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A Bibliometric Review of E-Mentoring for Professional Development: a Scopus Database Study

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Abstract. This research provides a bibliometric review of e-mentoring for professional development, using the Scopus database to analyze publication trends from 2005 to 2024. The aim of this study was to identify key trends, influential authors, and emerging themes in this field. A total of 335 documents were analyzed using advanced bibliometric methods, including author collaboration analysis, descriptive analysis, keyword occurrence analysis, and citation analysis. The main results showed a significant increase in the number of publications after 2012, highlighting the increasingly recognized important role of e-mentoring in professional development. The analysis also found important peaks in research activity related to global events and technological developments. This study emphasizes the importance of cross disciplinary collaboration and further research into the effectiveness and scalability of e-mentoring. The findings provide valuable insights for educators, policymakers and researchers, and contribute to the development of educational strategies that integrate digital mentoring environments.

Keywords: E-Mentoring, Professional Development, Bibliometric Analysis.

1 INTRODUCTION

Mentoring, an interpersonal relationship in which a more experienced mentor provides support to a less experienced mentee [1]. It is a collaborative and mutually beneficial learning relationship, where all parties are responsible for helping the mentee achieve shared learning goals [2]. With the development of technology, mentoring that was previously done face-to-face can now be done remotely through virtual, allowing real-time interaction and more flexibility [3]. This is reinforced by National & Pillars, by stating that mentoring activities can have more impact on educators' practices when compared to workshops or training courses [4].

E-mentoring is generally a combination of traditional mentoring with electronic communication, which allows interaction through various electronic means such as email, social media, instant messaging, and chat. The mentoring process can take place not only through computers, but also through handheld devices and other electronic platforms. In e-mentoring, a more experienced mentor assists the development of a less experienced mentee, both career-wise and emotionally, by providing guidance, advice,

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motivation, role models, and promotional support. The mentor's role is to create opportunities to develop business ideas, gain new knowledge and skills, understand the company culture, and increase the mentee's confidence and success in the workplace. E-mentoring differs from traditional mentoring in that it is not limited by distance and encourages a more egalitarian relationship [5]. The research study entitled "A bibliometric review of e-mentoring for professional development: a Scopus Database Study". By conducting a comprehensive bibliometric analysis using Scopus indexed journals, the researcher sought to provide insight into the past, present, and future trends in e-mentoring in the context of professional development.

The educational landscape has been transformed by innovative information and communication technologies that pave the way for traditional teaching methods to intelligent learning [6]. E-mentoring assists in taking classes at any time, learning independently, and communicating with instructors and peers through interactive technologies such as video conferencing and social media. This opens up opportunities for creating more meaningful knowledge, encouraging independence, more efficient time management, flexibility, and other aspects of social interaction that cannot be achieved in a traditional classroom environment [7].

While there is a growing body of literature on e-mentoring in various educational contexts, there is still a gap in understanding the most effective models and approaches for professional development purposes. Existing research has described models such as Bamford's e-Mentored Learning Model places technology at the core of the mentoring process, requiring participants to have strong ICT skills to guarantee long-term success [8]. In addition, frameworks such as the DARP model (Discussion, Archive, Reflection, Preparation) emphasize the importance of continuous reflection and planning to promote deeper professional growth [9].

In addition, the utilization of e-mentoring in specific disciplines such as the role of mentoring in higher education [10], vocational education [11], learning math [12], have been researched, showing the diversity of e-mentoring across different disciplines. However, a thorough bibliometric review specifically addressing e-mentoring models for professional development is lacking in the current literature. Filling this gap, this study aims to contribute to the existing knowledge as well as provide meaningful insights for policy makers, educators, and researchers in the field of professional development.

In conclusion, the proposed research on e-mentoring models for professional development through a bibliometric review is planned to provide a systematic analysis of current trends, research areas, and emerging patterns in this field. This research aims to present a comprehensive picture of the current state of e-mentoring in professional development, identify research gaps, and open up opportunities for further investigation in this important area of education.

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2 METHOD

The research methodology used in this study integrates a structured and thorough approach using the Scopus database. A comprehensive search strategy was applied, focusing on publications between 2005 and 2024. The search strategy included terms such as "e-mentoring" and "professional development" to ensure a thorough retrieval of relevant literature. Inclusion criteria included peer-reviewed journal articles, conference papers, and review articles published in English within the specified timeframe and relevant subject areas. In contrast, non-peer-reviewed literature, irrelevant fields of study, and duplicate records were excluded. Data were carefully extracted, cleaned, and standardized, capturing metadata such as title, abstract, author, affiliation, keywords, publication source, and number of citations.

To analyze the data, a number of bibliometric methods were used, including descriptive analysis, author collaboration analysis, shared keyword occurrence analysis, and citation analysis. Tools such as VOSviewer, R and RStudio, and Microsoft Excel supported data processing and visualization. Descriptive statistics provide a quantitative overview of the data set, while network analysis explores the relationships between bibliometric entities. Time series analysis is used to identify trends and patterns over a period of time, providing insights into publication growth, citation trajectories and emerging research topics. Data visualization is essential, using line graphs, network diagrams, heat maps, word clouds, and bar charts to intuitively represent complex bibliometric data.

Ethical considerations are essential in the research process to ensure compliance with data privacy and intellectual property rights. Public bibliometric data were used with appropriate attribution, and data analysis and presentation were conducted in a transparent and objective manner to reduce potential bias. The rigor in methodology and depth of analysis provide a strong foundation for understanding e-mentoring models in professional development. It offers valuable insights for researchers, educators and policy makers, and contributes to ongoing discussions and the development of effective blended learning strategies.

3 RESULTS AND DISCUSSION

3.1 Publication Growth

Figure 1 shows the time distribution of documents published from 2005 to 2024, providing an overall view of trends in research activity over two decades. An in-depth analysis of this data identifies some key patterns as well as significant shifts in research output. From 2005 to 2011, the volume of documents published remained relatively low, with annual outputs ranging from 11 to 16 documents. This period most likely represents the early stages of research development in this area. However, a noticeable increase occurred in 2012 with 30 documents. Projections for 2013 to 2022 show a

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decrease of 21 to 20 documents. The period 2023 saw an increase of 27 documents which may correlate with specific global events, increased funding, or technological advancements. The period 2024 saw a decrease of 8 documents. The fluctuations that have occurred in recent years, particularly the high output in 2023 (27 documents) and subsequent variations, underscore the dynamic nature of the research environment, which is driven by evolving scientific, technological and societal needs.

This trend has several implications. Analysis of the time distribution of documents published between 2005 and 2024 reveals some important implications regarding the development of research in this field. During the early period (2005-2011), the volume of publications was low, reflecting the early stages of attention to the topic. However, there was a significant spike in 2012 and 2023, which likely correlates with global events, increased funding and technological advances. Fluctuations in the number of documents, including a decline in 2024, indicate a dynamic research environment that is heavily influenced by the evolving scientific and social context. Therefore, stakeholders in this field, including funding agencies and researchers, need to adapt their strategies to respond to changing needs, in order to create innovative solutions that are relevant to current developments.

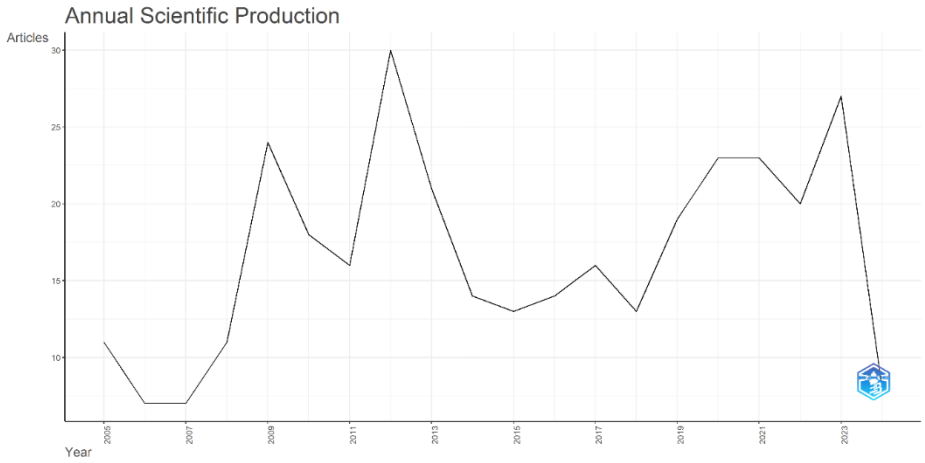

Fig 1 Annual Scientific Production

The conclusions from the analysis of the time distribution of documents published between 2005 and 2024 suggest significant growth in research in this area, with an initial pattern characterized by a low volume of publications between 2005 and 2011, which spikes in 2012 and 2023. This surge may be related to global events, increased funding and technological advances, while the fluctuations, including a decline in 2024, underscore the dynamic nature of the research environment influenced by the changing scientific and social context. It is therefore important for stakeholders, including funding agencies and researchers, to adapt their strategies to respond to evolving needs and generate relevant innovative solutions.

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3.2 Most Influential Author

Table 1 presents the key metrics of the ten most influential researchers in their respective fields, evaluated based on their h-index, g-index, m-index, total citations (TC), number of publications (NP), and year of publication start (PY_start). These metrics provide different perspectives on the academic impact, productivity, and resilience of each researcher.

Lindsay S stands out with an h-index of 5, g-index of 6, and m-index of 0.625, collecting 55 citations from 6 publications in 2017. This demonstrates relatively high impact and stable research results, showing significant influence in their research domain in a short period of time. Stinson J with an h-index of 5, g-index of 6, and m-index of 0.625, collected 53 from 6 publications in 2017. This highlights Graham's significant influence and the impactful nature of his research contributions in a relatively short timeframe. While Leck J, with an h-index of 4, g-index of 6, and m-index of 0.333, collected 45 citations from 5 publications in 2013. This shows a steady, albeit slower, rate of research contribution. While Stewart S with index-h of 4, index-g of 6, and index-m 0.2, 52 citations from 6 publications in 2005. while Cagliostro E with index-h of 3, index-g of 6, and index-m 0.5, 35 citations from 4 publications in 2019. These show stable research results, which indicate significant influence in their research domain in a short period of time.

Craig J has lower indexes-h and indexes-g of 3, indexes-m of 0.15, and a total of 120 citations from 3 publications since 2005, indicating a slower accumulation of citations over time. Doyle N and Gosland J have the same index-h and index-g of 3, while Doyle N and Jacobs have an index-m of 0.3 with 53 citations from 3 publications in 2015, while Gosland J and Headlam Wells J have an index-m of 0.15, with 120 citations from 3 publications in 2005. This shows Doyle N's results significant influence on research in a short period of time and Gosland J reflects consistent but modest scientific impact.

The data reveals several key trends: researchers who started publishing recently, such as Cagliostore, Lindsay S, and Stinson J, have high m-index values, indicating rapid citation accumulation and promising future impact. Established studies such as Craig J and Gosland J show significant influence and stable research results over time.

Potential implications include the need for ongoing support for early career researchers to maintain momentum and increase the impact of their research. Senior researchers are expected to leverage their networks to open collaborative opportunities to expand their impact. Suggested recommendations include encouraging cross-disciplinary collaboration, increasing funding for new researchers, and creating knowledge exchange platforms to maintain and strengthen research impact. In conclusion, this table highlights a range of researchers who each make significant contributions in their fields. Understanding these metrics allows for strategic planning for future research initiatives, ensuring continued academic excellence and influential scientific contributions.

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Table 1 Top Ten Most Influential Research

Author	h_index	g_index	m_index	TC	NP	PY_start
Lindsay s	5	6	0.625	55	6	2017
Stinson j	5	5	0.625	53	5	2017
Leck j	4	5	0.333	45	5	2013
Stewart s	4	6	0.2	52	6	2005
Cagliostro e	3	4	0.5	35	4	2019
Craig j	3	3	0.15	120	3	2005
Doyle n	3	3	0.3	53	3	2015
Gosland j	3	3	0.15	120	3	2005
Headlam-wells j	3	3	0.15	120	3	2005
Jacobs k	3	3	0.3	53	3	2015

3.3 Keyword Co-occurrences Analysis

Figure 2 presents a detailed analysis of the most frequently occurring keywords and their total link strength, which provides insight into the focal points of current research trends and the interconnectedness of different topics in the field. This data provides a comprehensive overview of the research landscape, highlighting trends, key, potential implications, and recommendations for future research directions.

The keyword "e-mentoring" dominates the list with 169 occurrences and a total link strength of 655, underlining the important role e-mentoring can be attributed. This prominence indicates substantial academic interest and a high level of interconnected research activity around e-mentoring. Similarly, "mentoring" with 101 occurrences and a total link strength of 585, "online mentoring" with 18 occurrences and a total link strength of 6, and "professional development" with 20 occurrences and a total link strength of 100, highlight the ongoing emphasis on improving professional skills and utilizing digital palforms for educational purposes.

The frequent mentions of "education" 43 occurrences and total link strength 383 and "teaching" 25 occurrences and total link strength 183 reflect a broad focus on pedagogical strategies and educational frameworks. Keywords such as "student" 44 occurrences and a total link strength of 257 and "human" 50 occurrences and a total link strength of 643 and "teacher" 20 occurrences and a total link strength of 245 indicate a strong emphasis on the human element in educational research, emphasizing the need to understand and improve students' learning experiences. Technology terms such as "online learning" 37 occurrences and a total link strength of 174, "computer-assisted instruction" 6 occurrences and a total link strength of 35 indicate integration in education which shows a trend towards a more digital and interactive learning environment. The inclusion of "covid-19" 10 occurrences and a total link strength of 79 highlights the impact of the pandemic on educational practices and the accelerated adoption of online learning and e-mentoring models.

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The presence of specialized terms such as "Engineering Education" 22 occurrences and a total link strength of 97, "medical education" 9 occurrences and a total link strength of 107 indicates the interdisciplinary nature of current research, which bridges different fields to improve educational outcomes. Significant attention is also paid to methodological and analytical aspects, as evidenced by keywords such as "qualitative research" 7 occurrences and a total link strength of 109. These terms underscore the importance of robust research methodologies and the design of effective educational interventions.

The implications of this trend cover a range of important aspects. The dominance of buzzwords such as "e-mentoring" and "mentoring" indicates the central role of technology in supporting professional development and education, emphasizing the need for a strong digital infrastructure. In addition, the increasing use of technology-related terms such as "online learning" and "computer-assisted instruction" indicates a shift towards the digitization of education, which demands that institutions adapt to technological developments to create more interactive learning environments. The impact of the pandemic, reflected through the keyword "covid-19," accelerated the adoption of distance learning and e-mentoring models, signaling a long-term trend towards technology-based education. The interdisciplinary trend seen in the use of terms such as "medical education" and "Engineering Education" highlights the need for collaboration across fields to solve increasingly complex challenges. Meanwhile, the focus on research methodologies such as "qualitative research" underscores the importance of a robust evidence-based approach in designing effective educational interventions.

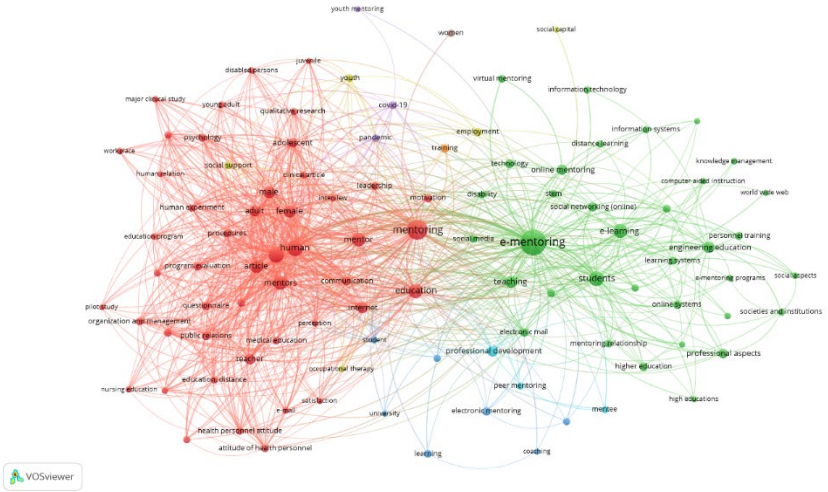

Fig 2 Keyword Co- occurrences Analysis

In conclusion, the data underscores the dynamic and interconnected nature of current education research, with a strong focus on e-mentoring, professional development and technology integration. By understanding and strategically utilizing these trends,

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researchers and educators can continue to advance the field of education, ultimately improving educational practices and outcomes globally.

4 CONCLUSION

This study provides a comprehensive bibliometric review of e-mentoring in professional development, analyzing publication trends from 2005 to 2024 using the Scopus database. The main results show a significant increase in the number of publications after 2012, indicating the important role of e-mentoring in supporting career development. In-depth analysis using various bibliometric methods such as author collaboration analysis and keyword occurrence, showed that e-mentoring is increasingly relevant, especially in the context of technological developments and global events that encourage digital interaction.

The research also identified the most influential authors in the field of e-mentoring, and revealed the importance of cross-disciplinary collaboration to strengthen the effectiveness and scalability of e-mentoring practices. Some researchers who are new to the field show rapid growth in terms of citations and scholarly influence, while senior researchers continue to make significant contributions through long-term research. In conclusion, e-mentoring has become a dynamic and growing research area, with great potential to contribute to future educational strategies.

The implications of this research include the importance of developing digital infrastructure to support e-mentoring and online education more broadly. The trends identified, such as the digitalization of education and the impact of the pandemic on distance learning, suggest that e-mentoring is not only relevant for educational contexts but also important in professional development in various sectors. This study provides valuable guidance for educators, policymakers and researchers to continue developing e-mentoring as an effective tool in improving the quality of education and career development.

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