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A Bibliometric Review of the Knowledge Base on Mentoring for the Professional Development of School Administrators

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Abstract: Mentoring for the professional development of school administrators has become widely acknowledged as an essential means of providing psychosocial and career support, particularly for novice administrators. Due to its strong potential to support the sustainability of schools by enabling successful administration, much research has been conducted on mentoring for the professional development of schools and an extensive knowledge base has been accumulated. The current study aims to evaluate this knowledge base holistically, to reveal the intellectual structure and evolution of this research field. With this purpose, the study conducted a combined bibliometric and science mapping analysis of 121 articles selected from the Scopus database using SciMAT software. The period-based science mapping analysis results showed that research initially focused on professional development and networking functions and later focused on developing school administrators' leadership skills through mentoring. During the last five years, the most prominent themes were enhancing the quality of mentoring and supporting school administrators' capacity to enable social justice. The results suggest several implications for the sustainability of mentoring programs to improve school administrators' professional capabilities and leadership skills, which would eventually help sustain a high level of school innovation and success.

Keywords: mentorship; school leader; principal; bibliometric analysis; science mapping

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1. Introduction

Briefly defined as a relational and developmental process of dynamic learning and a means of realizing professional and personal development of particularly novice employers [1], mentoring has become a prevalent topic in recent years. Mentoring is used not only for supporting the development of school administrators but also for teacher training, increasing students' school success, and other educational purposes. Mentoring is also widely used in many sectors other than educational institutions, such as health, banking, information and communication technologies, public relations, and security organizations [2]. This widespread use of mentorship results from its organizational and individual benefits. It is well known that top companies such as IBM, Apple, and Johnson & Johnson use mentoring programs as a human resource development strategy. These mentoring programs significantly enable them to sustain their leading position in the sector [3].

Mentoring in the educational field has attracted researchers' interest since the early 1980s. These studies were mainly focused on providing novice teachers with the career support they needed to overcome the problems experienced during their first years of teaching [4]. On the other hand, investigations into the mentoring of school administrators have begun to garner interest since the 2000s, indicating that this research line is still young compared with the literature on mentoring teachers. Nevertheless, studies which focused on mentoring school administrators shared a similar ground with studies on

mentoring teachers. These studies mainly addressed the problems experienced by novice school administrators during their first years [5]. They also proved that mentoring could effectively develop school administrators' leadership skills [6,7].

Due to the merit of mentoring as a professional development intervention, many researchers have conducted comprehensive investigations into the mentoring of school administrators [8–11]. However, despite its theoretical and practical significance, to our knowledge, the literature needs to include bibliometric studies that comprehensively analyze the intellectual structure of the developing knowledge base on mentoring for school administrators. Several contributions of such studies are cited in the literature, such as revealing the state-of-the-art knowledge and strategic research trends in the field [12,13], identifying the flow and growth of knowledge across periods and, thus, allowing a thorough process of scientific inference [14,15], identifying the strengths and weaknesses of a particular research field through unveiling its under or well-investigated aspects, establishing a rigorous scientific base for policy decisions, theory formulations, and future investigations [16], providing solid empirical validation of diverse schools of thought in a particular knowledge base [13], enabling the gain of broader insights into the structure, networks, and thematic interests of a research field and, thus, guiding researchers unfamiliar with the field [17]. Considering these substantial benefits of bibliometric science mapping research, the current study aims to reveal the intellectual structure and evolution of research on mentoring for school administrators' professional development through bibliometric and science mapping analysis. Within this framework, the study mainly aims to answer the following research questions:

RQ 1. What is the overall volume and growth trajectory of scholarship on mentoring for school administrators' professional development?

RQ 2. What are the most influential authors, journals, and countries on mentoring for school administrators' professional development?

RQ 3. What is the intellectual structure and evolution of the knowledge base on mentoring for school administrators' professional development?

RQ 4. What topical foci in research on mentoring for school administrators' professional development have attracted the most significant attention from scholars?

The rest of this article includes five more sections. The second section provides a conceptual framework of mentoring and succinctly presents its scientific development with a particular focus on mentoring for the professional development of school administrators. The third section explains the study's methodology and details the data selection and analysis processes. This section also provides detailed information to guide the interpretation of the results presented in the fourth section. The fourth section presents the bibliometric analysis results and the period-based science mapping analysis results. The fifth section discusses findings and elaborates on the prevalent themes yielded by the science mapping analysis. The sixth section summarizes the insights generated by the findings and notifies of research limitations.

2. Literature Review

The concept of mentoring is deeply rooted in human history and originates from Homer's epic poem Odyssey in ancient Greece. In this epic poem, while king Odysseus was at war, he commissioned his friend Mentor to bring, train, and protect his son Telemachus. In this role, the mentor acted as a trusted advisor, a role model, a guide, and a sage for Telemachus' upbringing. In addition, the mentor supported this younger and less experienced individual for a long time by sharing his profound knowledge with him. Following this story, the word 'mentor' has taken its place in the literature to define an experienced, knowledgeable, reliable, and guiding person [18,19]. It has been used in many cultures and has yet to change its structure and meaning. Mentoring is currently used to refer to a long-term learning journey taken by a novice and an experienced individual. In this mysterious journey, the individual with relatively less experience but eagerness to

learn and develop oneself is called a "mentee". In contrast, the experienced and guiding person is called a "mentor" [20,21].

Mentoring is a process designed to help the mentee gain the knowledge, skills, and self-confidence that s/he needs to become a better student, teacher or leader [22]. According to Crow and Matthews [23], during the mentoring journey, the mentee is the passenger, and the mentor is the guide. In contrast, mentoring has two main functions, career counselling and psychosocial support. However, these functions have diversified in today's changing society and organizational life [24,25]. Based on their own experiences, mentors share their knowledge and advice with the mentee to help him/her improve their professional and individual skills. This mentor could be a friend, a teacher, and sometimes even a parent or grandparent, and encourage the mentee's aspirations, hopes, and dreams, which eventually enable her/him to realize their full potential [26]. In the organizational context, though, the mentor is appointed chiefly as part of a formal professional development program.

Due to the significant organizational and individual benefits of mentoring, such as promoting professional success, supporting personal development, increasing organizational productivity, and developing leadership skills, mentoring programs have become widely-used personnel development incentives to support school administrators professionally [27–29]. School administrators have significant roles in managing schools, but their job has become even more complicated and challenging due to the changes in their duties and responsibilities over time. Since they are the decision-making authority, school administrators undertake a strategic role in fulfilling schools' social, organizational, pedagogical, and political functions. Their decisions significantly affect students, teachers, parents, and other stakeholders [30]. As a result, in addition to the training and selection of school administrators, providing them with high-quality mentoring has become crucially important to support the healthy management of schools.

In this digital age, a new perspective has emerged that considers school management a profession requiring a unique preparation process and expertise. The reasons for this paradigm change include expanding roles of school administrators, their increasing authority/autonomy at school, and the school's transformation into a more complex structure [31]. It has been emphasized that new school administrators face many problems and are vulnerable to challenges in the changing and more complex school structure. This perspective has recently gained much research evidence, and scholars often state that mentoring could help support school administrators in the face of these changing circumstances [32,33]. Existing research also indicates that school administrators often have many problems during their first years in the profession, primarily due to insufficient or lack of formal training in school administration, consistency/gap between theory and practice, and/or lack of functional guidance [28].

Daresh [34] listed the main benefits of mentoring for prospective school administrators and stated that the mentoring process based on a close relationship between a novice 'mentee school administrator' and an experienced/expert 'mentor school administrator' would enhance the self-confidence of the novice in their professional competency, help them transfer their theoretical knowledge into practice, and promote their communication skills. In other words, mentoring could help novice school administrators learn the intricacies of the profession and become more socially integrated. Considering all these organizational and individual benefits, mentoring programs for school administrators can offer significant opportunities to promote the professional development of both new and senior school administrators.

3. Materials and Methods

3.1. Study Design

This study analyzes the research field of mentoring for school administrators' professional development using the bibliometric and science mapping analysis methods. Combining these two methods of analysis enables the identification of the conceptual

structure, intellectual evolution, and bibliometric performance of the mentoring for school administrators' professional development knowledge domain [35,36].

3.2. Data Search and Identification

Data for bibliometric and science mapping studies are primarily identified using such digital databases as Google Scholar, Scopus, Web of Science Core Collection (WoS CC), or PubMed. In the current study, we preferred to use Scopus to collect data for several reasons. First, Scopus provides more extensive coverage of journals than WoS CC, and many articles indexed on WoS CC are also indexed on Scopus. This reduces the risk of missing articles and thereby helps to prevent data loss [37]. Scopus is also considered one of the finest databases used in bibliometrics since the bibliographic data supplied by Scopus is more beneficial for such analysis [38]. In addition, Scopus contains more comprehensive and relevant documents in the field of education [13]. Therefore, data for the current study were searched and extracted using the Scopus database.

A three-step procedure was used at this stage: (1) searching and defining data, (2) extracting and cleaning data, and (3) analyzing the data [39]. As a result of this process, 121 articles were selected to be included in the analysis. The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Reviews) guidance was used to report the data search and selection process [40] (see Figure 1).

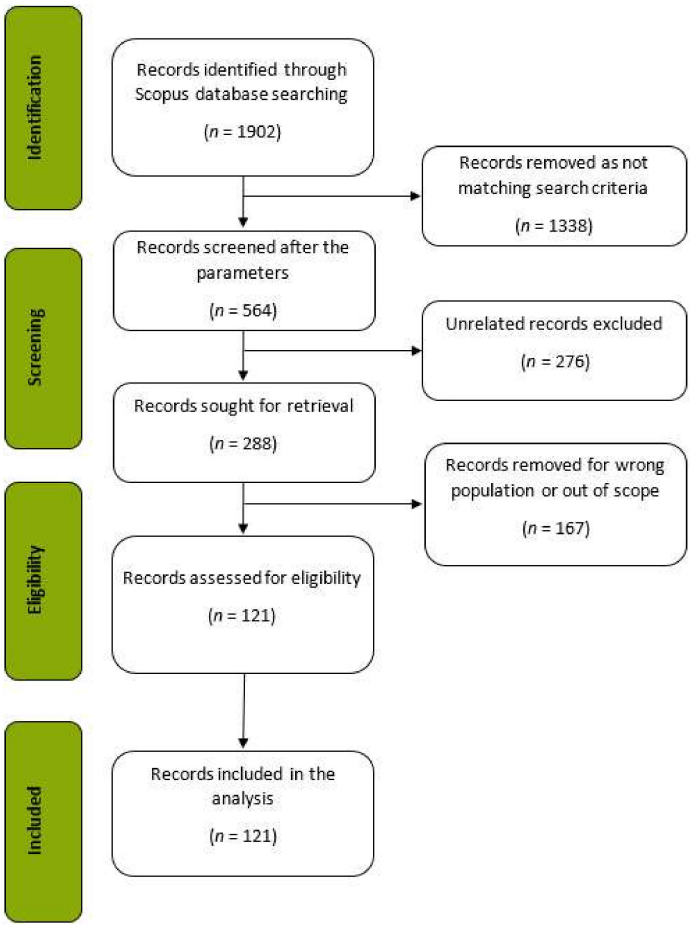


Figure 1. PRISMA flow diagram.

Data for the analysis were selected based on a comprehensive list of inclusion/exclusion criteria presented in Table 1.

Table 1. Inclusion/exclusion criteria.

Criteria	Included	Excluded	Rationale
Language	English	Other languages	English is internationally used as the language of science. Single language helps yield comprehensive conceptual analysis.
Document Type	Journal articles	Books, book chapters, proceedings	We targeted peer-reviewed, high-quality publications.
Context	Mentorship for school administrators only	Mentorship for teachers, students, or other professionals	We wanted context-specific results
Database	Scopus	Other databases (e. g., WoS, Google Scholar, PubMed)	Scopus already covers a broad scope of journals/articles

A keyword search was performed on the Scopus database on 22 September 2022, using the search string below:

> *TITLE ("mentoring" OR "mentorship" OR "mentor *" OR "mentee *" OR "traditional mentoring" OR "electronic mentoring" OR "e-mentoring" OR "digital mentoring" OR "virtual mentoring" OR "online mentoring" OR "distance mentoring" OR "cyber mentoring") AND TITLE ("school *" OR "principal *" OR "principalship" OR "school principal *" OR "school administrator *" OR "school administration" OR "school manager *" OR "school management" OR "head *" OR "headship" OR "headteacher *" OR "head teacher *" OR "school leader *" OR "school leadership" OR "teacher *" OR "secondary education" OR "primary education" OR "preschool education" OR "pre-school education" OR "K-12 education")*

While selecting the keywords, a detailed literature review was conducted on mentorship for school administrators. An initial list of keywords was formed based on this comprehensive review, and two field experts were consulted before agreeing on a final list of keywords. The first search conducted on the Scopus database yielded 1902 documents. Screening through this raw data, we identified that 1338 documents did not match either one or more search criteria in Table 1. Most of these excluded articles had a focus on mentoring for teachers. Skimming through the titles and abstracts of the remaining 564 articles, we identified that 276 were duplicates or did not address mentoring for school administrators' professional development, so we excluded them from the data set. Meanwhile, the remaining resources were checked for eligibility, and 167 documents were excluded as they were evaluated as being out of scope or providing insufficient information about their population. At this stage, we conducted a peer debriefing to discuss the inclusion/exclusion process and reached a high agreement over the 121 documents selected for analysis.

3.3. Data Extraction and Analysis

SciMAT software version 1.1.04 (https://sci2s.ugr.es/scimat/, accessed on 20 August 2022) was used to analyze data in the current study. First, the bibliometric data for each selected article were transferred to SciMAT. Next, keywords with similar meanings were combined manually to conduct a more effective thematic analysis [41,42]. For instance, we combined 'mentor' and 'mentors' or 'head teacher' and 'headteacher'. Next, the overall bibliometric and science mapping analysis was performed. Through bibliometric performance analysis, the distribution of articles addressing mentoring for school administrators' professional development was identified by their year of publication, the accumulated number of articles and the average citations received per article [17]. Then, the science mapping analysis was performed on the SciMAT software tool [41] to determine the conceptual architecture and thematic evolution of the mentoring for school administrators' professional development research field. The SciMAT software was particularly preferred in the current study because SciMAT allows for a combined analysis of scientific mapping and bibliometric performance. It also enables visualization and identification of topics/themes

specific to a research field. In addition, SciMAT demonstrates the intellectual evolution of the research field over sequential periods, allowing for comparative interpretations of its thematic and conceptual evolution [41,43].

The following steps were undertaken during the conceptual science mapping analysis on SciMAT [31,44–46]:

(i) *Identification of research topics*: A standardized network of common words was formed using the keywords extracted from the dataset to apply a clustering algorithm based on the co-occurrence of the keywords. Then, the clustering algorithm was applied to a normalized network of common words to identify research topics. A set of themes was then formed from a collection of closely related keywords. This process allowed identifying and visualizing the conceptual subfields and the thematic evolution of the research field;

(ii) *Visualization of research themes and thematic network*: The themes associated with the mentoring for school administrators' professional development research field were identified using two fundamental tools: *the strategic diagram* and *the thematic network*. Using centrality (x-axis) and density (y-axis) values as the basis, the themes were displayed in a two-dimensional, four-quadrant strategic diagram. Centrality values show the extent to which a cluster interacts with other clusters and the strength of their relationship. It is formulated as $c = 10 \times \Sigma ekh$. In this mathematical formulation, k stands for a keyword related to one particular theme, while h refers to a keyword that relates to another theme. Intensity values show the internal strength of the relationship between the keywords within a theme. It is formulated as $d = 100 (\Sigma eij/w)$. In this formulation, 'i' and 'j' refer to the keywords of a particular theme, and 'w' refers to the number of keywords in that theme.

In order to perform a conceptual analysis based on co-word and h-index analyses, which are conducted automatically by the software, the themes that emerged from the analysis were divided into four categories, and both were presented within the biaxial strategic diagram (see Figure 2). The four quartiles in the strategic diagram were labelled clockwise as motor themes (Q1), basic and transversal themes (Q2), emerging or declining themes (Q3), and highly developed and isolated themes (Q4). The interpretations concerning the themes that emerged in these quartiles were drawn according to the following information:

- Motor themes (Q1): Themes placed in this quartile demonstrated high density and centrality. These themes were highly-developed and had a significant role in the structuring and development of the research field under investigation;
- Basic and transversal themes (Q2): Themes placed in this quartile demonstrated high centrality but low density. The lower density values indicated these themes were relevant to the field but must have been well-developed. However, the higher centrality values indicated they could potentially be involved in the motor themes in the future;
- Emerging or declining themes (Q3): Themes placed in this section demonstrated low density and centrality values. Themes needed to be more developed or represent marginal topics in the field;
- Highly developed and isolated themes (Q4): Themes placed in this section demonstrated high density but low centrality values. They were highly developed but also highly specialized or peripheral to the field. These themes represented topics that lacked appropriate background for the field.

Figure 2b illustrates a thematic network structure that shows the emergence of strategic themes in combination with other subthemes addressed in the field. The name of the primary keyword in the associated theme was used to name each thematic network. The volume of the spheres in the network structure indicates the number of documents corresponding to each related keyword, which are also interconnected. Similarly, the size of each circle aligns with the corresponding number of articles, while the thickness of the lines demonstrates the strength of the relationship between keywords.

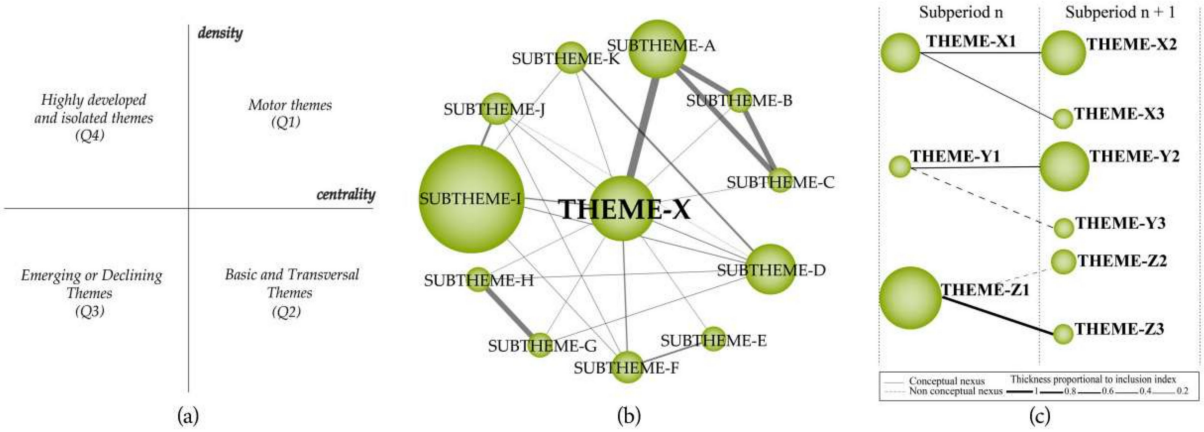


Figure 2. (**a**) Strategic diagram, (**b**) thematic network structure, and (**c**) thematic evolution structure [47].

Figure 2c shows an example of a thematic evolution map. It explores the time, origin, and evolution of the interrelationships of themes and includes a set of themes that emerged over consecutive periods. Whether a theme belongs to another thematic field or is a continuation of a previously-emerged theme is determined based on the interrelationships between these themes. On the thematic map, the exact keywords shared between themes are shown using solid lines, while common words shared along with theme names are shown using dashed lines. The degree of the relationships aligns with the thickness of the lines, while the number of articles aligns with the size of the circles.

The inclusion index also explores the conceptual links between themes from different periods. The equation for the inclusion index is Ii = #(U∩V)/min(#U, #V) [48,49]. The thematic evolution map was formed by combining the U and V themes through conceptual linking (i.e., co-occurring keywords). A thematic connection between the U and V themes demonstrates commonalities and, therefore, their evolution. The increase in the number of keywords shared by clusters across different periods makes the conceptual evolution more evident.

SciMAT allows for analysis over consecutive periods to determine the thematic evolution of the research field under investigation. This period-based analysis saves the data from uniformity [41,42]. Therefore, while identifying themes, the raw data were divided into three periods depending on the number of publications: Period 1 (1990–2011), Period 2 (2012–2016), and Period 3 (2017–2021).

4. Results

4.1. Overall Bibliometric Analysis

The accumulated number of publications, the distribution of articles according to the publication year, the citations per article, the most influential authors, the most influential journals, the most cited articles, and the most productive countries in the mentoring for school administrators' professional development field were determined using bibliometric performance analysis. The results exhibited the global impact of publications in this research field [17].

4.1.1. Publications and Citations Trends

The bibliometric analysis of 121 articles revealed the distribution of these articles by year of publication, the accumulated number of articles, and the average citations per article [42]. The graphical representation of the results is presented in Figure 3.

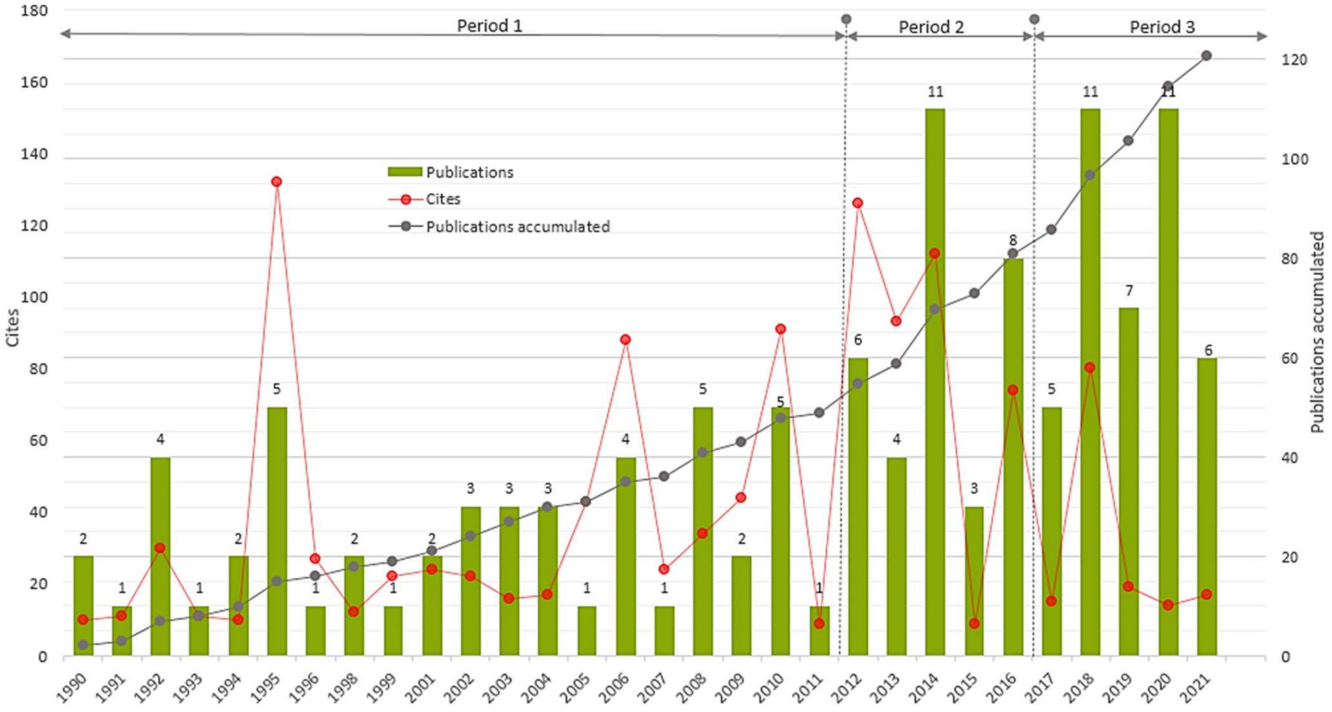


Figure 3. Distribution of publications and citations by year (1990–2022).

As can be seen in Figure 3, research on mentoring for school administrators' professional development was first published in 1990 and continued to gain fluctuating interest between the years 1990 and 2011. During the second period comprising 2012 and 2016, the number of published articles peaked in 2014. From 2016, mentoring for school administrators' professional development garnered increasing research interest. Notably, the distribution of publications by year exhibits a fluctuating interest in publishing research on mentoring for school administrators.

4.1.2. Most Influential Authors

The top 10 authors who published the highest number of articles and received the highest number of citations for their work on mentoring for school administrators' professional development are shown in Table 2. The list of authors was ordered based on the total number of citations received for their published articles. Within the scope of the 121 articles analyzed, a total of 210 authors investigated mentoring for school administrators' professional development. Some of the authors in the list co-authored more than one article.

Table 2. Top 10 authors most cited in the mentoring research field.

Rank	Author	TC	TP	h-Index
1	Bush, Tony	119	5	24
2	Bengtson, Ed	73	3	7
3	Parylo, Oksana	73	3	8
4	Zepeda, Sally J.	73	3	10
5	Pocklington, Keith	61	2	3
6	Weindling, Dick	61	2	8
7	Fletcher, Sarah J.	47	1	7
8	Rhodes, Christopher	47	1	14
9	Ehrich, Lisa Catherine	46	1	17
10	Hansford, Brian C.	46	1	14

TC = total citations; TP = total publications; data retrieved from Scopus on 22 September 2022.

As presented in Table 2, Tony Bush made the highest contribution to the field with the highest number of articles (n = 5) and citations (n = 119). Ed Bengtson, Oksana Parylo, and Sally J. Zepeda contributed significantly to the development of the research field through three articles cited 73 times by relevant publications.

4.1.3. Most Influential Journals

It was determined that studies on mentoring for school administrators' professional development were published in 47 journals between 1990 and 2021. Table 3 shows the ten most influential journals that published the most articles. The journals were listed based on the total number of articles they published.

Table 3. Top 10 journals publishing the highest number of articles in the mentoring domain.

Rank	Journal Name	TP	TC	SJR	Scopus Quartile
1	Mentoring and Tutoring: Partnership in Learning	15	155	0.29	Q3
2	International Journal of Mentoring and Coaching in Education	14	198	0.54	Q2
3	NASSP Bulletin	11	74	0.35	Q3
4	Educational Management Administration & Leadership	8	120	1.28	Q1
5	Journal of Educational Administration	8	216	1.01	Q1
6	Research in Educational Administration and Leadership	6	3	0.25	Q3
7	Journal of Research on Leadership Education	4	56	0.63	Q2
8	Management in Education	4	43	0.75	Q1
9	Phi Delta Kappan	3	17	0.43	Q2
10	Professional Development in Education	3	34	1.09	Q1

TP = total publications; TC = total citations; SJR = scientific journal ranking. Data retrieved from Scopus on 22 September 2022.

As presented in Table 3, the *Mentoring and Tutoring: Partnership in Learning* journal led the list of most influential journals with a total of 15 publications and was followed by the *International Journal of Mentoring and Coaching in Education* with a total of 14 publications. This is not surprising considering the mentoring and education focus of both journals. Almost all of the journals included in the list focus on school management and leadership, which might be due to the leadership enhancement potential of mentoring.

4.1.4. Most Cited Articles

Among the 121 articles included in the analysis, the articles which received the highest number of citations were determined. The ten most cited articles are listed in Table 4 according to the total number of citations they received.

As clearly shown in Table 4, the article by Rhodes and Fletcher on mentoring for school administrators' professional development received the highest number of citations. These writers were among the top 10 authors published in this research field (7th and 8th authors in the list, see Table 2), and their study that investigated mentoring for the enhancement of school administrators' self-efficacy and leadership skills received a total of 47 citations since it was published in 2013. Despite being relatively more recently published than the other studies included in the list, it gained a significant citation rate and contributed significantly to subsequent research. It is also noteworthy that the articles listed in Table 4 cover a broad scope of perspectives on the target and outcomes of mentoring.

4.1.5. Most Productive Countries

It was determined that mentoring for school administrators' professional development was studied in 21 countries. The 10 most productive countries that contributed to this knowledge domain are listed in Table 5.

Table 4. Top 10 articles cited in the mentoring domain.

Rank	Article Name	Journal Name	Author(s)	Year	TC *
1	Coaching and mentoring for self-efficacious leadership in schools	*International Journal of Mentoring and Coaching in Education*	Rhodes C., Fletcher S.	2013	47
2	The principalship: how significant is mentoring?	*Journal of Educational Administration*	Hansford B., Ehrich L.C.	2006	46
3	Professional development for heads: The role of mentoring	*Journal of Educational Administration*	Bush T., Coleman M.	1995	45
4	Reflections on mentoring for new school leaders	*Journal of Educational Administration*	Southworth G.	1995	44
5	Head to head: A systematic review of the research evidence on mentoring new head teachers	*School Leadership and Management*	Hobson A.J., Sharp C.	2005	43
6	Mentoring and coaching educators in the Singapore education system	*International Journal of Mentoring and Coaching in Education*	Tee Ng P.	2012	38
7	Preparation and induction for school principals: Global perspectives	*Management in Education*	Bush T.	2018	37
8	Principals in practice: The importance of mentorship in the early stages of career development	*Law and Policy*	Kay F.M., Hagan J., Parker P.	2009	34
9	Mentoring for new headteachers: recent British experience	*Journal of Educational Administration*	Bolam R., McMahon A., Pocklington K., Weindling D.	1995	34
10	Mentoring and coaching rural school leaders: What do they need?	*Mentoring and Tutoring: Partnership in Learning*	Duncan H.E., Stock M.J.	2010	31

(*) Data retrieved from Scopus on 22 September 2022.

Table 5. Top 10 countries with the most publications in the mentoring domain.

Rank	Country	TP *	TC
1	United States	55	512
2	United Kingdom	12	309
3	Canada	9	73
4	Singapore	8	105
5	Australia	6	75
6	South Africa	6	12
7	Turkey	5	33
8	Israel	5	31
9	New Zealand	4	47
10	Chile	2	7

(*) Data retrieved from Scopus on 22 September 2022.

As seen in Table 5, the United States has published the highest number of articles (n = 55) on mentoring for school administrators' professional development. The United Kingdom, Canada, and Singapore followed the United States. The list indicates that mentoring for school administrators' professional development garnered research interest in Western and Eastern countries. However, the construction of the knowledge domain was particularly based on the results from Western countries.

4.2. Science Mapping and Performance Analysis

This section reports the results that emerged from the science mapping analysis that was conducted on SciMAT software. The section mainly presents (i) scientific evolution

structure identified through period-based analysis, (ii) overlapping map, and (iii) thematic evolution structure.

4.2.1. Scientific Evolution Structure

Period 1 (1990–2011)

During the first period, seven themes emerged explaining the 49 articles included in the analysis. The performance values and strategic diagrams related to these themes are presented in Figure 4.

a. Period 1 (1990–2011)

b. Themes Performance

Cluster	Documents	h-index	Sum Citation	Centrality Range	Density Range
MENTORING	6	5	80	1	0.57
PROFESSIONAL-DEVELOPMENT	3	2	34	0.86	0.86
NETWORKING	2	2	13	0.71	1
RURAL-PRINCIPALS	1	1	31	0.57	0.43
LEADERSHIP	2	2	22	0.43	0.71
ADMINISTRATIVE-SUPPORT	1	1	12	0.29	0.14
PERSPECTIVE-ON-MENTORING	1	1	18	0.14	0.29

Figure 4. (**a**) Strategic diagram and (**b**) performance analysis for Period 1.

Seven main themes emerged during the first analysis (1990–2011). *Mentoring*, *professional development*, and *networking* themes emerged as the motor themes. The finding indicated that these themes contributed the most to the field's development. *Leadership* themes emerged as highly developed and isolated themes. The themes in this quartile were strongly related but did not provide the appropriate background or lacked significance for the research field under investigation. *Perspective on mentoring* and *administrative support* themes were found to be emerging/declining themes, which indicated that these themes just emerged or disappeared during this period. The *rural principals* theme emerged as a primary and transversal theme. The finding indicated that this theme needed to be developed more during this period, although it had a close association with the research field. The most significant theme during Period 1 was the *mentoring* theme, which emerged as a primary and transversal theme and was represented by six documents.

The topics related to the main themes that emerged during the first analysis period (1990–2011) were determined and exhibited in cluster networks (Figure 5). As can be seen in Figure 5, the central theme of *mentoring* (1, 0.57) was determined to be strongly associated with *leadership development*, *learning*, *administration*, *career phases*, *coaching*, *enculturation*, *headship*, and *individual behavior* themes.

The central theme of professional development (0.86, 0.86) was determined to be strongly associated with technology integration, technology standards, mentors' task, novice principals, novice teachers, and school administrators themes. The central theme of networking (0.71, 1) was found to have relationships with workplace learning, recruitment, school leadership, talent management and teachers themes.

Period 2 (2012–2016)

The 32 articles published during Period 2 were analyzed, and the 13 themes that emerged from this analysis are shown in Figure 6, which exhibits the strategic diagrams and the relevant performance values.

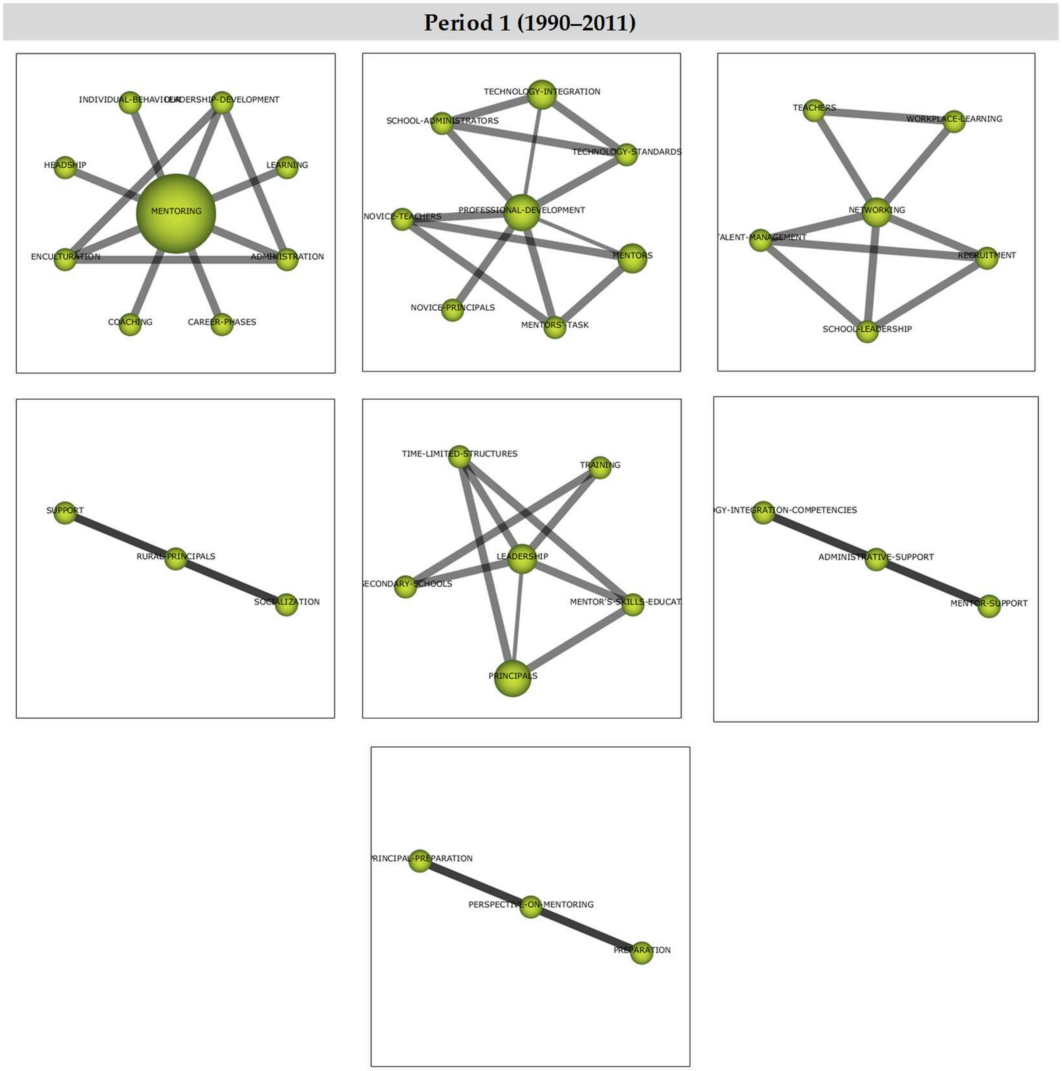
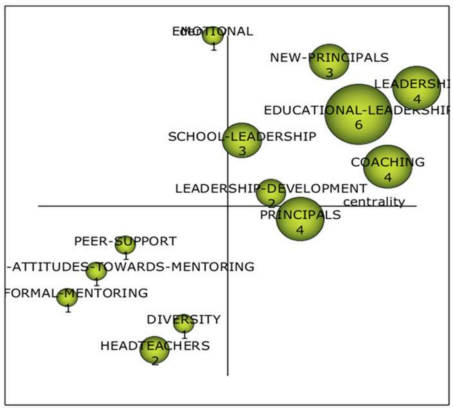


Figure 5. Thematic network structures for Period 1.

The most significant theme during the second period (2012–2016) was the *educational leadership* theme, represented by six documents. *Leadership*, *coaching*, *educational leadership*, *new principals*, *leadership development* and *school leadership* themes emerged as motor themes that guided research during this period. *The emotional* theme emerged as a highly developed and isolated theme, which indicated that it lacked the appropriate background or importance for this research field. *Peer support*, *mentees' attitudes towards mentoring*, *informal mentoring*, *diversity*, and *headteachers* themes were located in the emerging/declining themes quartile, which indicated that they were either being newly studied or lost research interest during the second period. The *principal* theme was found to be a basic and transversal theme. Although it was related to the field, it did not develop sufficiently during this period.

The topics related to the main themes that emerged during the second analysis period (2012–2016) were determined and exhibited in cluster networks in Figure 7. As can be seen, the central theme of *leadership* (1, 0.85) was found to have associations with *self- development*, *self-efficacy*, *gender equity*, *intrapersonal leadership*, *mentoring*, *resilience*, *role change*, and *school management* themes.

a. Period 2 (2012–2016)



b. Themes Performance

Cluster	Documents	h-index	Sum Citation	Centrality Range	Density Range
LEADERSHIP	4	4	86	1	0.85
COACHING	4	3	61	0.92	0.62
EDUCATIONAL-LEADERSHIP	6	5	63	0.85	0.77
NEW-PRINCIPALS	3	3	51	0.77	0.92
PRINCIPALS	4	4	67	0.69	0.46
LEADERSHIP-DEVELOPMENT	2	2	40	0.62	0.54
SCHOOL-LEADERSHIP	3	3	47	0.54	0.69
EMOTIONAL	1	1	3	0.46	1
DIVERSITY	1	1	9	0.38	0.15
HEADTEACHERS	2	2	41	0.31	0.08
PEER-SUPPORT	1	1	8	0.23	0.38
MENTEES'-ATTITUDES-TOWARDS-MENTORING	1	1	5	0.15	0.31
INFORMAL-MENTORING	1	1	6	0.08	0.23

Figure 6. (**a**) Strategic diagram and (**b**) performance analysis for Period 2.

The central theme of *coaching* (0.92, 0.62) was determined to have strong relationships with *finance, induction programs, acculturation, assimilation, career identity, coaching and mentoring, critical self-reflection,* and *education* themes. On the other hand, the central theme of *education leadership* (0.85, 0.77) was strongly associated with *mentoring for staff development, mentoring in education, adult learning, assistant principals, deputy/assistant-principals, leadership preparation*, and *learning and development* themes.

The central theme of *new principals* (0.77, 0.92) was identified to have associations with *professional development and mentoring, US-based principal mentoring, instructional leadership, mentoring mindset, principal attrition, principal development, principal mentors* and *principal training* themes. On the other hand, the central theme of *leadership development* (0.62, 0.54) was related to *succession planning, educational administration, mentors*, and *principal preparation* themes.

The central theme of *school leadership* (0.54, 0.69) was found to have associations with *teachers, visionary leaders, effectiveness, mentor–mentee matching, site-based learning*, and *successful school*.

Period 3 (2017–2021)

The 40 articles published during the third period were analyzed, and the 15 themes that emerged from this analysis are shown in Figure 8. The figure presents the strategic diagram for these themes and the relevant performance values.

The third period covers the years between 2017 and 2021. Among the fifteen themes identified for this period, *the mentoring* theme was the most significant and was represented by six documents. The *mentoring* theme emerged in the basic and transversal theme quartile, which indicated that it did not develop sufficiently despite being necessary for the research field. *Administrators, superintendents, schools, mentors, professional development, school administrators,* and *school principals* themes emerged as motor themes. The *mentorship* theme was highly developed and isolated, while the themes of *principals, mentors and mentees, mentoring quality, social justice, principal preparation* and *school leadership* were the emerging/declining themes.

The topics related to the main themes that emerged during the third period of analysis (2017–2021) were determined and exhibited in cluster networks in Figure 9. As can be seen, the central theme of *administrators* (1, 1) was strongly associated with *principals, students, building level specialist, district based administrators, higher education, I instructional coaches, new principals*, and *new teachers* themes.

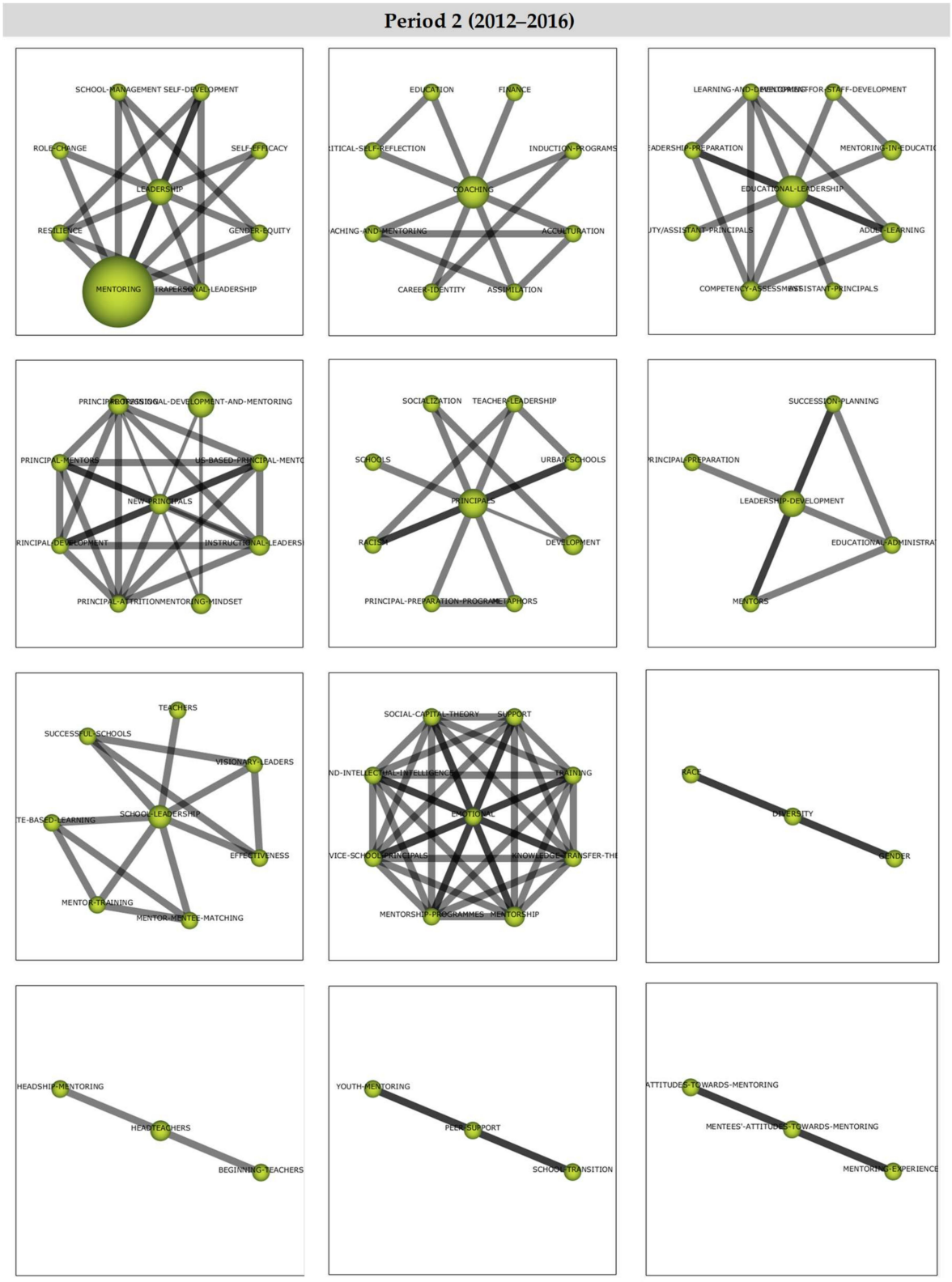
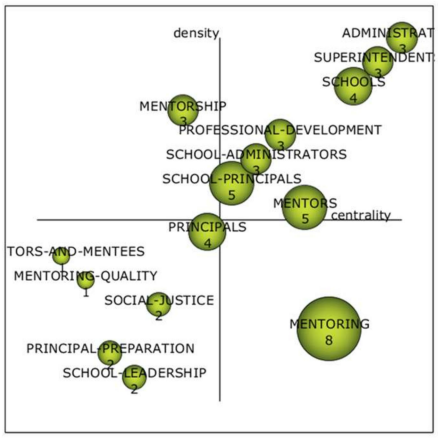


Figure 7. Thematic network structures for Period 2.

a. Period 3 (2018–2022)



b. Themes Performance

Cluster	Documents	h-index	Sum Citation	Centrality Range	Density Range
ADMINISTRATORS	3	0	0	1	1
SUPERINTENDENTS	3	0	0	0.93	0.93
SCHOOLS	4	1	4	0.87	0.87
MENTORING	8	2	19	0.8	0.2
MENTORS	5	1	17	0.73	0.53
PROFESSIONAL-DEVELOPMENT	3	2	5	0.67	0.73
SCHOOL-ADMINISTRATORS	3	1	3	0.6	0.67
SCHOOL-PRINCIPALS	5	2	40	0.53	0.6
PRINCIPALS	4	1	2	0.47	0.47
MENTORSHIP	3	1	12	0.4	0.8
SOCIAL-JUSTICE	2	2	6	0.33	0.27
SCHOOL-LEADERSHIP	2	1	1	0.27	0.07
PRINCIPAL-PREPARATION	2	2	17	0.2	0.13
MENTORING-QUALITY	1	1	9	0.13	0.33
MENTORS-AND-MENTEES	1	1	7	0.07	0.4

Figure 8. (**a**) Strategic diagram and (**b**) performance analysis for Period 3.

The central theme of *superintendents* (0.93, 0.93) was found to have associations with *diverse classrooms*, *evaluation*, *teacher leaders*, *teachers*, *coaching*, *collaboration*, *community engagement*, and *district management* themes. On the other hand, the central theme of *schools* (0.87, 0.87) was related to *teacher effectiveness*, *teacher engagement*, *family*, *level: K-12*, *LGBT*, *motivation*, *sexuality*, and *supported* themes.

The central theme of *mentors* (0.73, 0.53) was identified to have associations with *on the job learning*, *principal preparation program*, *capacity building*, *early career*, *induction programs*, *international development*, *leaders*, and *mentees* themes. On the other hand, the central theme of *professional development* (0.67, 0.73) had associations with *secondary schools*, *self-reflection*, *mentoring in education*, *novice principals*, *policy studies*, *principals evaluation*, *professional core knowledge*, and *school management team* themes.

The central theme of *school administrators* (0.6, 0.67) was identified to have associations with *school leaders*, *teacher induction programs*, *beginning teachers*, *learning culture*, *mentoring-based learning culture*, *mentor teachers*, *principal engagement*, and *qualitative research methodology*. On the other hand, the central theme of *school principals* (0.53, 0.6) was found to have relationships with *questionnaire development*, *supervisor support*, *administrative support*, *emotional competencies*, *headteachers*, *leadership development*, *leadership-preparation*, and *peer mentoring* themes.

4.2.2. Overlapping Map

The number of keywords used in each period of analysis and the newly-appeared keywords that were reused or disappeared in the next period are all shown on the overlapping-items graph [50]. The overlapping graph in Figure 10a demonstrates that 40 keywords appeared during the first period. Twenty-six of these keywords did not appear during the following period, while fourteen were also used during the second period. Eighty-nine keywords were used during the second period, twenty-nine were also used during the last period, and sixty were not used. During the third period, 113 keywords appeared in total. During the second period, the number of newly-used terms was 75, while their number reached 84 during the third period. The increase in the similarity index from 0.12 to 0.17 between the sub-periods indicated that many new keywords were added across the periods, and they constantly evolved.

The overlapping-items graph shows that the terminology related to mentoring for school administrators' professional development was increasingly consolidated across periods. Additionally, new terms appeared in the field across periods. As shown in Figure 10a from left to right, the number of keywords was 40 during the first period, and their number increased to 113 during the last period. The increasing number of keywords

from the first to the last period of the analysis indicated that mentoring-oriented research topics diversified and increased cumulatively. The increase in the number of keywords added in each period shows that issues discussed in the mentoring research field were perpetually developing in scope. The disappearance of some keywords shows that issues addressed by the mentoring researchers were perpetually updated in this research field.

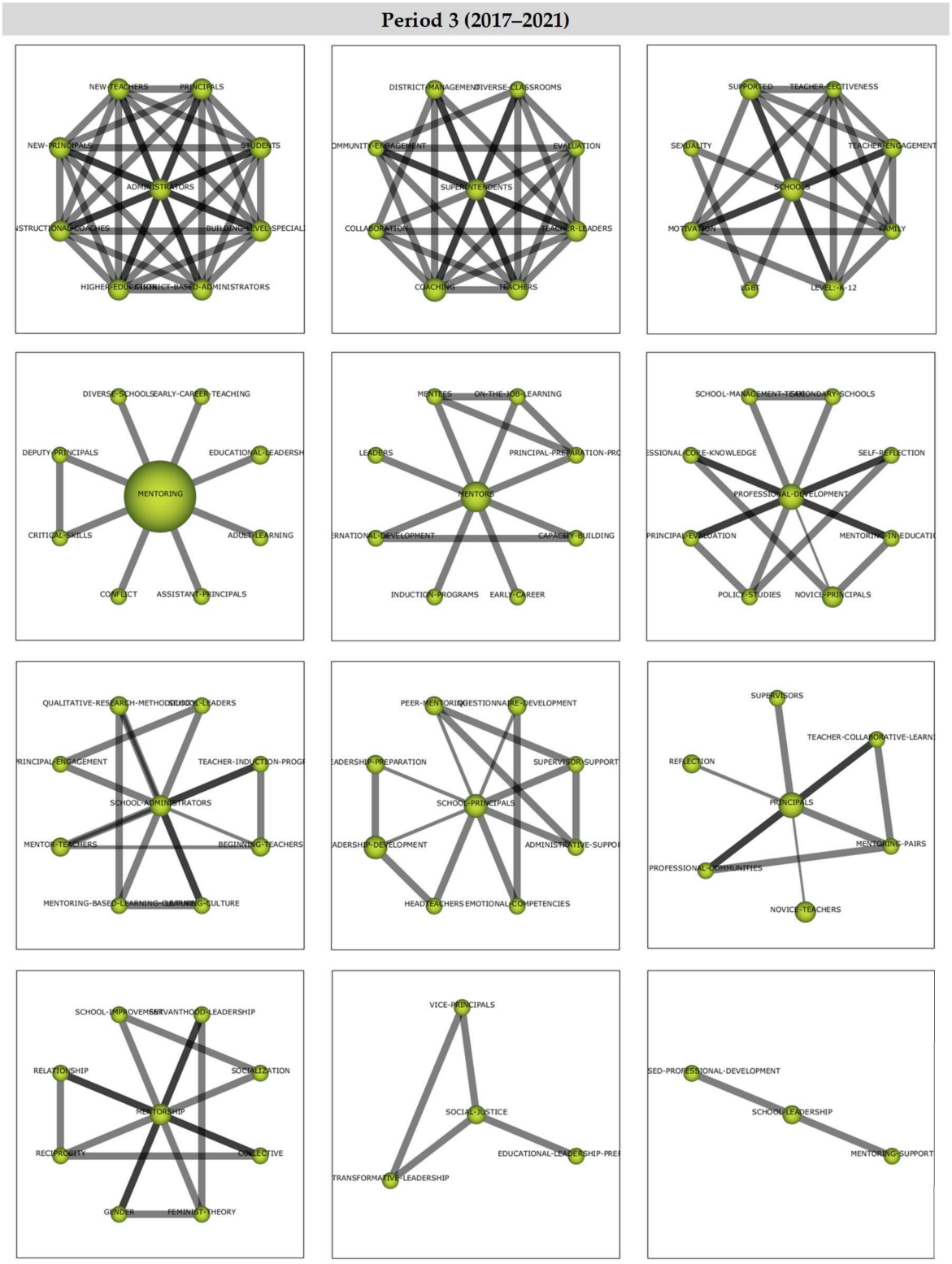


Figure 9. Thematic network structures for Period 3.

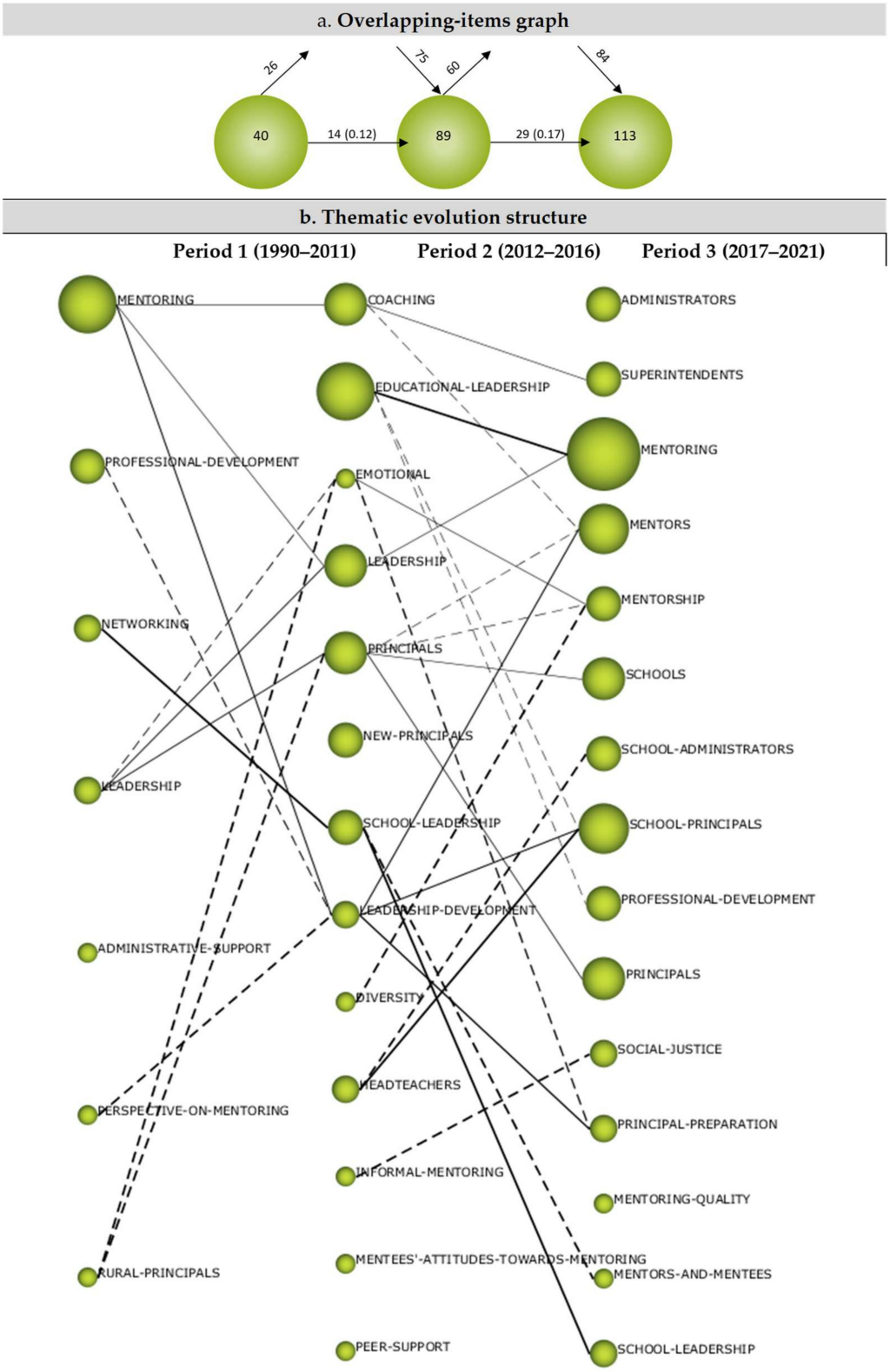


Figure 10. (**a**) Overlapping map, (**b**) thematic evolution map.

4.2.3. Thematic Evolution Structure

The relationship between the development patterns in the mentoring for school administrators' professional development knowledge domain was shown in the thematic evolution map in Figure 10b. The figure highlights the evolutionary relationships between

the research themes that emerged across three analysis periods. The size of the spheres on the map corresponds to the number of articles, while the thickness of the lines connecting these spheres indicates the strength of the correlation between the themes that emerged during these periods [41,46]. As shown on the thematic evolution map, seven themes emerged during the first period of analysis (2009–2016), constituting 40.50% of the articles (49 documents) included in the study. Among these themes, the *leadership* theme continued to exist in other periods.

In contrast, *mentoring, professional development, networking, perspective on mentoring,* and *rural principals* themes were connected with other themes that emerged during the second period. The *administrative support* theme disappeared during the second period without connecting with any themes. However, the *mentoring* theme was connected with the *coaching*, *leadership,* and *leadership development* themes during the second period. The *professional development* theme evolved into the *leadership development* theme during the second period, while the *networking* theme evolved into the *school leadership* theme. The *leadership* theme was connected to the *emotional, leadership*, and *principals* themes during the second period. The *perspective on mentoring* theme changed into the *leadership development* theme, while the *rural principals* theme changed into *emotional* and *principals* themes.

Thirteen themes emerged during the second period (2017–2019), constituting 26.45% of the articles (32 documents) included in the study. One theme was transferred from the first period in addition to the eleven newly-appeared themes. Ten themes that emerged during this period were related to the themes from the first and third periods. The *principals* and *school leadership* themes continued to exist during the last period, whilst the *coaching* theme was connected with the *superintendents* and *mentors* themes during the last period. The *educational leadership* theme was connected with *mentoring, school principals*, and *professional development* themes during the last period, whilst the *emotional* theme was connected with the *mentorship* and *principal preparation* themes. The *leadership* theme changed into the *mentoring* theme during the last period. The *principals* theme was connected with *mentors, mentorship, schools*, and *principals* themes during the last period, whilst the *school leadership* theme was connected with the *mentors and mentees* and *school leadership* themes during the last period. The *diversity* theme changed into the *mentorship* theme during the last period, whilst the *headteachers* theme was connected with the *school administrators* and *school principals* themes during the last period. The *informal mentoring* theme changed into the *social justice* theme during the last period. The themes *new-principals, mentees' attitudes towards mentoring,* and *peer support* that emerged during the second period did not connect with any themes from the first or last period.

The third period (2020–2022) represented 33.05% of the articles (40 documents) included in the study. Fifteen themes emerged during this last period. The *principals* and *school leadership* themes also existed in the previous period. In contrast, *administrators, superintendents, mentoring, mentors, mentorship, schools, school administrators, school principals, professional development, social justice, principal preparation,* and *mentoring quality* themes appeared for the first time during the third period. All themes, except the *administrators* and the *mentoring quality* themes, were connected to the themes that emerged during the previous period.

5. Discussion

This study aimed to reveal the intellectual structure and evolution of research on mentoring for the professional development of school administrators through bibliometric and science mapping analysis. The study results showed that mentoring for the professional development of school administrators has received growing attention since the early 1990s and has accumulated an increasing amount of research. Depending on the number of studies published in this knowledge domain, the publication output on mentoring school administrators was examined across three consecutive periods.

During the first period covering 1990 and 2011, *mentoring, professional development*, and *networking* emerged as the main themes. The prominence of these themes may be

closely related to the sweeping changes in the roles of school administrators with the acceleration of educational reforms in the globalizing world. School administration has become a more complex and challenging profession due to the changing needs of students and the increasing expectations of teachers, parents and school stakeholders [51–53].

Although the focus of the pioneering mentoring research for professional development has been primarily on teachers, growing awareness of the pivotal roles of school administrators in school success and effectiveness has initiated newer perspectives into the professional development of school administrators. As a result, pursuits of newer programs, planning, and budgets to support the improvement of school administrators' essential professional skills and capabilities have become more prevalent [54].

The review of relevant literature shows that there were neither great expectations nor significant interest in the professional development needs of school administrators before the 1980s. During this period, professional development practices for school administrators were unplanned and limited in terms of budget, scope, and content [55]. This situation has changed since the 1990s, and programs contributing to the professional development of school administrators have been initiated [56,57]. Professional development practices encompass any approach aimed at transferring knowledge, improving skills, or causing school administrators to be more effective. Mentoring is one of these practices used to promote school administrators' professional development [58]. Unlike other practices, the mentoring process in professional development also includes "work-embedded learning" [59]. This learning process supports both personal and professional development. Mentoring has begun to see more value over the years with its potential to bring individual and organizational benefits such as developing leadership skills, providing support for individuals who assume a new role, expanding their knowledge and understanding, and helping younger professionals mature [60]. As supported by the current study's findings, mentoring for school administrators' professional and personal development has become increasingly common.

Another prominent theme that emerged during the first period was the *networking* theme. One of the critical problems experienced by school administrators is considered to be the feeling of loneliness. Many school administrators are known to experience a feeling of loneliness due to the intensity of their daily work, the diverse expectations and needs of teachers, students and parents, and the pressure and stress caused by the increased accountability demands. It is challenging to understand that school administrators feel lonely since they spend significant time interacting with teachers and students. However, their complex roles often induce isolation [61]. Wright [62] refers to this feeling experienced by school administrators as "lonely at the top". This feeling of loneliness might harm the psychological well-being of school administrators. Riley [63] states that school administrators need urgent support to cope with the difficulties and loneliness brought by their jobs. Ng and Szeto [64] state that school administrators can be matched with an experienced principal to establish positive networking and exchange information and thoughts. This positive networking created through mentoring can, in turn, reduce their feeling of loneliness and isolation because quality mentoring provides psychological support through networking in addition to professional development [65]. Networking activities also offer opportunities for school administrators to understand and solve problems through peer support. These kinds of work-embedded learning opportunities help school administrators develop their knowledge and skills, which can positively affect the educational environment at school [66].

The current findings revealed that *educational leadership, leadership, coaching, new principals, leadership development,* and *school leadership* themes were the most influential and prominent themes during the second period covering the years between 2012 and 2016. Leadership has become integral to the changing roles of school administrators, which have evolved from operational management to educational leadership, and have been related to various positive outcomes such as balancing managerial and teaching roles and managing curricula [67]. As a comprehensive concept, educational leadership is closely

linked to school effectiveness, student learning, relationships with teachers, and school climate [68]. However, many school administrators need to receive training in educational leadership before starting their new duties at school. These people, who were teachers before assuming the school administration role, try to acquire leadership skills after taking on managerial roles. This raises the question of how school administrators can develop their leadership skills effectively [69]. Rhodes and Fletcher [70] stated that mentoring and coaching provide adequate professional development opportunities for principals and other school leaders. In addition, the mentoring relationship forms a significant basis for developing leadership skills [71]. Mentoring is also helpful in attaining sustainable leadership development [11,72] by improving the school administrators' leadership skills and building sustainable school-wide capacity for leadership, which also contributes to school succession planning [73]. Mentoring could also help school administrators adopt newer models of leadership developed to meet the needs of contemporary schools, such as distributed leadership [74] or digital leadership [75,76], and enable the sustained implementation of innovative programs and practices [77]. This would also contribute significantly to the sustainability of modern schools in the face of fast-changing conditions and expectations.

Other prominent themes that emerged during the second period were *coaching* and *new principals* themes. Coaching is a learning relationship that offers benefits such as developing leadership skills, problem-solving and professional development [78]. Coaching is often confused with mentoring; however, it differs from mentoring in that it focuses on developing more specific and personal skills and is shorter in duration than mentoring. While coaching aims to improve a person's performance in some aspects of their work or personal lives, mentoring deals with a more comprehensive and holistic development [79]. In many studies, it has been emphasized that the use of coaching in education will improve the leadership skills of school administrators [80], increase school success, and create a learning–teaching environment that is sensitive to the needs of teachers and students [81,82]. Despite the benefits it provides for school administrators and the development of their professional and personal skills, the number of studies on leadership coaching still needs to be increased in the relevant literature [83].

Fifteen themes were identified by analyzing articles published during the third period (2017–2021). Unlike other periods, *administrators, superintendents, school administrators, school principals, mentoring quality,* and *social justice* were the prominent themes. *The themes of administrators, superintendents,* and *school administrators* indicated that mentoring was becoming widespread as an essential career development tool for school principals and other professionals in managerial positions (assistant principal, education inspector or other senior education administrators). Kılıç and Gümüş [84] stated that mentoring/coaching programs could play an essential role in the development of school administrators, especially novice ones. A good match between the mentor and the mentee, the competencies of the mentors (knowledge, experience, ability to cooperate, etc.), and the mentee's willingness to learn, significantly impacted the sustainability and success of mentoring programs.

During the third period, the *mentoring quality* theme was one of the themes that emerged for the first time. The influence of the school administrator on the success/failure of the school, the significant responsibilities they undertake, and the higher expectations from them as educational leaders have further increased the importance of the mentoring process used in training school administrators. This has also contributed to the increase in the number of studies on the quality of the mentoring process. Although many factors were mentioned for the quality of mentoring, it was emphasized that the mentor–mentee relationship was the most crucial element in this process. Constructive and non-judgmental interactions between the mentor and the mentee are crucial for developing a safe and collegial environment that enables the active participation and reflection of school administrators as mentees [85]. Another significant factor in the quality of this relationship is mutual trust, because it is necessary to enable a mutual flow of ideas and discussions [73,85].

Studies on the outcomes of quality mentoring have stressed that a high-quality mentoring relationship increases job satisfaction through providing psychosocial and career-related

support, decreases turnover intention, and increases perceived career success [86]. Therefore, a qualified and positive mentor–mentee relationship also determines the sustainability and success of the mentoring program. Hence, a good understanding of the factors that could promote a more positive mentor–mentee relationship would enable the mentoring process to produce the expected outcomes. However, other factors such as age, gender, interests, goals and expectations should also be considered in designing these programs. Proper mentor–mentee matching would eventually increase the quality of the mentoring process and ensure that both parties obtained the most out of the mentoring process [87,88].

Another theme that emerged for the first time during the third period was the *social justice* theme. Social justice is one of the most studied subjects in the educational leadership field. In the relevant literature, social justice has been handled very narrowly. Studies have primarily focused on the need for school leaders' training in dealing with complex situations in urban and rural schools [89]. The uniform structure of schools has changed, and they have become colorful institutions hosting individuals from different cultures and nationalities. From this point of view, school principals should see themselves as a "social justice leader" who can ensure all students access to quality education regardless of their characteristics and backgrounds [90]. As influential school leaders, administrators are responsible for implementing changes that will ensure social justice. For this reason, school administrators are expected to cope with the problems arising from students' race, ethnicity, culture, language, and socio-economic differences, and to create innovative and proactive solutions to these problems [91]. Thus, mentoring could contribute to the social justice perspective of school leadership and help them cope with the challenges of managing schools in a socially just manner.

6. Conclusions

Combining the bibliometric and science mapping analysis, the current study delineated the conceptual architecture and intellectual evolution of mentoring research with a focus on the professional development of school administrators. Despite having a long history in the socialization and training of novice teachers, mentoring for supporting school administrators' induction into their new roles and promoting their professional development was relatively newly addressed in the literature. However, it also garnered growing research interest, particularly in the last couple of years. As this study showed, initial research addressing the mentoring of school administrators was mainly focused on the professional development and networking aspects of mentoring. However, during the following period, the leadership-promoting aspect of mentoring became the focus of research, and studies mainly addressed the development of novice principals' leadership skills through mentoring. Analysis of research published during the last five years indicated that variables addressed in mentoring for school administrators research were diversified, including principals and other educational administrators such as superintendents. This also occurred due to the increasing interest in distributed leadership in schools, which requires instilling collective responsibility for the improvement and effectiveness of schools [74]. This perspective in school leadership is now considered crucial to meeting modern schools' complex demands and enabling sustainability. Similarly, sustainable and quality mentoring programs built upon the mutual exchange of ideas are believed to be conducive to establishing this distributed cognition in schools [85].

As the current results showed, recent studies on mentoring school administrators were also particularly interested in enhancing the quality of the mentoring process and the role of mentoring in developing leadership skills for implementing school-wide social justice. Considering the significant role of education in securing a sustainable world for everyone regardless of their differences [92], building school administrators' capacity to construct a socially-just environment starting from their schools becomes crucial. Mentoring from early stages could help develop school administrators' leadership skills for social justice and promote school improvement, which eventually will help schools sustain a high level of

success and innovation by developing their capacity for cultural responsiveness, continuous learning, and constant change [93].

The results of the current study also have some implications for future studies on mentoring school administrators. In addition to providing school administrators with professional and personal support, mentoring is an effective means of building networks outside the organization. In the globalized context of school, developing school administrators' capacity to build networks not only through traditional face-to-face interaction but also through digital interactions is crucial. However, as the current results showed, networking as a mentoring function was only studied during the first period and lost research interest during the last period. However, as the context of modern schools is evolving, the extent and ways of networking are also changing. Therefore, the role of mentoring in building such capacity could be addressed in future studies. The existing studies mainly investigated formal mentoring programs, and informal mentoring did not emerge as a significant theme in either of the periods. Informal mentoring as a means of enabling effective and sustainable mentoring for school administrators could be addressed further in future studies. One last research implication could be related to investigating the mentoring needs of school administrators working in different school contexts, such as rural or urban schools, or schools with cultural, religious or racial heterogeneity. Comparative analysis concerning the influence of context-based development of mentoring programs could also contribute significantly to the mentoring school administrators' literature.

Although the current study has provided a broad perspective for understanding the evolution of research on mentoring for school administrators' professional development since the first study was published in 1990, and offered significant insights into future investigations, it also bears some limitations. The study comprised articles indexed in the Scopus database while excluding other publications such as books, book chapters or conference proceedings. Even though Scopus includes comprehensive coverage of quality journals and articles, and the co-word analysis allows it to reach an even broader scope of research, the current results should be interpreted concerning these specifications. In addition, it is noteworthy to underline that the current study differs from classical review studies. In this study, the analysis was performed using the meta-data regarding the selected articles, so the results did not exhibit previous research findings but revealed the changing research trends and evolution of themes addressed in this research field over time.

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Data Availability Statement: Data used are publicly available; no identifying information was collected or included. All the data used in this research were accessed through the Scopus database.

Conflicts of Interest: The authors declare no conflict of interest.

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