International Journal of Modern Education
EISSN: 2637-0905
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

INTERNATIONAL JOURNAL OF MODERN EDUCATION (IJMOE)
www.ijmoe.com

PROFESSIONAL DEVELOPMENT IN EDUCATION: A BIBLIOMETRIC ANALYSIS (2020-2025)

Jumriah Abdul Azis[1], Dg Norizah Ag Kiflee@Dzulkifli [2*], Abdul Said Ambatong[3]

[1] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia
Email: jumriahabdulazis@gmail.com
[2] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia
Email: dndz@ums.edu.my
[3] Faculty of Education and Sports Studies, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia
Email: said@ums.edu.my
[*] Corresponding Author

Article Info:

Article history:
Received date: 30.09.2025
Revised date: 20.10.2025
Accepted date: 28.11.2025
Published date: 15.12.2025

To cite this document:

Azis, J. A., Dzulkifli, D. N. A. K., & Ambatong, A. S. (2025). Professional Development in Education: A Bibliometric Analysis (2020-2025). *International Journal of Modern Education, 7* (28), 706-719.

DOI: 10.35631/IJMOE.728049

Abstract:

This bibliometric analysis examines global research patterns in educational professional development between 2020 and 2025, exploring publication trends, collaborative networks, and emerging themes. The study analyzed 27,808 Scopus-indexed articles using VOSviewer to visualize scholarly relationships and research directions. Key findings indicate substantial growth in PD publications, rising from 3,388 articles in 2020 to 6,748 in 2025, reflecting increasing worldwide acknowledgment of PD's critical role in enhancing teacher capabilities and driving educational reform. Most research outputs (81.2%) were published in peer-reviewed journals, underscoring their central position in scholarly communication. Analysis of keyword patterns revealed four major thematic areas: instructional practices, psychology in education, research approaches, and professional identity formation. Common keywords such as "professional development," "teaching," and "qualitative research" demonstrate the field's cross-disciplinary character. Examination of co-authorship patterns showed concentrated collaboration among specific scholars, notably Czapla Michał and Karniej Piotr. At the international level, China, the United States, and the United Kingdom led contributions, with robust collaborative networks extending across European and Asia-Pacific regions. The research concludes that PD scholarship continues its expansion, fueled by digital transformation, post-pandemic educational changes, and evolving policies. Nevertheless, significant gaps persist in developing nations where PD resources remain limited, highlighting the necessity for inclusive, culturally appropriate, and digitally supported approaches to guarantee equitable professional growth opportunities globally.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

Keywords:

Professional Development, Bibliometric Analysis, Teacher Education, Educational Research Trends, International Collaboration Networks

Introduction

Professional development (PD) in education has long been acknowledged as a vital foundation for elevating teacher quality, adapting to shifts in the education system, and ultimately enhancing student achievement standards. Over the past five years, PD has surged abruptly due to teachers' needs to address evolving teaching methods, technological progress, and global disruptions like the COVID-19 pandemic. Recent studies emphasize that PD is crucial not only for refining instruction but also for strengthening teacher commitment, shaping professional identity, and enabling teacher adaptability to changes (Dacholfany et al., 2024; Kruty et al., 2024; Lynch et al., 2025).

Recent shifts in PD practice reflect a growing emphasis on continuous, context-sensitive, and collaborative learning models. The integration of technology ranging from online platforms to immersive tools like virtual and augmented reality has redefined the parameters of effective PD, enabling more personalized and flexible learning experiences for educators. The pandemic accelerated the adoption of blended and remote PD formats, revealing both opportunities for innovation and challenges related to digital equity and sustained engagement (Fortanet-Gómez & Ruiz-Madrid, 2023; Philipsen et al., 2023; Sadeghi & Navaie, 2021).

The rationale for focusing on the latest research is clear: educational systems worldwide are grappling with unprecedented change, and the effectiveness of PD is increasingly linked to its ability to adapt to local contexts, leverage technology, and align with policy frameworks. This report synthesizes scholarly insights from the last five years, examining the effectiveness of PD programs, innovative models, persistent challenges, and the influence of technology and policy on PD design and outcomes (Alkaabi, 2023; Audisio et al., 2025; Olaniyan & Uzorka, 2024).

By bridging theoretical foundations with practical insights, this synthesis aims to provide a comprehensive understanding of the current state of PD in education. It draws on meta-analyses, large-scale studies, and qualitative research to illuminate the complex interplay between teacher learning, instructional quality, and student achievement. The report also identifies critical gaps in the literature, particularly regarding the sustainability of PD initiatives and the needs of educators in under-resourced settings.

In sum, professional development in education is at a pivotal juncture. The convergence of technological innovation, policy reform, and evolving teacher needs demands a reimagining of PD models that are both evidence-based and contextually responsive. This review sets the stage for a deeper exploration of recent advances, challenges, and future directions in the field.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

Literature Review

Effectiveness Of Professional Development Programs

Recent scholarship provides nuanced evidence on the impact of PD programs on teaching practices and student outcomes. Structured, job-embedded models such as Teacher Study Groups (TSGs) and inquiry-based PD have demonstrated improvements in instructional strategies, teacher efficacy, and, in some cases, student achievement (Audisio et al., 2025; Dacholfany et al., 2024; Lynch et al., 2025; Zeng, 2023). However, the magnitude of these effects varies across contexts and subject areas, with some large-scale programs yielding only modest gains. Meta-analyses highlight the complexity of directly linking PD to student learning, emphasizing the need for multi-level assessment frameworks that capture both immediate and long-term outcomes (S. Liu & Phelps, 2020; Lynch et al., 2025). Notably, teacher knowledge gains from PD can diminish rapidly post-training, underscoring the importance of sustained and iterative professional learning.

Innovative Models and Approaches

Emerging trends in PD reflect a shift toward technology-enhanced, collaborative, and context-sensitive models. Blended and online formats, virtual communities of practice, and the integration of digital tools such as AI, VR, and AR are increasingly prevalent (Gutiérrez & López-García, 2023; Kruty et al., 2024; Philipsen et al., 2023; Yurtseven Avci et al., 2020). These approaches offer personalized learning experiences, continuous feedback, and opportunities for experiential learning, supporting teacher engagement and instructional innovation. School-based PD models, supported by leadership and teacher involvement in planning, have shown promise for sustainable growth, particularly in remote or resource-limited contexts. The literature also highlights the importance of robust, data-driven design and ongoing support to ensure the effective implementation and refinement of instructional practices 8.

Challenges and Gaps in Professional Development

Despite progress, several challenges persist in the field of PD. Teacher workload, motivation, and contextual constraints especially in under-resourced settings continue to limit the effectiveness and sustainability of PD initiatives (Camili Trujillo et al., 2024; Ehlert et al., 2025; Goller et al., 2022; Taddese & Rao, 2022). Research points to the need for more contextually sensitive models that incorporate teacher voices and local needs, as well as more theory-driven studies to unpack the causal mechanisms behind PD impacts. Traditional PD often focuses on short-term gains without sufficient follow-up, which may explain the rapid decline in teacher knowledge retention. Underexplored areas include the needs of teachers in developing countries, the role of school leadership, and the integration of PD with broader institutional reforms.

Role of Technology in Professional Development

Technology has become a central driver of PD innovation, shaping both the design and delivery of programs. Digital platforms, online learning communities, and immersive tools facilitate flexible, scalable, and interactive PD experiences (Fortanet-Gómez & Ruiz-Madrid, 2023; Mourlam et al., 2025; Olaniyan & Uzorka, 2024; Yadav, 2025). The integration of technology supports the development of digital competencies, fosters collaboration, and enables real-time feedback. However, challenges related to digital accessibility, ongoing technical support, and the sustainability of technology-based PD initiatives remain. The literature calls for policy

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049
frameworks and institutional strategies that address these disparities to ensure equity and scalability in technology-driven PD.

Influence of Educational Policy

Educational policy plays a critical role in supporting, scaling, and sustaining PD initiatives, particularly in STEM education and digital transformation (Gersten et al., 2024; Hübner et al., 2021; Lhakard, 2024; T. Liu, 2024; Zhanbirov et al., 2022). Effective policies provide the necessary frameworks, resources, and incentives for integrated PD programs, foster university-school partnerships, and support continual professional growth. Policy alignment with local contexts and teacher needs is essential for maximizing the impact of PD and promoting equity. Recent studies emphasize the importance of multi-level assessment frameworks and participatory approaches in informing policy and institutional strategies for effective digital teaching integration.

Synthesis:

The past five years have witnessed significant advances in professional development for educators, marked by the rise of innovative, technology-enhanced models and a growing recognition of contextual and policy influences. While promising evidence exists for the effectiveness of collaborative and blended PD approaches, persistent challenges related to sustainability, equity, and contextual relevance remain. Future research should prioritize longitudinal, theory-driven studies and the development of PD programs that are adaptable to diverse educational ecosystems, leveraging technology, policy support, and community engagement as intertwined factors driving professional growth (Ehlert et al., 2025; Gersten et al., 2024; Lhakard, 2024; Mourlam et al., 2025).

Research Question

Q1 What are the research trends in professional development in education studies according to the year of publication?
Q2 Which are the most relevant and studies, authors, affiliation?
Q3 What are co-occurance, authors, and countries' collaboration?

Methodology

Bibliometrics refers to the systematic collection, organization, and analysis of bibliographic data derived from scholarly publications (Verbeek et al., 2002). Beyond descriptive statistics such as publication outlets, years, and authorship patterns (Wu & Wu, 2017) bibliometric studies also employ advanced analytical techniques, including co-citation and co-authorship analyses. A structured and iterative process involving the selection of appropriate keywords, database searching, and refinement of results is essential to ensure the accuracy and reliability of the bibliographic review (Fahimnia et al., 2015).

In this study, journals indexed in the Clarivate Analytics Journal Citation Reports (JCR) were prioritized, as they signify academic credibility and impact (Meier, 2011). Consequently, the analysis focused exclusively on high-quality, peer-reviewed journal articles, excluding conference papers and books to maintain academic rigor (Liu et al., 2015). Data collection was conducted using the Thomson ISI Scopus database, known for its comprehensive coverage and reliability (Di Stefano et al., 2010; Tan et al., 2014). While Scopus also indexes a wide range of publications, its strength primarily lies in more recent materials, making WoS more suitable for longitudinal citation tracking (Aghaei Chadegani et al., 2013).

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

Articles retrieved for analysis were limited to those published between 2020 and November 2025, drawn from the Social Science Citation Index (SSCI), Science Citation Index Expanded (SCIE), and Arts and Humanities Citation Index (AHCI). The WoS Core Collection, which offers extensive citation and bibliographic coverage in the fields of social sciences and humanities, was used as the principal data source for this bibliometric investigation (Aghaei Chadegani et al., 2013; Olijnyk, 2015).

Data Search Strategy

This study employed a screening sequence to determine the search terms for article retrieval. The study began by querying the Scopus database for general searches on the topic of professional development in education, which initially yielded 136,653 documents. After filtering based on the specific focus of the study, a total of 27,808 articles were obtained using the following keywords, which limited the publication year, subject area, document type, and language, as specified below:

TITLE-ABS-KEY (Professional Development Education) AND PUBYEAR > 2019 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "PSYC") OR LIMIT-TO (SUBJAREA , "ARTS") OR LIMIT-TO (SUBJAREA , "DECI") OR LIMIT-TO (SUBJAREA , "BUSI")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp") OR LIMIT-TO (DOCTYPE , "re") OR LIMIT-TO (DOCTYPE , "bk")) AND (LIMIT-TO (LANGUAGE, "English"))

The final refined search yielded 27,808 articles, which were used for bibliometric analysis. As of December 2020, all Scopus articles related to professional development and focusing on education were incorporated into the study.

Data Analysis

The dataset used for this study included details such as publication year, article title, author names, journal sources, citation counts, and keywords, all extracted in PlainText format from the Scopus database for the period between 2020 and November 2025. These data were analyzed using VOSviewer software (version 1.6.15), which specializes in constructing and visualizing bibliometric networks through mapping and clustering techniques. VOSviewer offers an alternative to the traditional Multidimensional Scaling (MDS) approach (Van Eck & Waltman, 2010), sharing the same goal of representing items in a low-dimensional space where the proximity between any two items reflects their degree of relatedness or similarity (Appio et al., 2014).

Unlike MDS, which commonly employs similarity measures such as the Jaccard index or cosine coefficients, VOSviewer utilizes a more robust normalization technique based on association strength (ASij). This index is calculated as:

$$AS_{ij} = \frac{C_{ij}}{W_i W_j}$$

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

It expresses the ratio between the observed number of co-occurrences of two items (i and j) and their expected number if they were statistically independent (Van Eck & Waltman, 2010). Using this association index, VOSviewer minimizes the weighted sum of squared distances between all item pairs to generate an optimized spatial map. The LinLog/modularity normalization technique proposed by Appio et al. (2016) was applied to improve cluster separation and map interpretability.

Through this visualization process, the study uncovered relational patterns among research items, enabling analyses such as keyword co-occurrence, citation mapping, and co-citation analysis. Keyword co-occurrence analysis was used to identify dominant and emerging research topics over time (Zhao, 2017; Li et al., 2016). Citation analysis, on the other hand, helped reveal influential research themes, methodologies, and historical developments in the field (Allahverdiyev & Yucesoy, 2017). Document co-citation analysis a widely adopted bibliometric method (Appio et al., 2016; Fahimnia et al., 2015; Liu et al., 2015) was also conducted to examine the structural relationships within the research network, providing insights into the intellectual foundations and thematic evolution of the discipline.

Findings

Trend Of Research in Professional Development in Education by Years

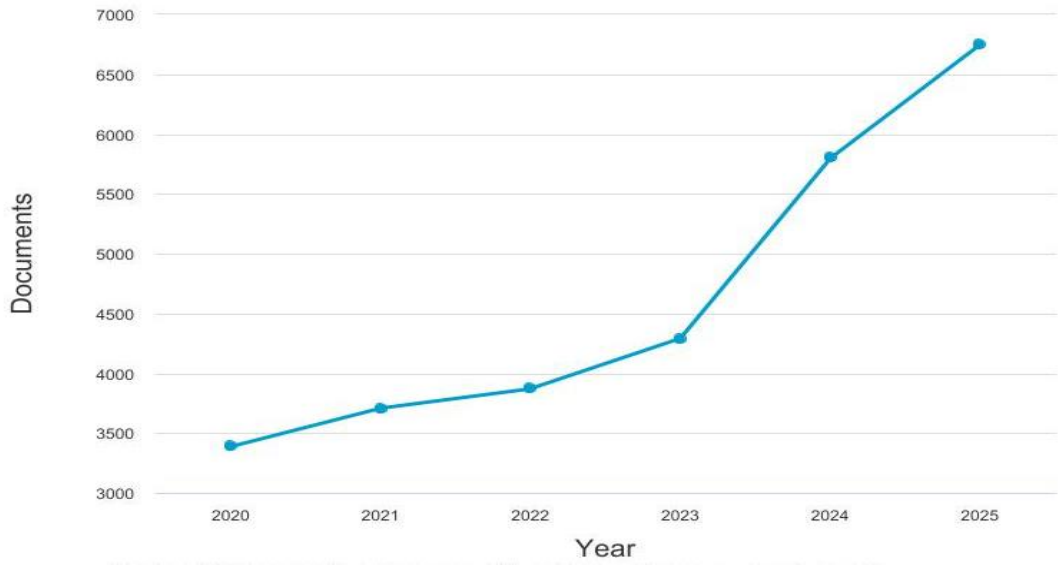

Figure 1: Trend Of Research in Professional Development in Education by Years

Table 1: Total Publication by Years

Year	Total publication
2025	6,748
2024	5,803
2023	4,288
2022	3,874
2021	3,707
2020	3,388

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

The line graph in Figure 1 demonstrates an encouraging growth pattern for Scopus-indexed documents from 2020 to 2025, reflecting increasingly efficient and progressive academic publication dynamics throughout the six-year period. In the initial stage of 2020, a total of 3,388 documents were published, a figure that subsequently increased to 3,707 in 2021 and continued to record moderate growth reaching 3,874 in 2022. However, a more notable increase was recorded in 2023 when the number of publications rose significantly to 4,288 documents. A highly significant leap occurred between 2023 and 2024 when the number of documents surged dramatically to nearly 5,803, marking the most aggressive growth during the study period. This impressive upward trend shows no signs of slowing down; rather, it continued to increase in 2025 with the total reaching nearly 6,748 documents. The overall picture reveals an increasingly rapid and consistent growth pattern in research publication activity across the six-year period, a phenomenon that clearly illustrates a deepening academic interest and notable proliferation of scholarly output in this field. These findings are summarized in Table 1.

Which Are the Most Relevant and Studies, Authors, Affiliation

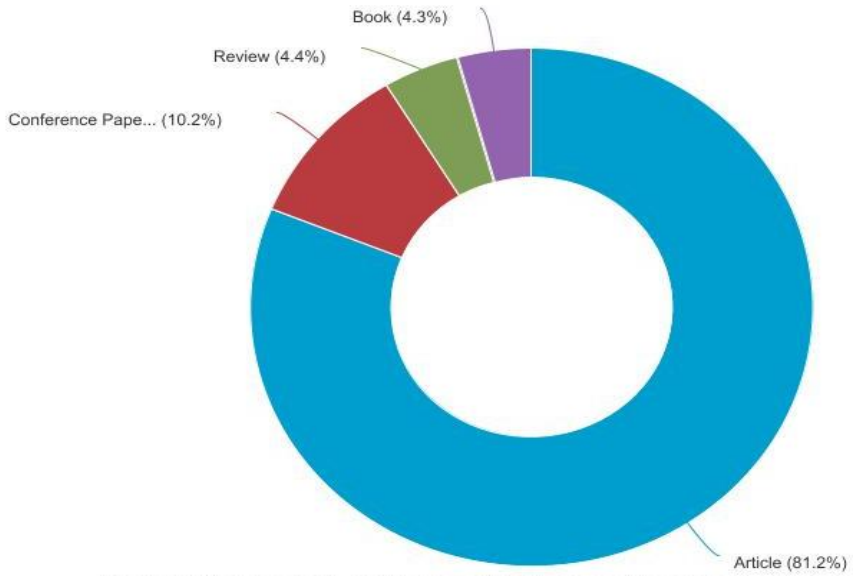

Figure 2: Distribution of Publication Types in Teacher Professional Development Research

Table 2: Publication Type

Publication Type	Percentage (%)
Article	81.2
Conference Paper	10.2
Review	4.4
Book	4.3

The Scopus data visualization in Figure 2 reveals a clear dominance of journal articles in the distribution of academic publications, accounting for more than four-fifths (81.2%) of all documents indexed in the database. Conference papers rank second with 10.2%, reflecting the

International Journal of Modern Education
EISSN: 2637-0905
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

critical role of academic conferences as vital platforms for sharing research findings and fostering scholarly discourse. Meanwhile, review articles contribute 4.4% of the total, serving an important function by providing critical synthesis and comprehensive insights into existing literature within specific research domains. Books represent the smallest segment at only 4.3%, yet they occupy an important niche in presenting comprehensive and holistic compilations of knowledge. This distribution structure clearly highlights that peer-reviewed journal articles remain the dominant and central medium for disseminating original research findings across the diverse academic landscape. The smaller proportions of conference papers, review articles, and books illustrate their more specialized complementary roles within the scholarly ecosystem, with each category fulfilling distinct functions conference papers communicate early or specialized findings, review articles offer systematic literature synthesis, while books provide in-depth and comprehensive analyses of specific topics. Overall, this pattern demonstrates how different publication formats play unique and essential roles within the broader ecosystem of academic knowledge production and dissemination. These findings are summarized in Table 2.

What Are Co-Occurrence, Authors, And Countries' Collaboration

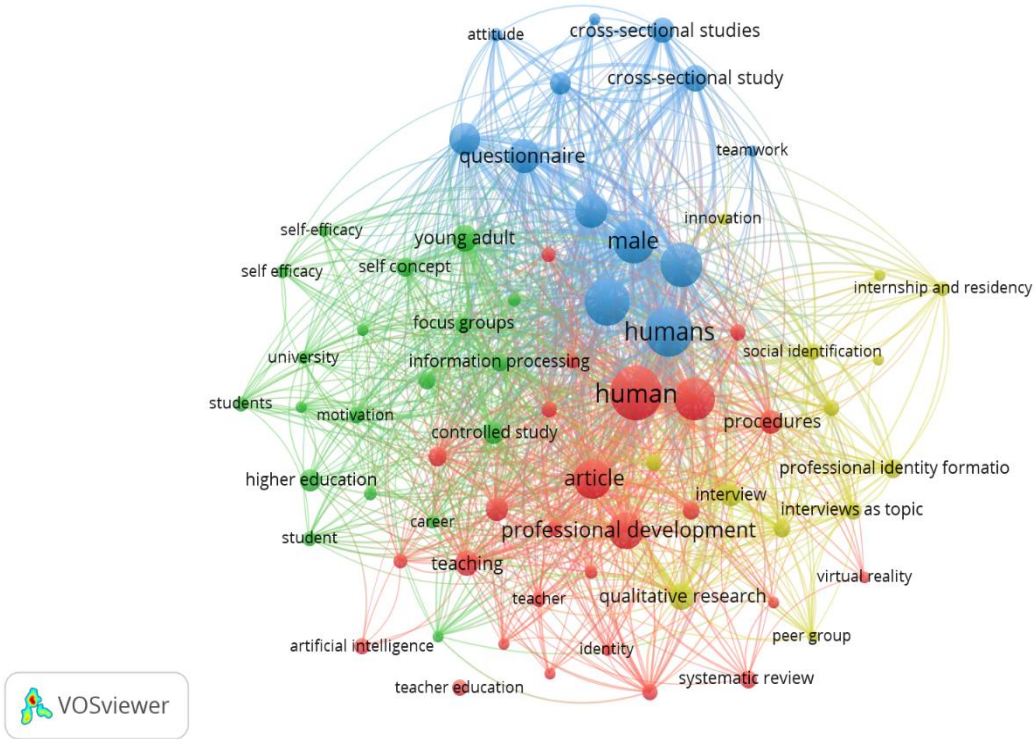

Figure 3: Network Visualization Map of Keywords' Co-Occurrence

The VOSviewer visualization in Figure 3 displays the co-occurrence network of keywords within the corpus of publications studied, revealing patterns of concurrent occurrence frequency of specific terms and how they form distinct thematic clusters. In this map, each keyword is represented as a node with varying sizes—larger nodes indicate higher usage frequency, while different colors show groups of related concepts that frequently appear together in the same studies. The thick and dense connecting lines between nodes reflect the strength of relationships and the frequency of co-occurrence between these keywords. Analysis

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

of this map reveals several central terms dominating the network, including professional development, teaching, qualitative research, students, questionnaire, and cross-sectional study, thereby marking their critical importance in the literature corpus. This network map demonstrates four unique thematic clusters: the red cluster focuses on professional development and pedagogical practices; the green cluster emphasizes educational environments and psychological aspects of students; the blue cluster highlights research methods and methodological approaches; while the yellow cluster encompasses themes of professional identity formation, practical training experiences, and team collaboration dynamics. Overall, this visualization reveals a highly integrated research ecosystem, where elements of pedagogy, educational psychology, and research methodology frequently intersect and overlap, thus reflecting the multidimensional and complex nature of studies in this domain.

Network Visualization of Author Collaboration in Teacher Professional Development

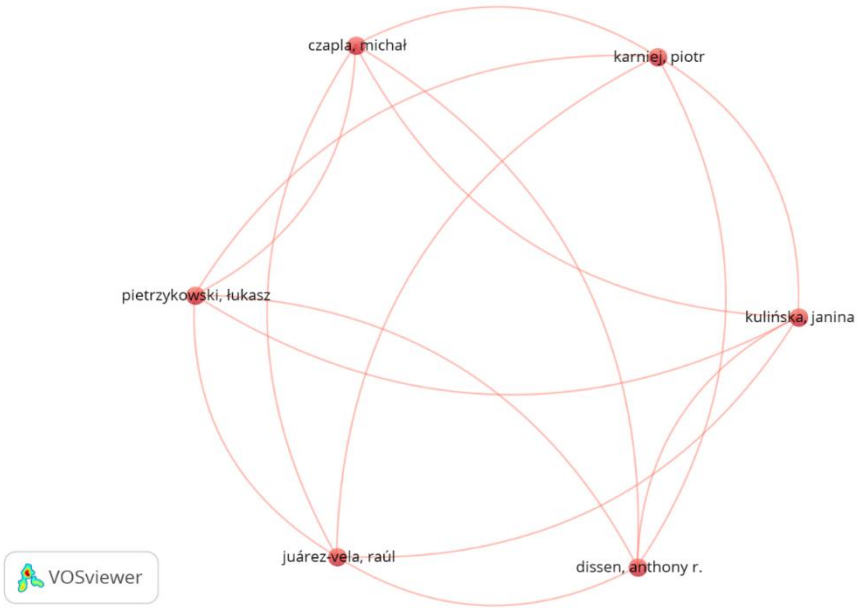

Figure 4: Network Visualization of Author Collaboration in Teacher Professional Development Research

The VOSviewer visualization presented in Figure 4 illustrates a co-authorship network that unveils collaborative patterns among a selected cohort of researchers. Each node within this map represents an individual author, while the connecting lines between them depict the frequency and intensity of publication collaboration forged among them. This densely packed and highly interconnected network structure indicates that these researchers frequently engage in active collaboration or belong to the same research teams and projects. Within this network, several researchers emerge as central nodes with elevated levels of collaboration, notably Czapla Michał, Karniej Piotr, and Kulińska Janina, who exhibit extensive collaborative involvement. Other researchers including Juárez-Vela Raúl, Dissen Anthony R., and Pietrzykowski Łukasz also contribute actively through co-authored publications, though with relatively less intensive collaborative ties compared to the principal figures. Comprehensively, this network pattern portrays a highly integrated and systematically organized co-authorship ecosystem, reflecting robust and sustained collaborative dedication within this research community.

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

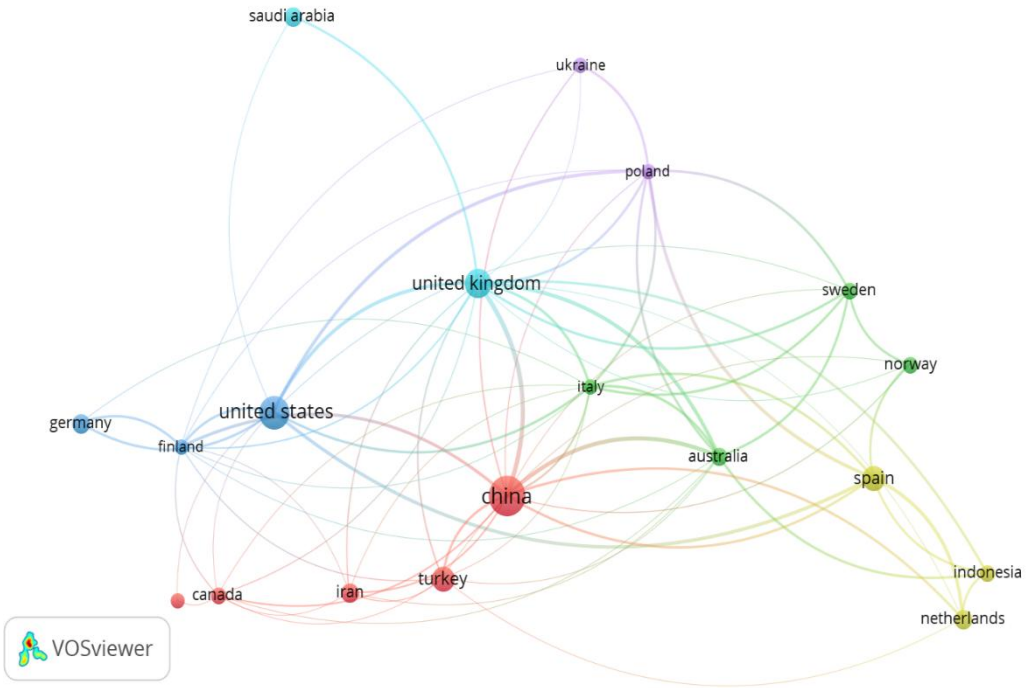

Figure 5: International Co-Authorship Network in Teacher Professional Development Research

The VOSviewer visualization in Figure 5 illustrates the pattern of research collaboration between countries, where each node symbolizes a country and the connecting lines between these nodes represent the intensity level of collaborative scientific activity established. This map unveils the structure of global research cooperation by showing how countries are interconnected through co-publications and collaborative authorship networks. China emerges as the most dominant and productive country in this network, as indicated by its large node size and extensive links with countries such as the United States, the United Kingdom, Australia, Türkiye, and Canada. The United States and the United Kingdom also act as central hubs, forming strong collaborative relationships with various European nations, including Germany, Finland, Italy, Poland, Sweden, and Norway. The international research landscape is currently described as a highly interconnected and dynamic network, spearheaded by a powerful triumvirate: China, the United States, and the United Kingdom. Furthermore, European nations emerge as a well-integrated cluster—a manifestation of frequent and continuous cooperation within the region, establishing them as a firm pillar in global innovation. Meanwhile, rising players such as Indonesia, Saudi Arabia, and Iran demonstrate more focused yet significant collaborative relationships, particularly through strategic alliances with Beijing and Washington. Overall, this map of collaboration clearly illustrates the dominance of core powers, supported by the cohesion of Europe, and enriched by the substantial contributions from emerging nations that are increasingly taking bold steps.

International Journal of Modern Education
IJMOE
EISSN: 2637-0905
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

Discussion

The bibliometric analysis demonstrates a strong upward trend in scholarly work on professional development (PD) in education between 2020 and 2025, underscoring the growing emphasis on continuous teacher learning and innovation worldwide. The rise in publications—from 3,388 in 2020 to 6,748 in 2025—shows that PD has become a core theme in global educational discourse, largely shaped by digital transformation, post-pandemic adaptation, and policy reform (Lynch et al., 2025; Dacholfany et al., 2024). The dominance of journal articles (81.2 %) reflects the field's academic maturity and the preference for peer-reviewed dissemination as the most credible scholarly outlet.

Keyword co-occurrence mapping indicates that PD research spans multiple disciplines, integrating pedagogy, psychology, and methodology (Zeng, 2023). This interdisciplinary perspective highlights growing interest in how teacher learning links to classroom effectiveness and student outcomes. The co-authorship network also reveals strong international collaboration, led by countries such as China, the United States, and the United Kingdom, which act as central nodes connecting Europe, Asia, and North America (Olaniyan & Uzorka, 2024; Hübner et al., 2021). Such partnerships reflect PD's global importance as a mechanism for educational transformation.

Despite this expansion, gaps persist in under-resourced regions where research and implementation are still limited. The clustering of authors within small academic networks further suggests that PD scholarship remains concentrated in specific circles. Expanding collaboration across diverse geographic and institutional contexts is therefore essential to develop inclusive and context-sensitive PD models that meet the varied needs of educators worldwide (Lhakard, 2024; Yadav, 2025).

Conclusion

This study highlights that professional development in education is undergoing a transformative shift influenced by technological innovation, policy alignment, and global research collaboration. The sustained growth in publication output affirms PD's increasing relevance in strengthening teacher competency, instructional quality, and student learning. Effective PD now extends beyond traditional training sessions to include technology-enhanced, reflective, and collaborative approaches that foster sustained professional growth. The adoption of digital platforms, AI-based learning environments, and virtual networks illustrates a paradigm change toward personalized and data-driven PD experiences.

However, the findings also reveal continuing disparities. While developed countries dominate research productivity, teachers in developing contexts often face limited access to structured and sustainable PD opportunities. This imbalance emphasizes the urgency of developing inclusive policies that adapt PD frameworks to local conditions and resource availability. Although global collaboration is growing, future research should broaden participation from underrepresented scholars and bridge the gap between theory and practical implementation.

In summary, professional development has evolved into a vibrant, interdisciplinary field that underpins educational innovation worldwide. As schools navigate post-pandemic realities and accelerating digitalization, PD must remain evidence-based, equitable, and adaptable. Strengthening cross-sector collaboration among researchers, policymakers, and practitioners will be crucial to sustaining teacher excellence, promoting instructional innovation, and

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049

achieving equitable educational transformation.

Acknowledgment

The author extends sincere appreciation to Universiti Malaysia Sabah for the continuous support rendered throughout this research. This contribution has been invaluable in enabling the successful completion of this study.

References

Aghaei Chadegani, A., Salehi, H., Yunus, M., Farhadi, H., Fooladi, M., Farhadi, M. and Ale Ebrahim, N.(2013), "A comparison between two main academic literature collections: web of science and Scopus databases", Asian Social Science, Vol. 9 No. 5, pp. 18-26.

Alkaabi, A. M. (2023). Designing enduring and impactful professional development to support teacher growth. In *Innovations in Teacher Development, Personalized Learning, and Upskilling the Workforce* (pp. 1–23). IGI Global. https://doi.org/10.4018/978-1-6684-5518-0.ch001

Appio, F.P., Cesaroni, F. and Di Minin, A. (2014), "Visualizing the structure and bridges of the intellectual property management and strategy literature: a document co-citation analysis", Scientometrics, Vol. 101 No. 1, pp. 623-661.

Audisio, A. P., Taylor-Perryman, R., Tasker, T. B., & Steinberg, M. P. (2025). Does Teacher Professional Development Improve Student Learning? Evidence from Leading Educators' Fellowship Model. *Journal of Research on Educational Effectiveness*, *18*(4), 878–917. https://doi.org/10.1080/19345747.2024.2361467

Camili Trujillo, C., Gil Pastor, L., Serrano Díaz, S., & Aimá González, L. (2024). Training for teacher professional development in schools: systematic review. *Revista de Educacion*, *1*(406), 203–231. https://doi.org/10.4438/1988-592X-RE-2024-406-643

Dacholfany, M. I., Antoni, R., Sulissusiawan, A., Rijal, S., Utiarahman, A., Vanni Alam, H., & Bagea, I. (2024). THE EFFECTIVENESS OF TEACHER PROFESSIONAL DEVELOPMENT PROGRAM ON CLASSROOM AND BEHAVIOUR MANAGEMENT: A SYSTEMATIC REVIEW. *Journal of Education Culture and Society*, *15*(2), 451–470. https://doi.org/10.15503/jecs2024.2.451.470

Di Stefano, G., Peteraf, M. and Verona, G. (2010), "Dynamic capabilities deconstructed: a bibliographic investigation into the origins, development, and future directions of the research domain", Industrial and Corporate Change, Vol. 19 No. 4, pp. 1187-1204.

Ehlert, M., Adloff, M., & Souvignier, E. (2025). It's about time! Teachers' perspectives on supportive and hindering contextual conditions for implementing innovations in schools. *Education Inquiry*. https://doi.org/10.1080/20004508.2025.2454083

Fortanet-Gómez, I., & Ruiz-Madrid, N. (2023). Adapting English Language Teaching: Moving Online During the COVID-19 Crisis. In *English Language Education* (Vol. 31, pp. 11–30). Springer Science and Business Media B.V. https://doi.org/10.1007/978-3-031-27825-9_2

Gersten, R., Dimino, J., Jayanthi, M., & Taylor, M. J. (2024). CONCEPTUAL REPLICATIONS OF THE TEACHER STUDY GROUP APPROACH TO PROFESSIONAL DEVELOPMENT IN VOCABULARY. *Elementary School Journal*, *124*(4), 669–692. https://doi.org/10.1086/730082

Goller, M., Kyndt, E., Paloniemi, S., & Damşa, C. (2022). Addressing Methodological Challenges in Research on Professional Learning and Development. In *Professional and Practice-based Learning* (Vol. 33, pp. 1–16). Springer Science and Business Media B.V. https://doi.org/10.1007/978-3-031-08518-5_1

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049
Gutiérrez, R. C., & López-García, A. (2023). Emerging technologies: Virtual reality, augmented reality, and robotics. In *Teaching History to Face the World Today: Socially-Conscious Approaches, Activity Proposals and Historical Thinking Competencies* (pp. 73–97). Peter Lang AG. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85192706092&partnerID=40&md5=e7062570ca9ca69c6a13000b2de4ecf6

Hübner, N., Fischer, C., Fishman, B., Lawrenz, F., & Eisenkraft, A. (2021). One Program Fits All? Patterns and Outcomes of Professional Development During a Large-Scale Reform in a High-Stakes Science Curriculum. *AERA Open*, *7*. https://doi.org/10.1177/23328584211028601

Kruty, K., Zdanevych, L., Desnova, I., Blashkova, O., & Zameliuk, M. (2024). The Main Trends in the Formation of Psychological Competence in the Process of Teacher Training. *Academia (Greece)*, *35–36*, 50–72. https://doi.org/10.26220/aca.5002

Lhakard, P. (2024). A Comparative Analysis of STEM Design Curriculum Policy for Country Development: A Case Study of Taiwan and Thailand. *Review of Business and Economics Studies*, *12*(2), 74–87. https://doi.org/10.26794/2308-944X-2024-12-2-74-87

Liu, S., & Phelps, G. (2020). Does Teacher Learning Last? Understanding How Much Teachers Retain Their Knowledge After Professional Development. *Journal of Teacher Education*, *71*(5), 537–550. https://doi.org/10.1177/0022487119886290

Liu, T. (2024). Innovations in Higher Education Policy: Professional Development Strategies for Economic Growth and Social Inclusion. *Revista Electronica de LEEME*, *54*, 254–268. https://doi.org/10.58262/LEEME.54.0017

Lynch, K., Gonzalez, K., Hill, H., & Merritt, R. (2025). A Meta-Analysis of the Experimental Evidence Linking Mathematics and Science Professional Development Interventions to Teacher Knowledge, Classroom Instruction, and Student Achievement. *AERA Open*, *11*. https://doi.org/10.1177/23328584251335302

Meier, M. (2011), "Knowledge management in strategic alliances: a review of empirical evidence", International Journal of Management Reviews, Vol. 13 No. 1, pp. 1-23.

Mourlam, D. J., Jin, Y., Foulger, T. S., Ebersole, L., & Clausen, J. M. (2025). How Is TPACK Used in PK-12 Technology Integration Professional Development Models? A Systematic Literature Review. In *Handbook of Technological Pedagogical Content Knowledge (TPACK) for Educators, Third Edition* (pp. 295–322). Taylor and Francis. https://doi.org/10.4324/9781032635194-18

Olaniyan, A. O., & Uzorka, A. (2024). Impact of faculty professional development programs on the adoption of modern technology. *SN Social Sciences*, *4*(11). https://doi.org/10.1007/s43545-024-00991-w

Philipsen, B., Tondeur, J., Blieck, Y., & Vanslambrouck, S. (2023). Teacher Professional Development for Online Teaching: An Update of Insights Stemming from Contemporary Research. In *Learning, Design, and Technology: An International Compendium of Theory, Research, Practice, and Policy* (pp. 527–554). Springer International Publishing. https://doi.org/10.1007/978-3-319-17461-7_167

Sadeghi, K., & Navaie, L. A. (2021). Iranian EFL Teachers' Experiences with Online Professional Development: Perceptions and Preferences. *Iranian Journal of Language Teaching Research*, *9*(SpecialIssue 3), 9–23. https://doi.org/10.30466/ijltr.2021.121073

International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 28 (December 2025) PP. 706-719
DOI: 10.35631/IJMOE.728049
Taddese, E. T., & Rao, C. (2022). School-based continuous professional development of teachers: a case study of primary school teachers in Ethiopia. *Education 3-13*, *50*(8), 1059–1071. https://doi.org/10.1080/03004279.2021.1929382

Van Eck, N.J. and Waltman, L. (2007), "Bibliometric mapping of the computational intelligence field", International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems, Vol. 15 No. 5, pp. 625-645.

Van Eck, N.J. and Waltman, L. (2010), "Software survey: VOSviewer, a computer program for bibliometric mapping", Scientometrics, Vol. 84 No. 2, pp. 523-538.

Verbeek, A., Debackere, K., Luwel, M. and Zimmermann, E. (2002), "Measuring progress and evolution in science and technology – I: the multiple uses of bibliometric indicators", International Journal of Management Reviews, Vol. 4 No. 2, pp. 179-211.

Yadav, S. (2025). Digital pathways to excellence for bridging gaps and building competencies: The role of educational technology in transforming teacher professional development. In *Holistic Approaches to Teacher Development: Leadership, Pedagogical Practices, and Cognitive Insights* (pp. 287–307). IGI Global. https://doi.org/10.4018/979-8-3373-0472-4.ch012

Yurtseven Avci, Z., O'Dwyer, L. M., & Lawson, J. (2020). Designing effective professional development for technology integration in schools. *Journal of Computer Assisted Learning*, *36*(2), 160–177. https://doi.org/10.1111/jcal.12394

Wu, Y.C.J. and Wu, T. (2017), "A decade of entrepreneurship education in the Asia Pacific for future directions in theory and practice", Management Decision, Vol. 55 No. 7, pp. 1333-1350.

Wu, H.K., Lee, S.W.Y., Chang, H.Y. and Liang, J.C. (2013), "Current status, opportunities and challenges of augmented reality in education", Computers and Education, Vol. 62, pp. 41-49.

Wu, P.H., Hwang, G.J., Su, L.H. and Huang, Y.M. (2012a), "A context-aware mobile learning system for supporting cognitive apprenticeships in nursing skills training", Journal of EducationalTechnology and Society, Vol. 15 No. 1, pp. 223-236.

Zeng, J. (2023). A theoretical review of the role of teacher professional development in EFL students' learning achievement. *Heliyon*, *9*(5). https://doi.org/10.1016/j.heliyon.2023.e15806

Zhanbirov, G., Toktamyssova, A., Mussabayev, B., Tanachova, Y. S., & Zheldak, T. A. (2022). DIGITALIZATION APPROACH IN EDUCATION BASED ON APPLYING THE NETWORK READINESS INDEX AS THE UNIVERSAL METRIC. *Naukovyi Visnyk Natsionalnoho Hirnychoho Universytetu*, *4*, 162–169. https://doi.org/10.33271/nvngu/2022-4/162