" (TLS=132, occurrence=64), and "knowledge" (TLS=64, occurrence=34). Cluster 2 emphasis on student-centered learning in educational settings highlights the importance of developing specific competencies.

Cluster 3 (Blue)- This cluster includes 9 items and focuses on the relationship between institutions, conflict, and development as described by Ibn Khaldun. Significant keywords are "teaching effectiveness" (TLS=224, occurrence=134), "teachers" (TLS=113, occurrence=51), and "achievement" (TLS=100, occurrence=35). These terms highlights the effectiveness of teaching practices and the teacher's role in educational success.

Cluster 4 (Yellow)- Encompassing 4 items, this cluster centers on the impact of teaching ability on student learning. Key terms include "motivation" (TLS=72, occurrence=26), "school" (TLS=63, occurrence=23), "model" (TLS=27, occurrence =22), and "satisfaction" (TLS=40, occurrence=21). Cluster 4 focuses on student motivation and satisfaction across various educational models.

Cluster 5 (Purple)- Including 3 items, this cluster centers on the impact of teaching ability on student learning. Key terms include "performance" (TLS=90, occurrence=49), "experience" (TLS=44, occurrence=17), "feedback" (TLS=43, occurrence=17). This cluster examines how experiential learning and feedback enhance individual performance and explores factors for performance assessment.

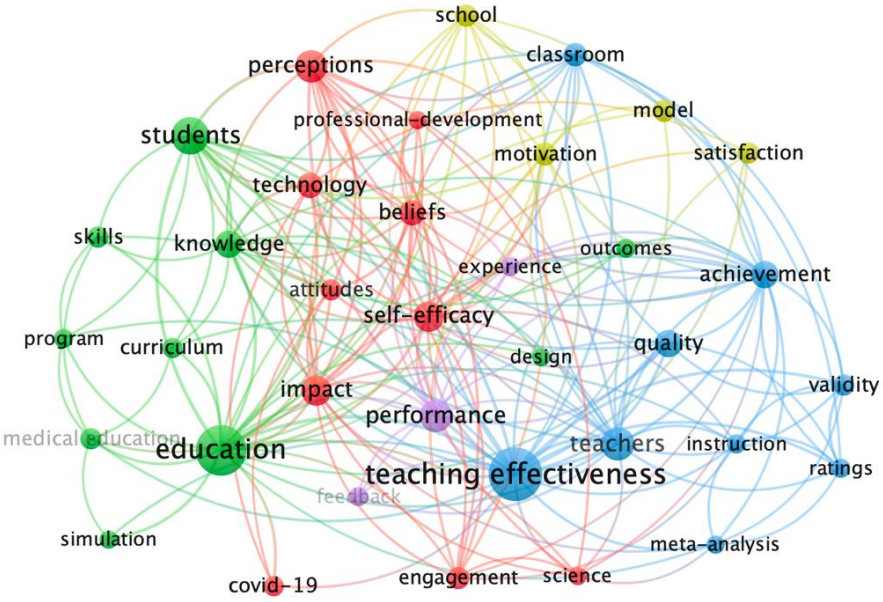


Figure 6. Keywords Network Visualization

Emerging Trends and Future Research Directions

In the teaching ability review study, researchers utilized a co-occurring overlay network to identify four emergent popular terms that have been gained. In VOSviewer diagrams, the analysis targets are depicted as nodes. The size of a node indicates its significance, with larger nodes representing more critical elements. Nodes that frequently occur are positioned centrally within the diagram, highlighting their importance in the network (Markscheffel & Schröter, 2021). This visual representation allows for an intuitive understanding of the relative importance and frequency of various terms within the analysed dataset (figure 7). They are Covid-19 (clusters=1, Avg. pub. year: 2022.58), science (clusters=1, Avg. pub. year: 2022.81), outcomes (clusters=2, Avg. pub. year: 2022.00), experience (clusters=5, Avg. pub. year: 2022.00), self-efficacy (cluster=1, Avg. pub. year: 2021.94), knowledge (cluster=2, Avg. pub. year: 2021.94)

These items highlight emerging trends and future directions in teaching competencies. Figure 7 underscores the significance of "Covid-19", "science", and "outcome", suggesting that teaching ability are crucial in addressing the evolving educational demands in the post-pandemic era. Prominent keywords like "experience", "knowledge", and "self-efficacy" reflect a dual focus on enhancing teaching practices and learning experiences. Visual analysis underscores their critical importance in both traditional and epidemic-affected education

systems, highlighting current priorities and future research directions, and emphasizing the need for continuous improvement in teaching competencies.

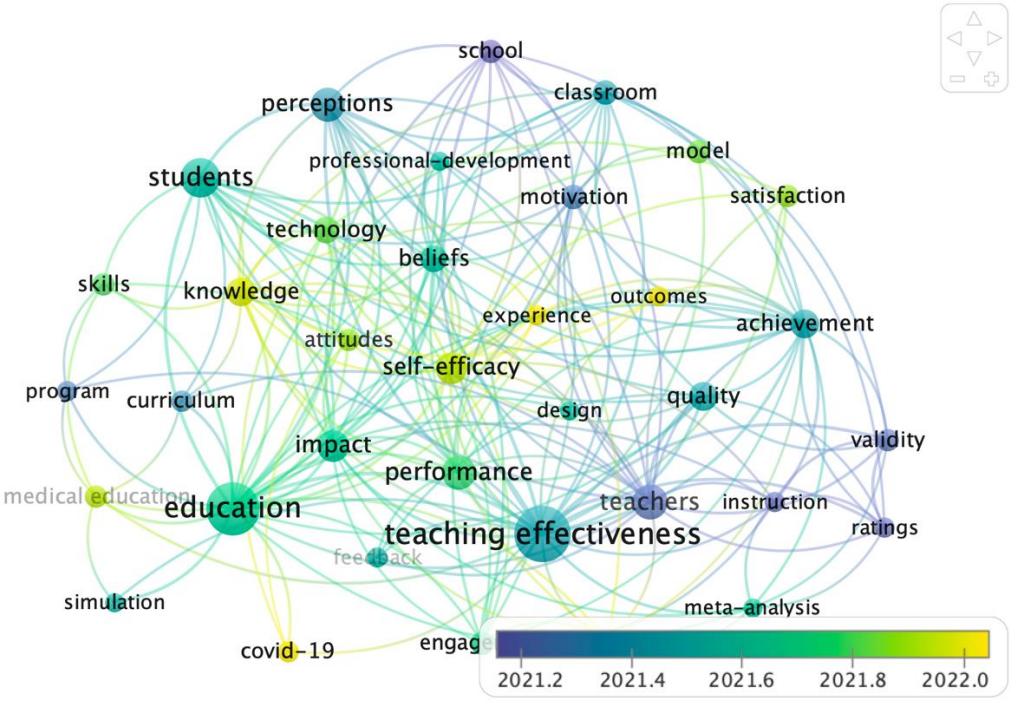


Figure 7. Keywords Overlay Visualization

Discussion

While the previous literature has primarily focused on the effectiveness of teaching ability—thereby establishing the theoretical foundation for our study—our central aim is to introduce a fresh perspective on the teaching ability framework. The study reveals that the rapid surge in publications influenced by COVID-19 reflects a clear, expanding scholarly interest in this area. The substantial increase in citations further highlights the growing focus on adapting teaching and learning strategies to the evolving educational landscape. Notably, the knowledge collaboration network reveals that China and the USA are at the forefront in both publication volume and institutional impact. However, the limited extent of international collaboration signals a critical gap, emphasizing the need for enhanced global academic exchanges to push the field forward.

Literature co-citation analysis highlights the importance of research on teacher efficacy, which focuses on enhancing student outcomes, teaching effectiveness, teacher development, and statistical methods—marking a milestone in the field of teaching ability. Notably, the distribution of keywords across five clusters reveals key themes: effective teaching processes, student-centered practices, professional development, motivation and satisfaction assessment, and experiential learning with feedback. This enriched the understanding of the literature co-citation analysis. Furthermore, the overlay visualization highlights emerging trends in science-related fields, particularly those shaped by the impacts of COVID-19. This observation is consistent with the findings of previous literatures, offering a foundation for future research, reflecting a significant shift toward integrating science and technology into traditional teaching

frameworks. Such integration aims to enhance teaching effectiveness in the post-pandemic era (Albiladi, 2020; Deng & He, 2023).

Perhaps most compellingly, one promising avenue for future research stands out: professional development and organizational support. Given the close relationship between teaching competencies and organizational interventions, this area holds significant untapped research potential. Addressing this gap could enhance the understanding of teaching effectiveness and offer practical solutions for institutional and systemic improvements in education.

Conclusion

This study employed bibliometric analysis, leveraging the WoSCC database alongside VOSviewer and SCImago Graphica, to create a comprehensive knowledge map of teaching ability. It addresses a significant bibliographic gap in analyses of teaching ability by examining publication and citation trends, key contributors, influential articles, research hotspots, and emerging trends from 2019 to 2024, offering a forward-looking perspective on how teaching ability are evolving in response to changing educational practices.

Additionally, co-citation analysis reveals that the most influential studies, acting as bridges in the literature, focus on teaching effectiveness, professional development and the application of statistical methods.

Keyword co-occurrence analysis reveals robust research on factors influencing teaching ability and practices. Additionally, studies exploring teacher professional development and organisational support are potential future research trends.

The insights gained offer valuable guidance to scholars, particularly those new to the field, equipping them with the tools to design impactful, innovative research. Ultimately, this research advances our understanding of teaching ability, offers new directions for shaping practices in line with ongoing educational transformations.

Limitation

This study conducted a bibliometric analysis selecting high-quality literature from the WoSCC database. Future research could expand the analysis by incorporating additional databases and examining teaching competencies over a longer time frame. Investigating collaborative frameworks across geographic boundaries could further enrich this field. Additionally, exploring mixed research methods could uncover more possibilities for effective strategies to improve teaching ability.

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