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Review

The Intellectual Evolution of Educational Leadership Research: A Combined Bibliometric and Thematic Analysis Using *SciMAT*

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Abstract: This study aims to describe the century-long trajectory of educational leadership research (ELR), including changes over time in its main and subsidiary themes, as well as its most influential authors, papers, and journals. The study combines the bibliometric performance and science mapping analysis of 7282 articles retrieved from the Scopus and WoS databases. SciMAT software (version 1.1.04) was used to analyze changes over four sequential time periods and to exhibit the thematic evolution of the field—Period 1 (1907 to 2004), Period 2 (2005 to 2012), Period 3 (2013 to 2019), and Period 4 (2020–2023). Research during Period 1 focused on principals and included efforts to distinguish between their administrative functions and forms of 'strong' leadership contributing to school improvement. Period 2 included research aimed at understanding what strong principal leadership entailed, including the development and testing of more coherent models of such leadership. While instructional and transformational leadership models were prominent during Periods 1 and 2, Period 3 research invested heavily in conceptions of leadership distribution. Early research about 'social justice leadership' appeared during this period and eventually flourished during Period 4. While principals were an active focus through all Periods, the leadership of others gradually dominated ELR and accounted for the broader leadership theme found in all four periods. The results point to the evolutionary nature of ELR development, which eventually produced a relatively robust knowledge base. Experiences with the COVID-19 pandemic suggest that crises such as this might prompt more revolutionary orientations in the ELR field.

Keywords: educational leadership; leadership; school leadership; bibliometric; science mapping; SciMAT

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1. Introduction

In its history of over a hundred years, leadership science has garnered the attention of scholars from diverse fields and backgrounds [1], including education. Early conceptions of educational leadership were built, to a large extent, on conceptions borrowed from the management and behavioral sciences [2,3]. Over the ensuing decades, the educational leadership field has produced a considerable body of research. This research has included a wide range of perspectives on the theory and practice of effective leadership, as well as the antecedents and consequences of such leadership.

Considering its long history and large corpus, 'enquiry into knowledge production in the field of educational leadership is a· · · necessary project' though it might be challenging [4] (p. 254). As eloquently stated by Hunt and Dodge [5], 'to know where we are going with leadership research, we must know where we are and where we have been—we must look backward and forward at the same time' (p. 453), and we must conduct a careful examination of the series of phases in which the discourse on educational leadership has evolved [6] so that we can draw a road map for its future development.

Substantial efforts have already been made by scholars to conduct reviews of published research but with various purposes and methodologies. Some of these reviews addressed

the global educational leadership, administration, and management (EDLAM) literature [7,8] while others focused on research produced in certain regions of the world [9–16]. Some of these reviews were qualitative in nature and aimed to synthesize existing findings about leadership or its relationship with other school-related variables [16–19], while others were more quantitative in nature, such as meta-analysis [20,21]. Although these studies made a significant contribution through 'illuminat[ing] practices of educational leadership and management across the globe' [9] (p. 1), and 'lay[ing] the groundwork for future knowledge production' [22] (p. 540), all had limitations, not least significant methodological challenges [8].

Aiming to complement previous reviews, the present study tracks the developmental trajectory of the educational leadership research (ELR) field across four phases of development guided by four questions:

1. What is the volume and growth trajectory of the ELR field?
2. What is the nature of the ELR field in terms of "performance results"; that is, citation impacts, most influential authors, journals, and publications as well as their geographical distribution?
3. How do prominent, emerging, and declining themes change over time?
4. How have the conceptual and thematic strands evolved over time?

We also briefly explore the extent to which differences in bibliometric methods influence results.

The current study provides several original contributions to the literature. First, our analysis focused solely on leadership research rather than the whole EDLAM field. Although the analysis turned up some much broader terms due to the nature of the keyword co-occurring analysis, the study retained its focus on the investigation of educational leadership across four main periods of analysis. This is significant as previous reviews on the EDLAM literature showed that leadership has become more central compared to management or administration [7,8,23]. While a dedicated ELR-framed analysis, such as this one, could yield more focused and complementary results, it also risks the omission of relevant studies without "leadership" in their titles. We acknowledge this as a limitation of the study.

Second, unlike previous bibliometric reviews conducted in the field, the present study uses SciMAT software (version 1.1.04) to conduct the analysis. Compared to previously used analysis tools, such as CiteSpace or VOSViewer, SciMAT is capable of revealing the thematic landscape of a research field during different periods of its development. These results are also presented in four different categories depending on the strength of their influence on the development of research during a particular time period. In addition, SciMAT reveals subthemes associated with central themes and thus offers a more meaningful understanding of their scope and development. More significantly, SciMAT can identify the thematic evolution of the field by illuminating trends and linkages of themes across periods in a single map, which, to our knowledge, is unique to SciMAT.

The present analysis is also significant because of the unusually large quantity of research reviewed (7282 Scopus and WoS-indexed articles). Also unique is the time span over which selected papers were published (1907–2023).

The current study accomplishes the major goals of most bibliometric reviews: it unveils the boundaries of knowledge [24]; illuminates the growth and flow of knowledge; and exhibits diverse schools of thought across different time-periods [12,25–27]. Offering a well-documented understanding of ELR's intellectual landscape, the review also identifies emerging trends and promising directions for future research [28]. The study consolidates the findings of some previous reviews (e.g., [7,29,30]), and supplements some of their results, especially about the developmental trajectory of ELR research.

2. Materials and Methods

This is a bibliometric review of the ELR field that integrates the bibliometric performance assessment and science mapping analysis [31]. Performance assessment is used to measure the most prominent researchers, journals, articles, and countries contributing to

the development of the field [32]. Science mapping analysis is used to determine the intellectual structure and thematic evolution of a research field [33,34]. As Chen [35] explains, 'the unit of analysis in science mapping is a domain of scientific knowledge that is reflected through an aggregated collection of intellectual contributions from members of a scientific community or more precisely defined specialties' (p. 3). Therefore, bibliometric reviews differ from the systematic literature reviews that address the accumulated findings of the published research, usually on a specific specialty in the field [34].

The general workflow of a standard science mapping analysis covers six basic steps: data search and retrieval, data processing and extraction, network extraction, normalization, mapping, analysis and visualization, and interpretation of the maps [32,36]. The workflow of the current analysis is elaborated in the following section under two subheadings: (1) data search and extraction, (2) analysis and interpretation of maps.

2.1. Data Search and Extraction

Two databases were searched for the current study: Scopus and Web of Science (WoS). Both databases allow for reaching and downloading information needed for bibliometric analysis. Scopus indexes more journals of education [37] but started to index such research as of 2004. WoS, on the other hand, indexes research published as of 1900 to the present, and offers wide coverage of high-quality research. Considering this, both indexes were used to retrieve data. As we aimed to reach all the indexed articles in the ELR field, we did not adopt any time restrictions. However, to access articles that directly address educational leadership, the 'titles' of the articles were targeted during the data search. The following search string (Figure 1) was used while searching data:

The Search String
("leader*" OR "leadership") AND ("education*" OR "school*" OR "teacher*" OR "principal*" OR "head*" OR "headship*" OR "headteacher*" OR "head teacher*" OR "supervisor*" OR "inspector*" OR "school administrator*" OR "school administration" OR "school manager*" OR "school management" OR "department head" OR "vice-principal*" OR "vice principal" OR "middle manager*" OR "assistant principal*" OR "deputy principal*" OR "deputy head*" OR "deputy head teacher" OR "deputy headmaster" OR "student*" OR "learner*" OR "pupil*" OR "classroom*" OR "learning" OR "teaching" OR "secondary education" OR "primary education" OR "preschool education" OR "pre-school education" OR "K-12 education")

Figure 1. The search string.

The process of data search is presented in the Figure 2 PRISMA diagram [38]. The initial search was conducted on 1 April 2023, which yielded 13.085 documents from Scopus, and 6613 from WoS (19,698 in total) documents. Criteria for including documents to be further analyzed from this large set were based on the following criteria:

- Only journal articles were included because keywords were significant for the analysis. Many books and book chapters do not provide explicit keywords. We also excluded conference proceedings as we targeted rigorously peer-reviewed research.
- The articles included were all in English as it has become the language of science globally and the keywords used needed to be in the same language to produce meaningful results.
- Articles addressing K-12 schools were included while those addressing higher education were excluded due to diverse points of interest in these two fields.

Documents identified in the two databases were examined separately. After a first reading of article titles in each dataset, 2202 documents were removed (1411 from the Scopus list; and 791 from the WoS list) because they failed to meet the selection criteria. A second scanning was carried out of titles of the remaining 17.496 documents leading to the

removal of an additional 3607 documents (2562 documents from Scopus and 1115 from WoS) because they were not directly related to the educational leadership field. Next, the abstracts of the remaining articles were skimmed leading to the elimination of 4251 documents (3452 from Scopus; 799 from WoS) articles because of their scope, failure to meet other selection criteria, or lack of sufficient data for the review. Finally, the remaining 9568 documents were entered into the R Studio Program version 2023.6.0.421, and 2286 duplicate studies were removed during this process. The final data set included a total of 7282 articles.

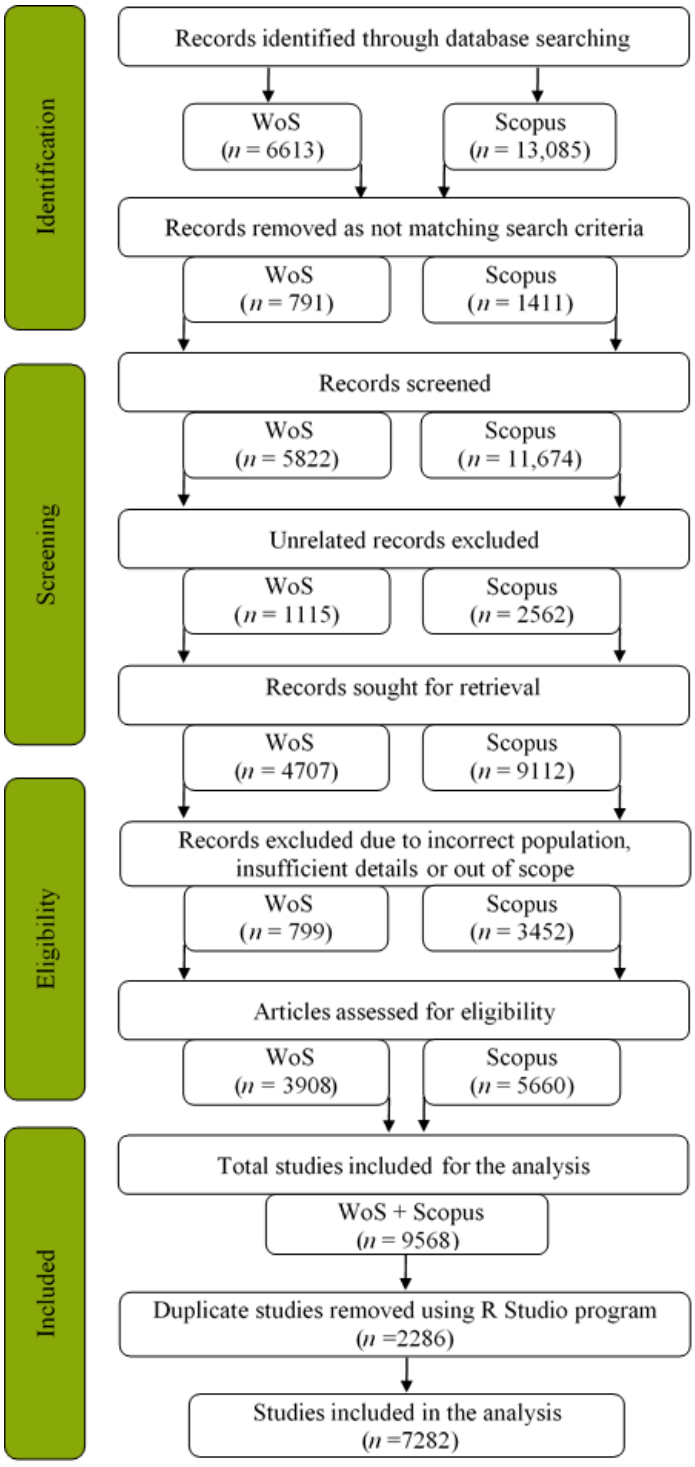


Figure 2. PRISMA diagram.

2.2. Analysis and Interpretation of Maps

As Figure 2 indicates, this stage started with determining the network extraction, normalization, and mapping methods. The frequency of keyword co-occurrence was used for extracting themes and thematic networks. For mapping the themes, the 'equivalence index' was used to identify the similarities and the strength of the link between subthemes in a thematic cluster, and the 'clustering algorithm' was used to measure the strength of the links between different thematic clusters [32,33]. Prior to the analysis, we also manually combined keywords that were very similar to each other such as 'school' and 'schools', 'student' and 'pupils'.

The next stage before starting the analysis was period formation. One of the strengths of SciMAT software is its ability to perform thematic evolution analysis within and across periods of the research field, and allow for longitudinal analysis of prevalent themes [39]. For a rigorous analysis, it is recommended that the following three criteria be applied in balance [32,40]: (1) watch for the key events and changes; (2) make sure to include a sufficient number of documents in each period; (3) ensure balancing the number of documents for each period as much as possible. Four periods were identified as a result of following these three recommendations.

Period 1 (1907–2004): Including 1114 documents, Period 1 was defined as a time of turmoil and adolescence with attempts to build the educational administration and leadership field following the post-theory and post-industry era [3]. By the beginning of 2000, the educational leadership field, which had grown through the work of mostly Western scholars, gradually became international with studies included from diverse regions of the world [11]. A recent review of the ELAM literature by Tian and Huber [8] also showed that by 2007, half of the publications came from non-Western contexts. Considering these iterations with the temporal distribution of articles (also see Figure 4 in Section 3), the years between 1907–2004 were designated as Period 1.

Period 2 (2005–2012): This period includes 1413 documents, and to a large extent represents the years after the global examination that PISA started with fierce comparisons among countries. The accountability demands of this era brought a new focus and perspective on the role of leadership [18,41]. Considering these developments with the temporal distribution of articles in Figure 4, the years between 2005–2012 were designated Period 2.

Period 3 (2013–2019): This period includes 2580 documents. Much of this research grew directly out of the accumulated knowledge developed in Period 1 about the means and ends of leadership. This period also demonstrated a preoccupation with the development of leadership models: 14 such models emerged between 1980–2014 [29]. Considerable amounts of research from 2013 to the pre-COVID era aimed to better understand and test these emergent leadership models.

Period 4 (2020–2023): The 2175 included in Period 4 were published during the COVID-19 pandemic which had significant effects and implications for the field of education. Defined as 'unprecedented territory with few education signposts, clues, or markers' [42], this era required significant changes to school leadership and policy [43]. Harris and Jones [44] argued that this era actually created a different leadership order 'which has no leadership standards, no preparation or development programs, no inspection framework, ⋯ no benchmarks, ⋯ no blueprints to help school leaders' (p. 246).

Results of the period-based science mapping analysis (Figure 3) are presented in three types of diagrams: (1) a strategic diagram, (2) a diagram describing thematic network structures, and (3) a thematic evolution map [45]. The strategic diagram, based on Callon's centrality and density values, is used to cluster themes for each period of analysis. The centrality values displayed on the horizontal axis measure the external cohesion of different networks while density values displayed on the vertical axis measure the internal cohesion of a network [33]. Thus, four quadrants are formed in the strategic diagram (Figure 3a), each representing a type of theme [36]:

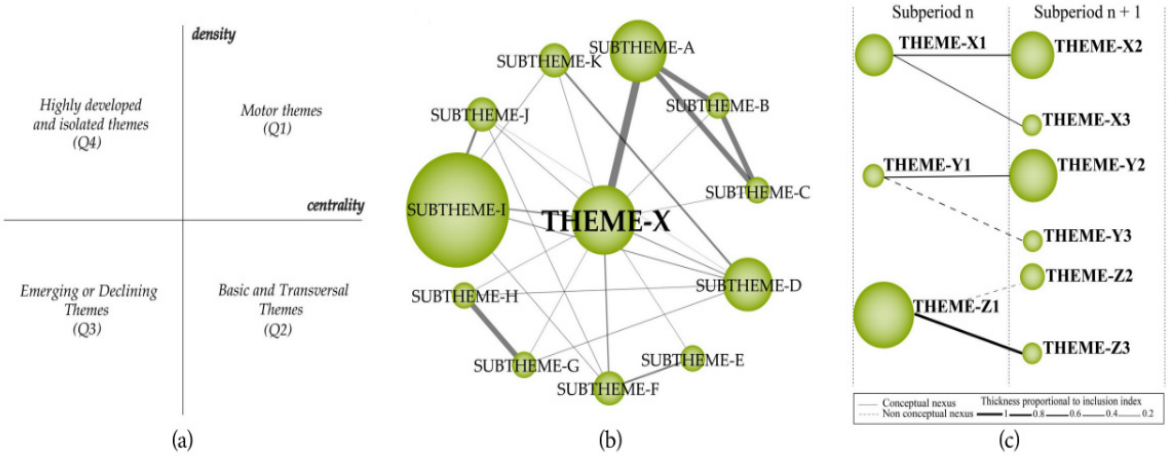


Figure 3. (**a**) Strategic Diagram; (**b**) Thematic Network Structure; (**c**) Thematic Evolution Structure [45].

Q1—Motor themes; exhibit the most developed themes during a period (high centrality/density values)

Q2—Basic and transversal themes; exhibits themes that are not well-developed but were significant in the development of motor themes (high-centrality/low-density values)

Q3—Emerging or declining themes; exhibits under-developed or emerging themes (low-centrality/low-density values)

Q4—Highly developed and isolated themes; exhibits themes that are highly developed but remain peripheral to the development of the field (low-centrality/high-density values)

Figure 3b is an example of a thematic network structure in which the size of the circles corresponds to the number of associated documents. The thickness of the lines connecting the subthemes in the cluster indicates the strength of the links between them [40]. The network structures in the figure are labeled using the most central keyword in the cluster. Figure 3c is an example of a thematic evolution map. This map exhibits the evolution of prevalent themes across the two periods of analysis. Solid lines indicate that the themes share the same keywords as the theme itself. As the lines become thicker, the relationship becomes stronger. Dashed lines indicate that the themes share common keywords other than the theme itself [33].

3. Results and Discussion

3.1. Bibliometric Performance Analysis

The metadata uploaded to the SciMAT program was first submitted to bibliometric performance analysis. This analysis (Figure 4) calculated the yearly distribution of publications over all periods of analysis, citations received, and the accumulated number of publications.

The green bars in Figure 4 show the number of documents published each year while the continued red line indicates the number of citations received. The continued grey line, on the other hand, shows the accumulated number of publications across the years. The timespan for four periods of analysis used in the present analysis are also shown in the figure. As shown in Figure 4, the articles included in the analysis were published between 1907–2023, first with a gradual and then a sharp increase in terms of the number of publications and citation trends. In fact, the figure shows that only a couple of articles were published each year up to 1972, and researchers began to cite some of this research at the beginning of the 1980s. This clearly indicates that publications began to have an impact on the development of the field starting in the late 1970s and early 1980s. As Riehl [46] stated, the earlier periods since the mid-1970s were defined as the 'behavioral science era' during which the field was unproductive but made attempts to break from it. However, some others see value in these attempts for the development of theory and practice in

educational leadership. Figure 4 also shows that the highest rate of citations was reached in 2008 while the highest number of articles was published in 2022.

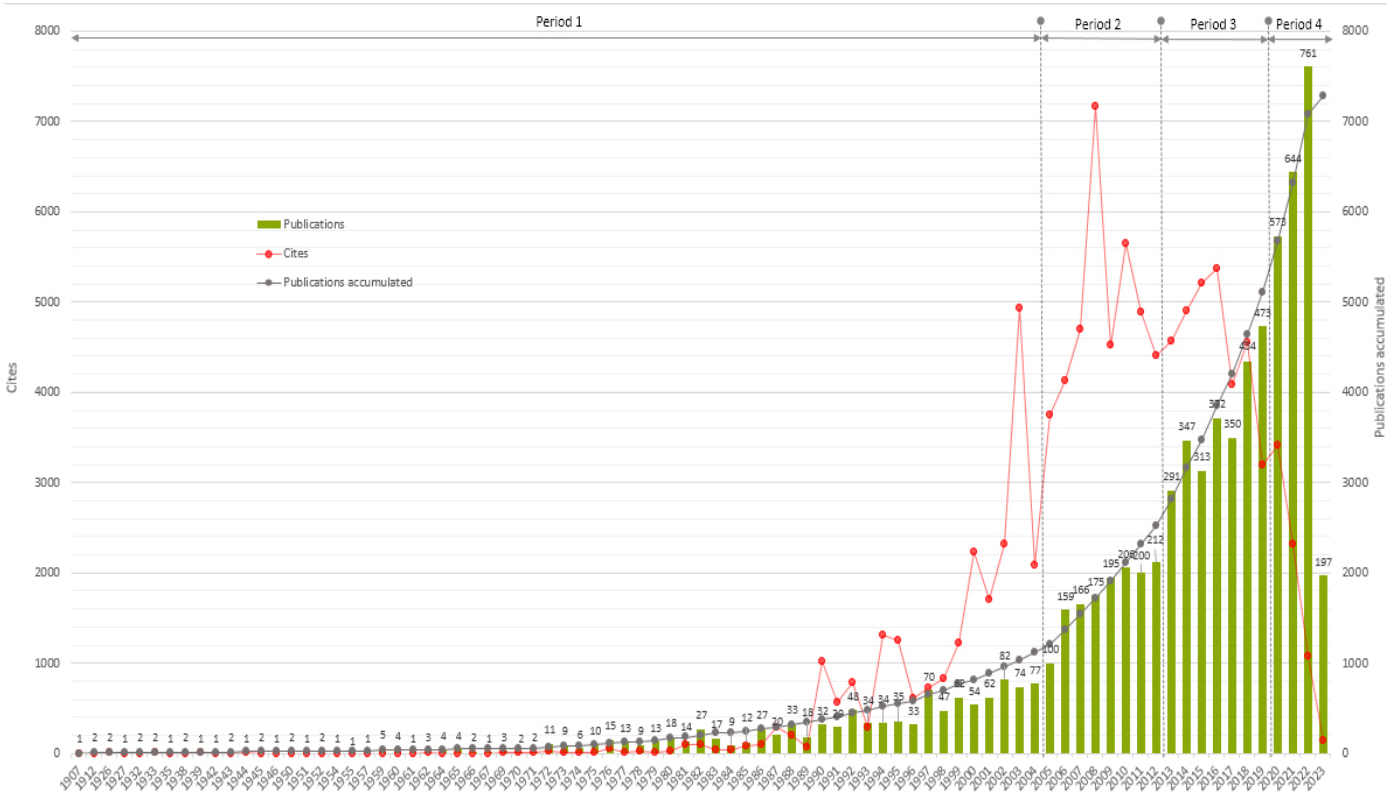


Figure 4. Publication and citation trends.

As compared with this review, Hallinger and Kovačević's [7] review was also international in scope and included only quantitative studies reported in English. We compare the remaining performance results from our study with those from Hallinger Kovačević (H&K) in this section to explore our interest in the comparability of bibliometric results using at least partly different methods. Combining results over all four periods of development in the field, Table 1 identifies the top ten journals in the ELR field, the 10 most influential scholars by the number of publications and citations received (Table 2), the 10 most cited articles (Table 3), and the top 10 countries contributing to the field according to the count of publications (Table 4).

Table 1. Top 10 journals most cited.

Rank	Journal Name	TC *	TP **
1	Educational Administration Quarterly	16,064	257
2	Journal of Educational Administration	8888	329
3	Educational Management Administration and Leadership	7941	446
4	School Leadership and Management	6580	264
5	International Journal of Leadership in Education	4336	387
6	School Effectiveness and School Improvement	3459	65
7	Leadership and Policy in Schools	2615	192
8	International Journal of Educational Management	1825	149
9	Teaching and Teacher Education	1516	41
10	Journal of Research on Leadership Education	1206	154

* TC: total citations; ** TP: total publications.

Table 2. Top 10 authors with most publications/Top 10 authors most cited.

Rank	Author	TP *	TC	Rank	Author	TC **	TP
1	Hallinger, Philip	90	6232	1	Hallinger, Philip	6232	90
2	Leithwood, Kenneth	41	5736	2	Leithwood, Kenneth	5736	41
3	Walker, Allan	28	1002	3	Harris, Alma	2747	27
4	Berkovich, Izhak	28	392	4	Jantzi, Doris	2250	27
5	Harris, Alma	27	2747	5	Heck, Ronald H.	2110	23
6	Schechter, Chen	26	367	6	Spillane, James P.	1375	24
7	Devos, Geert	25	813	7	Robinson, Viviane M. J.	1146	8
8	Spillane, James P.	24	1375	8	Louis, Karen Seashore	1290	15
9	Heck, Ronald H.	23	2110	9	Lloyd, Claire A.	1122	2
10	Murphy, Joseph	22	795	10	Rowe, Kenneth J.	1122	2

* TP: total publications; ** TC: total citations.

Table 3. Top 10 articles most cited.

Rank	Article Title	Journal Name	Author(s)/Year	TC *	
				Scopus	WoS
1	The impact of leadership on student outcomes: An analysis of the differential effects of leadership types	Educational Administration Quarterly	Robinson V.M.J., Lloyd C.A., Rowe K.J., 2008	1109	973
2	Seven strong claims about successful school leadership	School Leadership& Management	Leithwood, K., Harris, A.; Hopkins, D., 2008	736	651
3	Leading educational change: Reflections on the practice of instructional and transformational leadership	Cambridge Journal of Education	Hallinger P., 2003	679	n/a
4	Principal leadership and school performance: An integration of transformational and instructional leadership	Educational Administration Quarterly	Marks, H.M., Printy, S.M., 2003	657	584
5	Social justice educational leaders and resistance: Toward a theory of social justice leadership	Educational Administration Quarterly	Theoharis G., 2007	496	447
6	Leadership for learning: Lessons from 40 years of empirical research	Journal of Educational Administration	Hallinger P., 2011	397	332
7	Leadership for school restructuring	Educational Administration Quarterly	Leithwood K., 1994	387	284
8	Educational leadership and student achievement: The elusive search for an association	Educational Administration Quarterly	Witziers B., Bosker R.J., Krüger M.L., 2003	361	315
9	Shaping teacher sensemaking: School leaders and the enactment of reading policy	EducationalPolicy	Coburn C.E., 2005	359	294
10	The effects of transformational leadership on organizational conditions and student engagement with school	Journal of Educational Administration	Leithwood K., Jantzi D., 2000	346	n/a

* TC: total citations; n/a: not available.

Table 1 lists journals clearly focused on the field of educational management, administration, and leadership except for Teaching and Teacher Education, which is more focused on teacher education and professional development. While Educational Administration Quarterly did not publish the highest number of articles (EMAL published 446 vs. 257 by EAQ) citations were very lopsided. EAQ's 16,604 citations were almost twice the number of citations for second and third-place JEA and EMAL. Comparing the top ten journals identified in this review with the 22 journals ranked in the H&K review indicates that rankings were quite similar for *Educational Administration Quarterly* (1 vs. 2), *Journal of*

Educational Administration (2 vs. 4), and *SESI* (6 and 5). Five of the top ten journals in this review also appeared in the H&K review, However, two of the top ten journals in this review were not included among the 22 in the H&K review (*Teachers and Teacher Education*, *Journal of Research on Leadership Education*. Several of this review's top ten were ranked well down the H&K list: *School Leadership and Management ranked* 13, *Leadership and Policy in Schools* ranked 19. *Teaching and Teacher Education*, along with the *Journal of Research on Leadership Education* did not appear at all in the H&K review. The first issue of the *Journal of Research on Leadership Education was published in 2006, however, much more recent than the other top journals.*

Table 4. Top 10 countries with the most publications.

Rank	Country	TP *	TC
1	USA	2495	40,167
2	United Kingdom	708	11,804
3	Australia	491	6939
4	Canada	315	7784
5	Türkiye	287	2304
6	South Africa	260	2065
7	Spain	239	1518
8	Israel	186	2119
9	Malaysia	173	1155
10	China	161	3021

* TP: total publications; TC: total citations.

Table 2 indicates that Philip Hallinger and Kenneth Leithwood were the most influential scholars in the field of educational leadership by both the number of publications and citations, results also reported by H and K. Of the 10 highest-ranked scholars by total publications in this review, only 6 appeared in H&K's 20 while 5 did not (Berkovich, Izhak, Schecter, Devos, and Spillane). Especially in the case of Spillane, this seems not to be explained simply at the time of review. Comparing only the top 10 total publication ranks, only 5 of the top 10 in this review appeared in H&K's top ten.

Table 3 indicates that two review studies published in the same year received the highest number of citations and the four authors of these top 10 papers were also listed among the most influential authors (Hallinger, Leithwood, Harris, and Robinson). Among these articles, the highest citation impact belonged to the review study by Robinson et al. [47], which addressed the relationship between student outcomes and leadership types. This was followed by another large scoping review by Leithwood et al. [48] that presented seven strong claims about successful school leadership. Of the top ten papers total citations in Table 3, this review and H&K's review agreed on only 2. Extending the comparison to all 20 papers ranked by H&K extended the number in common to 7. Three were included in this review but not H&K including Spillane, Lloyd, and Rowe. Both Lloyd and Rowe were included in the top ten citations based on only 2 publications each. Two papers in H&K's top ten belonged to Jeynes and were published in two journals (*Urban Education*, *Education, and Urban Society*) not reflected in the current review. Similarly, Hartog's paper was published in a journal included in H&K but not this review (Economics of Education Review). Only H&K reports co-citation rankings. These rankings did include most of the papers missing from this review's citation ranking which did not report co-citation data.

Table 4 indicates that US publications dominate the ELR field; its 2498 publications are more than three times the number of second place UK while its 40,167 citations are almost four times the number of UK citations. These results are at least consistent with claims that the ELR field started in Western countries, and gradually spread to other regions of the world [25]. Yet, countries from diverse parts of the world such as Canada, Turkey, South Africa, and China were also listed as significant contributors to the ELR field. The field began to develop an international knowledge base during the last quarter of the 21st century. These results also indicate that during the last decade, growth in educational

leadership research was significantly fueled by scholars from Asia (e.g., Türkiye, Malaysia) and other emerging regions (e.g., South Africa) in the world. No comparable data were reported by H&K.

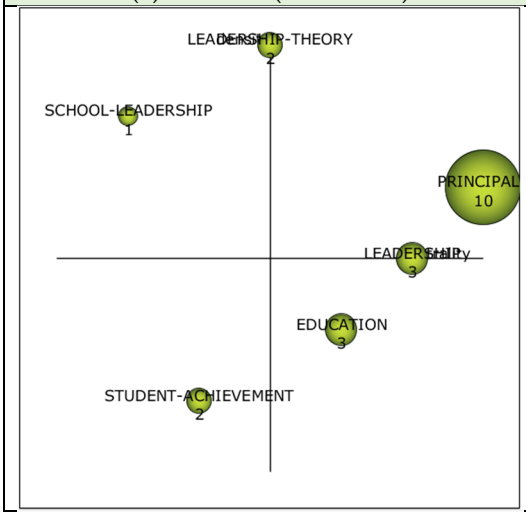
3.2. Science Mapping Analysis

This section presents the results of the science mapping analysis identifying the thematic structure and evolution of the ELR field across the four periods of its evolution since 1907. Examples of prominent studies in each period are briefly discussed as a means of illustrating the nature of each of the themes and sub-themes. Written in capital letters are the main themes in each period while subthemes related to these main themes are written in italics. Subthemes, identified from thematic network analysis of the motor themes (the themes around which the research field grew) provide additional insights into the development of those motor themes.

3.2.1. Period 1 (1907–2004)

Science mapping analysis of the 1114 articles published during Period 1 identified the PRINCIPALS theme along with LEADERSHIP and LEADERSHIP-THEORY themes. These three themes were the motor themes (Figure 5) underpinning investigations into leadership in schools and enabling the development of the research field in this direction. These early studies about school/educational leadership emanated from the research and policy focus on school effectiveness, particularly during the 1980s [49–51]. These studies generally assumed a central leadership role for principals [52,53], in addition to their management or administrative roles. The assumption that educational leadership was synonymous with principal leadership [54,55] was largely reflected in the leadership research during Period 1.

(a) Period 1 (1970–2004)



(b) Performance measures for Period 1

Theme	h-index	Cites	Centrality Range	Density Range
PRINCIPALS	10	921	1	0.67
LEADERSHIP	3	68	0.83	0.5
LEADERSHIP-THEORY	2	21	0.5	1
EDUCATION	3	235	0.67	0.33
STUDENT-ACHIEVEMENT	2	39	0.33	0.17
SCHOOL-LEADERSHIP	1	582	0.17	0.83

Figure 5. Strategic diagram for Period 1.

Subthemes associated with the PRINCIPALS theme included *Decision-Making*, *School-Based-Professional-Development*, *Teacher-Leadership*, *Distributed-Leadership*, *School-Reform*, and *School-Performance*. Views of school leadership changed in response to school reform and restructuring policies that flourished, especially in North America in the early 1990s, and later more globally probably through policy borrowing [53]. This altered view of school leadership did not give up its conception of principals as key leaders—change agents who could influence the successful integration of school reform policies into practice [56,57]. Several scholars acknowledged, however, that this emphasis on principals reflected a heroic, 'white knight view of leadership · · · [which] runs counter to knowledge about the organiza-

tional nature of schools, [and] · · · fails to treat some of the most important organizational variables · · · that interact with and promote or limit the exercise of leadership' [58] (p. 301).

In addition, as Hallinger [53] underlined, newer trends emanated from school reform initiatives such as teacher empowerment and professionalism, schools as learning communities, and sites of professional development. These trends directed the attention of researchers to the cultivation of leadership capacity in schools beyond just principals. For example, Fullan [59] argued that 'leadership at all levels of the system is the key lever for reform, especially leaders who focus on capacity building and develop other leaders who can carry on' (p. 21).

During this phase, many scholars pointed out that allowing teachers the autonomy to make their own decisions about how best to align curriculum and instruction with the needs and capabilities of their students constituted a significant increase in the leadership capacities of schools [60,61]. Marks and Printy [57] claimed that shared leadership would benefit both teachers (increasing their commitment and satisfaction), and principals (easing the burden of sole or heroic leadership), eventually enabling schools to perform better. Supporting teacher leadership was crucial to cultivating school performance [57]. With their focus on transformational leadership, Leithwood and Jantzi [62] argued that it was not only the efforts of principals but also teachers as the direct implementors of change that created the necessary leadership capacity to improve school performance. Understanding leadership as a group function [63] was significantly advanced during this period by the theoretical and empirical work of both Gronn [64] and Spillane et al. [65,66].

Educational-Reform and *School-Effectiveness* subthemes were closely associated with the LEADERSHIP and LEADERSHIP-THEORY themes. However, as shown in the thematic network structures in Figure 6, the LEADERSHIP theme was also associated with *Gender*, *School-Climate*, *Superintendents*, and *Middle Leaders* subthemes. These lines of research inquired about the leadership roles of people other than principals with management/administrative roles, particularly superintendents and middle leaders. Superintendent leadership studies by Murphy and Hallinger [67], and LaRocque and Coleman [68] advanced this line of research. In their study of factors explaining the high performance of schools in 12 districts of California, Murphy and Hallinger [69] found that superintendent leadership played a significant role in improving school performance. This study also attributed considerable influence on schools' curriculum and instruction to positive relationships between principals and superintendents. Teacher professional development also helped to cultivate the performance of these schools. LaRocque and Coleman's [68] study carried out in a Canadian province similarly reported positive effects on school performance of superintendent leadership. These results likely prompted much of the additional research about superintendent leadership during Period 1.

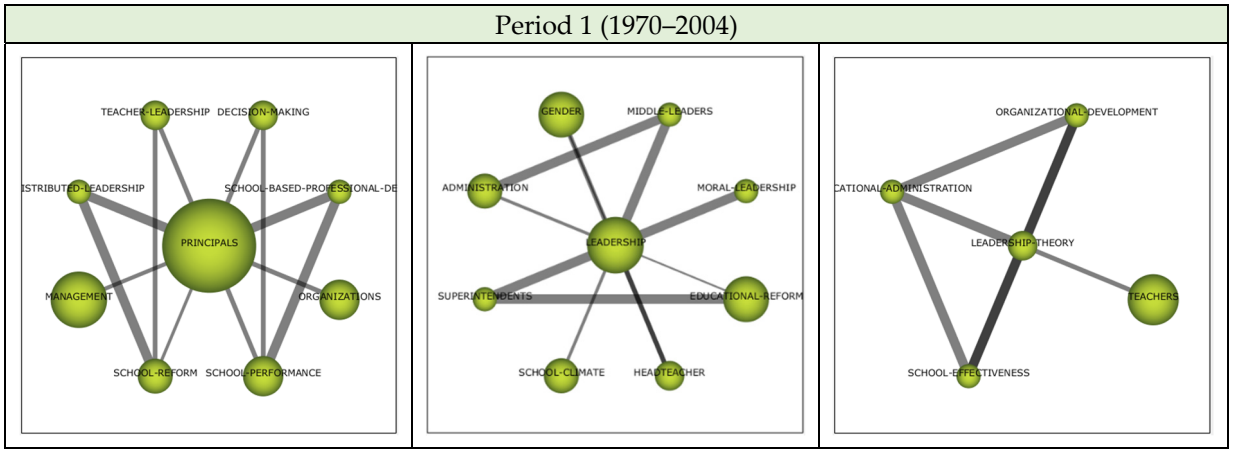


Figure 6. Thematic network structures for Period 1.

Regarding the *Middle-Leaders* subtheme, some Period 1 research inquired about the leadership roles and effects of middle-leaders in both elementary and secondary school contexts [70]. These leaders occupied such roles as curriculum coordinators, subject leaders, department heads, or other members of the management team (e.g., [71–73]). In his review of such research published between 1988–2002, Bennett et al. [74] underlined the significant role of middle leadership in enhancing the quality of teaching and learning.

The *Gender* subtheme associated with LEADERSHIP frequently included studies documenting and often comparing the leadership of female and male leaders. Eagly and her colleagues were among the most prominent scholars pursuing this subtheme. In 1990, Eagly and Johnson [75] conducted a meta-analysis on the relationship between gender and leadership styles including research conducted in non-school contexts. The leadership styles of women and men, they found, could differ significantly. A second meta-analysis by Eagly et al. [76] further enforced the significant influence of gender on the enactment of leadership. These results are likely to have fueled interest in the study of gender in school leadership.

Our science mapping analysis indicated that STUDENT-ACHIEVEMENT was the single emerging theme during the initial phase of leadership research in the educational field. The ultimate goal of school effectiveness and restructuring initiatives was to create more productive school conditions for the learning of students. Research during this era used student achievement data to evaluate school effectiveness [52,57]. In their seminal work on the effect of leadership on student achievement, Bossert [77] proposed that principal leadership made a significant contribution to student achievement through principals' strategic allocation of resources, building a supportive climate, and communicating a strong vision and goals. Evidence by Heck et al. [78] demonstrated both direct and indirect effects of principal leadership on student outcomes: indirect effects were primarily the result of creating a positive and supportive school climate. Hallinger [53] summarized evidence confirming the indirect influence of principal leadership on student achievement; the direct effects of leaders in Heck et al. [78] were mostly observed in elementary schools. The growing case for significant indirect leadership effects was challenged during this period, however, by Witzier et al. [79] in a paper listed in Table 3 as one of the all-time most frequently cited papers in the field. This paper drew attention to controversial results in the literature and argued that methodological and conceptual differences in the knowledge base might account for such controversial results. Studies reported during Period 1 about whether leadership really mattered in accelerating student achievement, to what extent, and how [79] had a considerable influence on STUDENT-ACHIEVEMENT becoming an emerging theme that prompted much more research in subsequent years.

3.2.2. Period 2 (2005–2012)

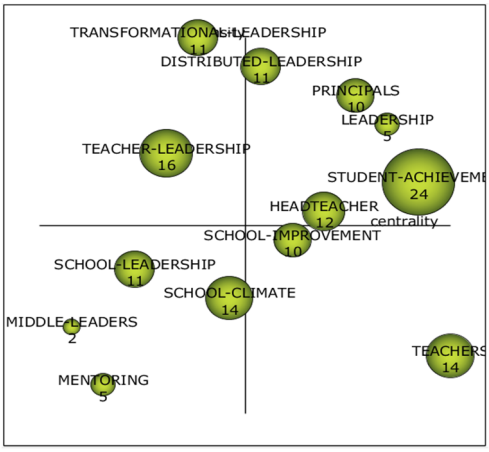
The science mapping analysis of the 1413 articles published during Period 2 revealed that the focus on PRINCIPAL and HEADTEACHER themes continued along with the LEADERSHIP theme (Figure 7).

Results of the thematic network analysis (Figure 8) indicate that the PRINCIPAL theme was studied mostly in association with *Situational-Leadership*, *Professional-Development*, *Leader-Characteristics*, *Teacher-Efficacy*, *Instructional-Practice*, *Secondary-Schools*, and *Organizational-Commitment* subthemes while the HEADTEACHER theme was mostly associated with *Pedagogical-Leadership*, *School-Justice*, *Educational-Leadership*, *Management-Development*, *Education-Policies*, and *School Inspection* themes. Prominent subthemes associated with LEADERSHIP were *School-District*, *Social-Theories*, *School-Director*, *Principal-Instructional-Leadership*, and *Professional-Identity*.

The emerging theme of Period 1, STUDENT-ACHIEVEMENT, became one of the motor themes of the second period. This signifies the beginnings of what became an enduring focus on whether and how school leaders contribute to their students' success. Among the subthemes associated with *Student Achievement*, *Teacher Self-Efficacy*, *Teacher Motivation*, *Self-Efficacy*, *Classroom Management*, *Principal Leadership*, *School Performance*,

Students, and *School-Leaders* stand out. Two seminal papers published during this period investigated the effects of leadership on student achievement, one by Robinson et al. [47] and one by Leithwood et al. [48]. As Table 4 indicates, these two publications were widely cited by educational leadership researchers and their findings are likely to have encouraged this line of research during Period 2.

(a) Period 2 (2005–2012)



(b) Performance measures for Period 2

Theme	h-index	Cites	Centrality Range	Density Range
TEACHERS	14	2296	1	0.15
STUDENT-ACHIEVEMENT	24	4210	0.92	0.62
LEADERSHIP	3	133	0.85	0.77
PRINCIPALS	10	814	0.77	0.85
HEADTEACHER	12	1242	0.69	0.54
SCHOOL-IMPROVEMENT	10	938	0.62	0.46
DISTRIBUTED-LEADERSHIP	11	1182	0.54	0.92
SCHOOL-CLIMATE	14	774	0.46	0.31
TRANSFORMATIONAL-LEADERSHIP	11	437	0.38	1
TEACHER-LEADERSHIP	16	1178	0.31	0.69
SCHOOL-LEADERSHIP	11	1265	0.23	0.38
MENTORING	5	140	0.15	0.08
MIDDLE-LEADERS	2	30	0.08	0.23

Figure 7. Strategic diagram for Period 2.

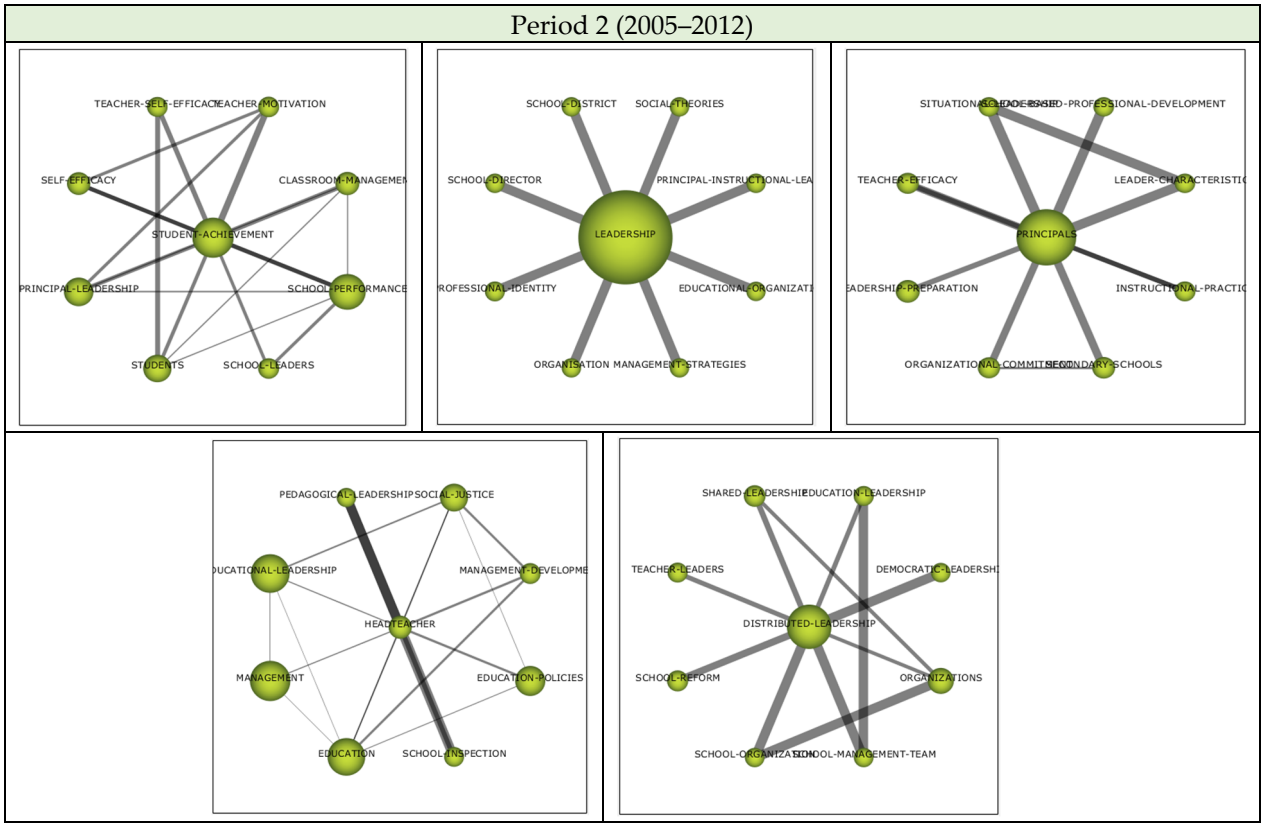


Figure 8. Thematic network structures for Period 2.

Investigating the effect of different leadership models on academic and non-academic outcomes of students, the Robinson et al. [47] review showed that much of the research on student outcomes was limited to academic outcomes. According to their analysis,

qualitative investigations into this relationship showed direct effects while quantitative studies showed indirect or no effect of leadership on student achievement. One major contribution of the study was the finding that different types of leadership had different levels of influence on student outcomes and that 'the closer educational leaders get to the core business of teaching and learning, the more likely they are to have a positive impact on students' outcomes' (p. 664). "Instructional leadership" was reported as having a greater influence on student success than transformational leadership, a finding that prompted some subsequent studies to conclude that transformational leadership was an important mediator of the impact of instructional leadership on student success. Considerable research continued during this period about both Instructional and Transformational approaches to leadership, nonetheless (e.g., [80,81]). Theoharis [82] introduced the beginnings of what would become a substantial line of inquiry in subsequent periods about "social justice leadership".

The Robinson et al. [47] review also noted that research on the relationship between leadership and student outcomes was prompted by increased policy attention to eliminating achievement gaps among students from different social and ethnic backgrounds. Reducing this gap was a responsibility attributed to school leaders by policymakers, although most research during this period failed to establish a strong direct relationship between the two. These results did prompt considerable subsequent research about the effects of particular leadership functions (e.g., goal setting, supporting teachers' professional development, etc.) rather than broad leadership styles or models.

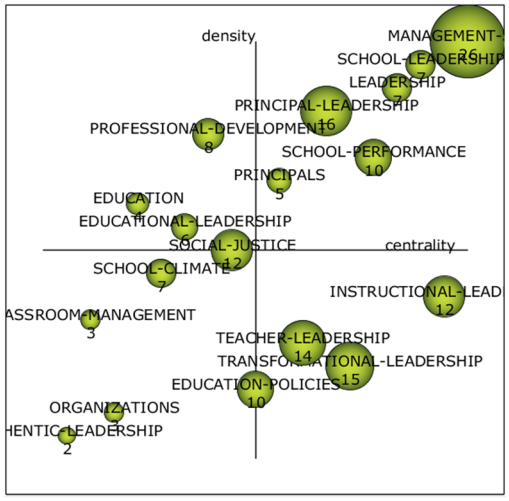
The second highly cited review during this period [48], used existing evidence to justify "seven strong claims" about effective leadership. These were claims about the significant contribution of leadership to student success, the common (or core) practices used by most successful leaders, and the importance of accounting for context in enacting those practices. These claims also included an endorsement of both the indirect nature of leadership's influence and the value of planfully distributing leadership functions among organizational members. Effective leaders, the paper also argued, are not only skilled in the use of core leadership practices but also possess a small handful of personal dispositions that help explain their influence on their schools and students.

Another motor theme, reflected in Leithwood et al.'s seven claims, that emerged during Period 2 was DISTRIBUTED LEADERSHIP (Figure 7), which initially appeared during Period 1. Research by Gronn [64], Hallinger [53], and Spillane and his colleagues [65] was especially influential in advancing this theme. The results of the thematic network analysis showed that research focusing on DISTRIBUTED-LEADERSHIP was mostly held together with—or often indistinguishable from—the subthemes of *Shared-Leadership*, *Teacher-Leaders*, *Democratic-Leadership*, *School-Reform*, *and School-Management-Team*. As suggested earlier by Hallinger [53], terms like shared, distributed, democratic, or teacher leadership were introduced into the literature prompted by school reform initiatives starting in the 1990s in North America. Research about these approaches to leadership emphasized the importance of leadership models going beyond the expertise, authority, and power of a single leader, i.e., the principal. Building on previous research in the early 2000s, several leadership scholars (e.g., [66,83–87]) continued to investigate distributed leadership in relation to such diverse outcome variables as teacher commitment, job satisfaction, school improvement, and team performance. These scholars sparked debates for and against practicing distributed leadership in schools. Hulphia et al. [88] also contributed to this line of research by developing a distributed leadership scale that enabled quantitative investigation of the relationships between distributed leadership and other school-level variables.

The emerging themes appearing on the lower-left side of the strategic diagram (Figure 7) imply that SCHOOL LEADERSHIP began to establish itself in the knowledge base, and could probably replace the LEADERSHIP theme in the coming years. Our finding that SCHOOL LEADERSHIP became a motor theme during the subsequent period (Figure 8) supports this interpretation and also seems to indicate that the educational leadership knowledge base was beginning to establish its own sub-discipline by focusing

on leadership not as a general phenomenon but as a school level construct. The other two themes appearing in this quadrant, MIDDLE LEADERS, and MENTORING, though, could be considered as emerging-declining themes since they disappeared in the coming periods (Figures 9 and 10). Likewise, the SCHOOL-CLIMATE theme remained in this quadrant as an emerging theme until Period 4 (see Figure 12), and then became a basic and transversal theme. The SCHOOL-CLIMATE theme maintained its significance during this period but failed to become a motor theme.

(a) Period 3 (2013–2019)



(b) Performance measures for Period 3

Theme	h-index	Cites	Centrality Range	Density Range
MANAGEMENT-STYLE	26	2631	1	1
INSTRUCTIONAL-LEADERSHIP	12	759	0.94	0.39
SCHOOL-LEADERSHIP	8	167	0.89	0.94
LEADERSHIP	7	128	0.83	0.89
SCHOOL-PERFORMANCE	10	303	0.78	0.72
TRANSFORMATIONAL-LEADERSHIP	15	585	0.72	0.22
PRINCIPAL-LEADERSHIP	16	829	0.67	0.83
TEACHER-LEADERSHIP	14	656	0.61	0.28
PRINCIPALS	5	160	0.56	0.67
EDUCATION-POLICIES	10	262	0.5	0.17
SOCIAL-JUSTICE	12	518	0.44	0.5
PROFESSIONAL-DEVELOPMENT	8	125	0.39	0.78
EDUCATIONAL-LEADERSHIP	6	149	0.33	0.56
SCHOOL-CLIMATE	7	125	0.28	0.44
EDUCATION	4	85	0.22	0.61
ORGANIZATIONS	3	35	0.17	0.11
CLASSROOM-MANAGEMENT	3	23	0.11	0.33
AUTHENTIC-LEADERSHIP	2	9	0.06	0.06

Figure 9. Strategic diagram for Period 3.

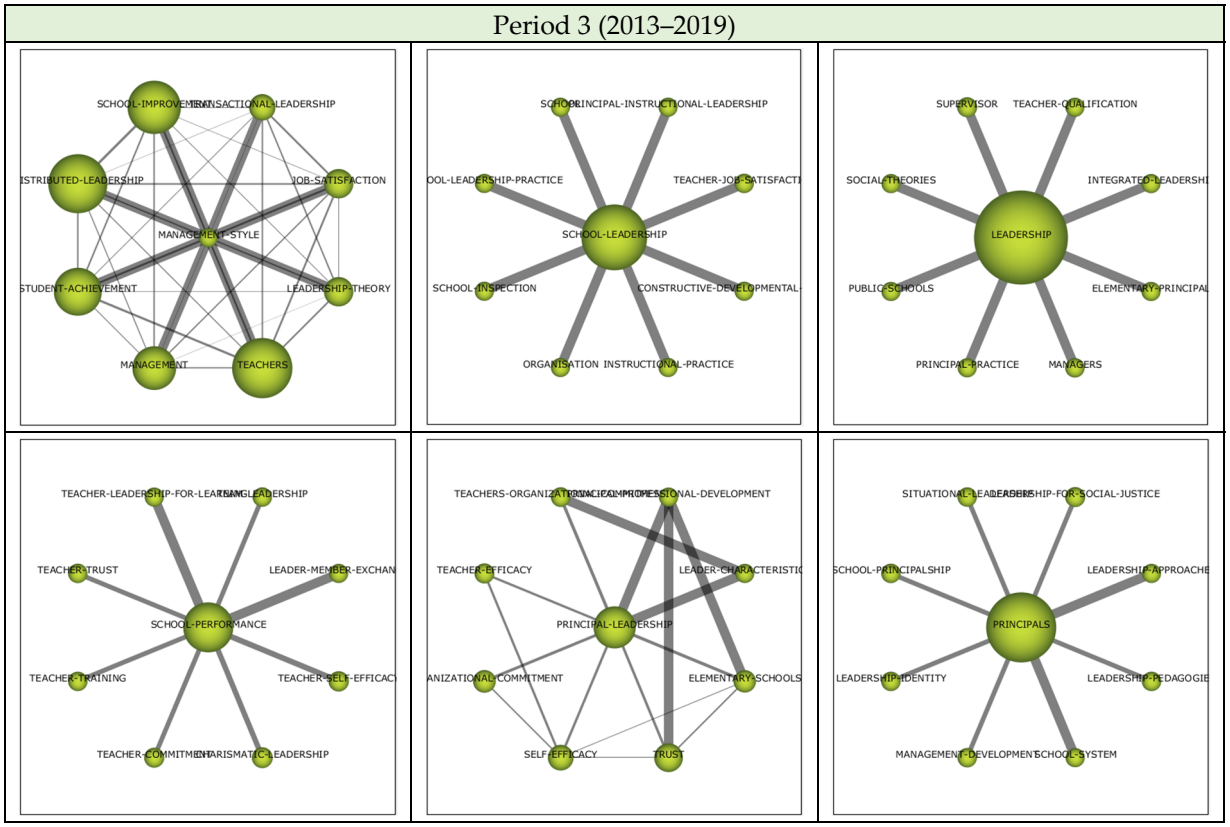


Figure 10. Thematic network structures for Period 3.

On the lower-right side of the strategic diagram (Figure 7), SCHOOL-IMPROVEMENT and TEACHER appear as basic and transversal themes. While these themes are significantly related to the development of the research field during this period, they did not become motor (most central) themes attracting consistent researcher interest. Although these themes did not contribute directly to the development of the knowledge base during this period, they guided the development of the most central themes in the field. One reason why the TEACHERS theme remained as a basic and transversal theme could be the prevalence of the DISTRIBUTED-LEADERSHIP theme which focused, to a larger extent, on teacher collective and cooperative efforts with the senior leadership team rather than their classroom-level leadership. Another reason for the TEACHER basic theme was the amount of research aimed at identifying those school conditions that serve as significant mediators of leadership effect on students. Among the mediating conditions examined in this period were teachers' job satisfaction, commitment and organizational citizenship behavior [89], teacher professionalism and trust [90], collaborative school cultures, and teachers' instructional practices [91] as well as a large handful of other variables (e.g., [92]).

Distributed leadership theory was often used to frame research on teacher agency and leadership [93]. Also, the SCHOOL IMPROVEMENT theme in this quadrant could indicate that, despite emanating from school improvement research during its initial phase, leadership studies began to look beyond improving schools through principal leadership. School improvement research also shifted its primary focus on leadership to other school-level variables.

3.2.3. Period 3 (2013–2019)

The science mapping analysis of 2580 articles published between 2013–2019 revealed increased variety in the themes addressed by educational leadership researchers. The prevalent motor themes of the period were SCHOOL-PERFORMANCE and PRINCIPAL LEADERSHIP along with MANAGEMENT-STYLE, SCHOOL-LEADERSHIP, and PRINCIPAL.

The thematic network analysis indicates that the motor theme SCHOOL PERFORMANCE was closely associated with the subthemes *Teacher-Commitment*, *Teacher-Self-Efficacy*, *Teacher-Trust*, *Teacher-Training*, *Teacher-Leadership*, *Leader-Member-Exchange*, and *Charismatic-Leadership* (Figure 9). This Period 3 research extends and deepens Period 1 and 2 research (e.g., [53,78]) demonstrating school leaders' indirect effects on student performance. During Period 3, many researchers continued efforts to identify the most significant mediators of leaders' indirect effects on school and student performance through, for example, shaping teacher attitudes and behaviors [16,17]. Focused on one such condition, teacher commitment, Sun [94] identified such influential leadership practices as collaborative supervision, empowerment strategies, encouragement of risk-taking, and consideration. In a later study, Bush et al. [41] also pointed to emerging evidence on the mediating effect of teacher commitment, job satisfaction, and self-efficacy on the relationship between school leadership and improved student outcomes. These initiatives during Period 3 seem to have supported Period 2's themes related to enabling better school performance prompted, at least in part, by increased accountability pressures and international comparisons of schooling outcomes through tests like PISA [41,95].

During this period, scholars not only emphasized the mediating role of teachers in enhancing leadership effects on school performance but also focused on the unique position of teachers in creating actual change and improvement through their in-class activity and collaboration on content-specific issues [96]. The term teacher leadership attracted attention as a potential trigger of school improvement and was used as 'an umbrella term referring to a myriad of work' performed by teachers [97] (p. 320). Teacher leadership also became the focus of teacher evaluation policies, particularly in the Western context [93]. Empowering teachers through enabling the practice of teacher leadership was also considered to be a viable tool for managing the significant problem of teacher attrition identified in previous studies (e.g., [93,98]); identifying this potential solution to the teacher attrition problem could explain at least some of the interest in studying teacher leadership as a means of

supporting school performance. The emergence of charismatic leadership in the school performance cluster network might also be a reflection of evidence about the influence on teacher change of the transformational leadership practice 'idealized influence' [81,99].

The PRINCIPAL LEADERSHIP cluster network (Figure 10) also shows that principal leadership was investigated in association with mostly teacher-level variables as indicated by the subthemes *Teacher-Organizational-Commitment*, *Organizational-Commitment*, *Professional-Development*, *Teacher-Efficacy*, *Self-Efficacy*, and *Trust*. Studies during this period have a stronger focus on the leadership practices of principals in support of teachers' performance. The subtheme of *Leader-Characteristics*, on the other hand, indicates a growing focus on the personal and managerial qualities of principals in relation to their leadership practices [16,100–102]. Similarly, the subtheme of *Elementary Schools* indicates that most research addressing principal leadership during Period 3 was conducted in elementary schools.

The PRINCIPAL theme maintained its place as the most central (motor) theme across three periods of analysis from 1907 till 2019, and its associated subthemes during Period 3 were *Leadership Identity*, *Leadership Approaches*, *Management Development*, *Situational Leadership*, *Leadership-For-Social-Justice*, *School Leadership*, and *School System* (Figure 10), In fact, the analysis also showed that the PRINCIPAL cluster had much in common with the MANAGEMENT-STYLE cluster, and shared similar grounds. As shown in Figure 10, the MANAGEMENT-STYLE theme was associated with *School Improvement*, *Transactional-Leadership*, *Distributed-Leadership*, *Job-Satisfaction*, *Student-Achievement*, *Leadership-Theory*, *Management*, and *Teachers* subthemes. The results also resonate with the use of leadership/principal/management interchangeably during this era, and the term management style might refer to different leadership models used by the principals. Indeed, many ELR scholars have been at pains to separate the two as a way of justifying the focus and responsibility of school leaders on improving the success of their pupils in alignment with the direction of accountability policies. Several papers about skills labeled management were also published during this period (e.g., [103–105]), which might have been influential in featuring these themes.

During the first two periods of research into educational leadership, several leadership models or theories (e.g., instructional, transformational, distributed, etc.) were developed, and their relationship to several school-level variables were investigated [16]. The development of these theories served as conceptual starting points for further investigations into educational leadership [106]. Subthemes listed above reflect the use of these theories to help better understand the relationship between different models of leadership and various schooling outcomes.

Understanding the means and ends of leadership identity development was a significant goal of some researchers during this period, a subtheme in the PRINCIPAL cluster network. Some research published just before Period 3 (e.g., [107,108]) argued that principals' leadership identity mattered in developing their capacity to practice effective leadership. As Wenger [109] argued, 'institutions define roles, qualifications, and the distribution of authority—but unless institutional roles can find a realization as identities in practice, they are unlikely to connect with the conduct of everyday life' (pp. 244–245). What is more, identity is shaped through the interaction of school leaders with educational policy environments, the school community, and culture, as well as the surrounding community. These interactions determine the extent to which principals identify with their leadership role and make it actually work [95,110].

The subtheme *Leadership-Pedagogies* is the product of increased research attention to the training and professional development of principals during Period 3. Methods for developing and assessing the leadership skills and competencies of principals before and during their principalship were the focus of most of this research. Evidence published during Periods 1 and 2 about successful educational leadership was an important stimulus for research about the analysis and development of leadership training pedagogies and programs [111–113]. However, considerable research has been published about the effective preparation of school leaders before Period 3, especially in the US. Much of this research

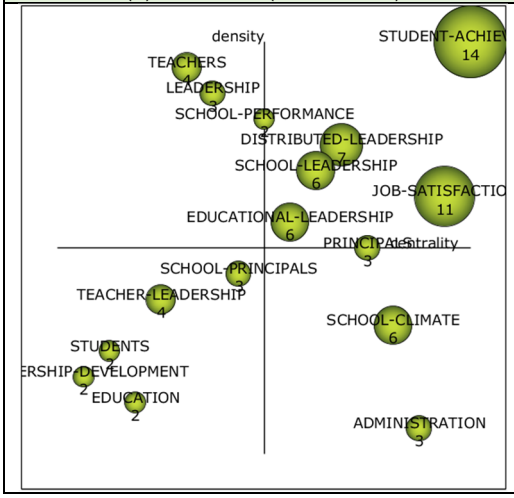
was in response to substantial, high-profile critiques of existing preparation programs (e.g., [114]). Linda Darling Hammond and her colleagues produced among the most widely cited of the more recent studies [115,116]. However, proposals for the reform of leadership preparation in the US predate these studies by many years (e.g., [117]). Attention to leadership learning became a major priority for universities belonging to the University Council of Educational Administration (UCEA). This professional association developed resources to support the leadership development programs of its members and launched the Journal of Research on Leadership Education in Period 2 (2006).

Investigations related to the SCHOOL LEADERSHIP theme during this period focused mostly on the relationship between leadership and improved instruction as the subthemes in the cluster network such as *Principal-Instructional-Leadership*, *Instructional-Practice*, *School-Inspection*, and *School-Leadership Practice* suggested. The LEADERSHIP cluster network, on the other hand, included such associated subthemes as *Supervisor*, *Teacher Qualification*, *Social Theories*, *Public Schools*, *Principal Practice*, and *Managers*. Research flourished in relation to the LEADERSHIP theme during the third period seemingly focused on defining school leadership roles, approaches, and practices [118–122]. Some of this research sought to advance theoretical understandings about leadership processes using broad social theories; for example, Diamond and Spillane's [123] account of leadership emanating from social interactions among leaders, followers, and the context in which they find themselves.

3.2.4. Period 4 (2020–2023)

The science mapping analysis of 2175 articles published during the last three years revealed that research during this period was developed over similar themes from the previous periods, but the subthemes associated with some of the motor themes changed. These themes were STUDENT-ACHIEVEMENT, JOB-SATISFACTION, PRINCIPALS, DISTRIBUTED-LEADERSHIP, SCHOOL-LEADERSHIP, EDUCATIONAL-LEADERSHIP, and SCHOOL-PERFORMANCE (Figure 11).

(a) Period 4 (2020–2023)



(b) Performance measures for Period 4

Theme	h-index	Cites	Centrality Range	Density Range
STUDENT-ACHIEVEMENT	14	474	1	1
JOB-SATISFACTION	11	375	0.94	0.62
ADMINISTRATION	3	46	0.88	0.06
SCHOOL-CLIMATE	6	149	0.81	0.31
PRINCIPALS	3	19	0.75	0.5
DISTRIBUTED-LEADERSHIP	7	375	0.69	0.75
SCHOOL-LEADERSHIP	6	142	0.62	0.69
EDUCATIONAL-LEADERSHIP	6	136	0.56	0.56
SCHOOL-PERFORMANCE	2	29	0.5	0.81
SCHOOL-PRINCIPALS	3	53	0.44	0.44
LEADERSHIP	3	56	0.38	0.88
TEACHERS	4	79	0.31	0.94
TEACHER-LEADERSHIP	4	79	0.25	0.38
EDUCATION	2	15	0.19	0.12
STUDENTS	2	6	0.12	0.25
LEADERSHIP-DEVELOPMENT	2	9	0.06	0.19

Figure 11. Strategic diagram for Period 4.

The STUDENT-ACHIEVEMENT theme in this period was more focused on classroom/instruction-oriented aspects of leadership, particularly the leadership of the principal, as the subthemes *Principal-Leadership* and *Instructional-Leadership* suggested. The other subthemes associated with student achievement were *Trust*, *Teacher-Efficacy*, *Instructional-Practice*, *Teacher-Perspective*, *School*, and *Classroom* (Figure 12). These subthemes demonstrate researchers' continuing interest in exploring the indirect effects of especially instructional leadership [47] by searching for the most powerful mediators. Evidence continued to identify the effects on students of principals' instructional leadership, as relatively higher, and

more direct compared to other models [8,124–127]. Evidence reported during this period continued to provide justification for the claim that leadership was critically important for improving teaching and learning [100].

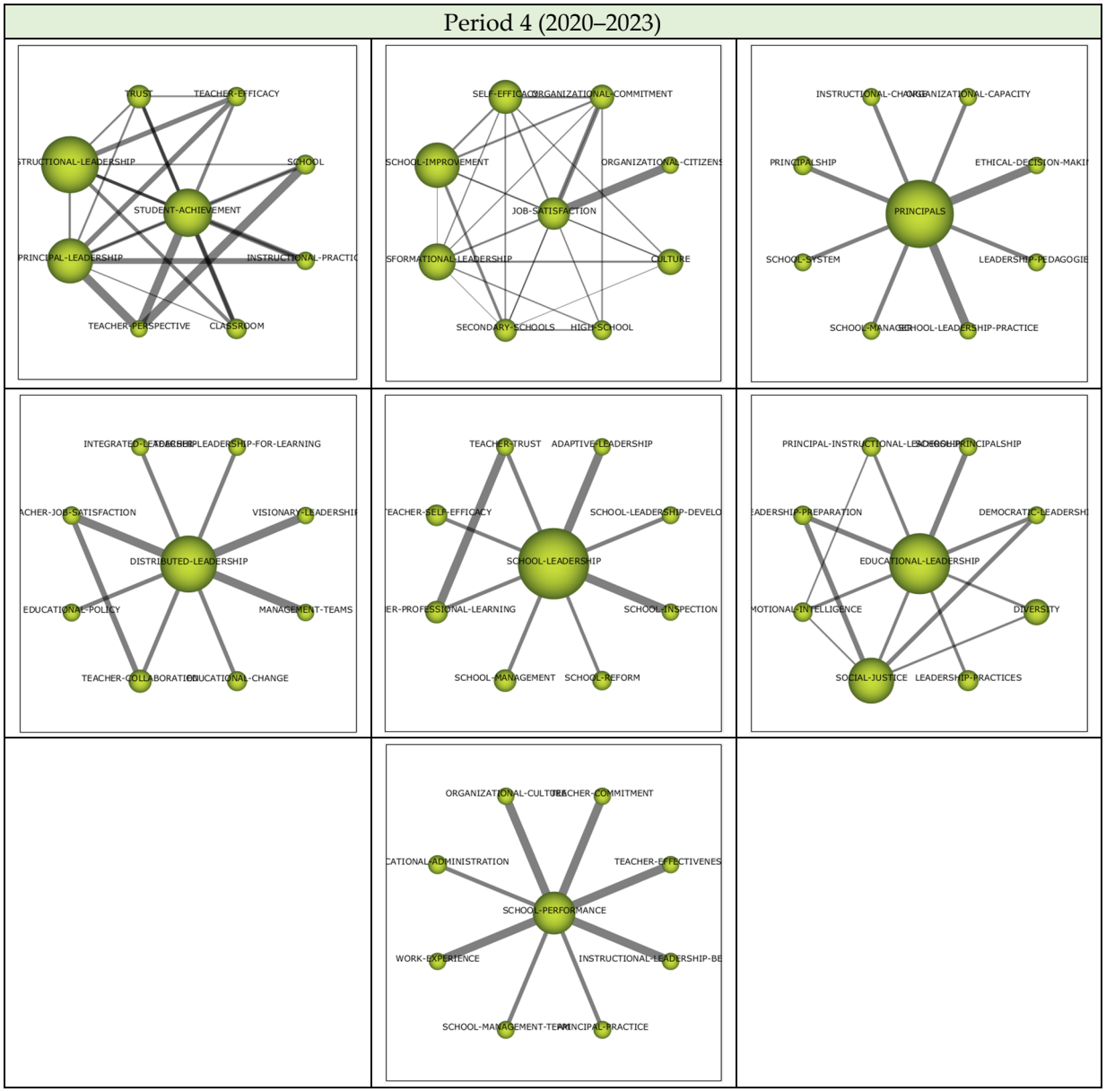


Figure 12. Thematic network structures for Period 4.

Evidence reported during this period also acknowledged limitations in the knowledge base about what effective leaders actually do and how their behaviors influence student learning [19,47,128,129]. Addressing these limitations, Leithwood et al. [128] investigated the indirect effects on student learning of their integrated model of leadership mediated by four categories (paths) of variables (12 in total). Results identified one category of mediators (rational) as having the most direct effects on students. This category includes academic press, disciplinary climate, and teachers' use of instructional time. The other three categories of mediators influenced students through their contribution to those three variables in the rational category. Likewise, in their review study on the relationship between school leadership and student achievement, Özdemir et al. [18] confirmed that these studies mostly focused on this rational path, followed by the organizational (e.g., school climate, safety, collective teacher efficacy, and school capacity) and emotional path (e.g., teacher commit-

ment, job satisfaction, self-efficacy, and trust). Other research (e.g., [130,131]) demonstrated a significant relationship between instructional leadership and teacher efficacy in support of better student outcomes.

Period 4 spans the COVID-19 and post-COVID period, a context that seems likely to have influenced some of the research results reported during that period. For instance, Kemethofer et al.'s [132] study of Austrian primary schools found that principal leadership did not have any effect on instructional quality or student achievement in math. The authors speculated that this result could be explained by the changing circumstances and expectations of principals under the pressing conditions of the COVID-19 lockdown. Shaked's [133] investigation of instructional leadership in the context of COVID-19, for example, found that, especially during the initial stages of the pandemic, principals refrained from prioritizing teaching/learning, focusing more of their efforts on the emotional needs and well-being of both teachers and students. Similarly, Longmuir [134] reported that the uncertainty of the pandemic turned principals' attention to the 'humanizing purposes of education' and the basic needs of school communities. These findings seem likely to have fostered some of the attention to subthemes such as *Teacher-Perspectives*, *Trust*, and *Teacher-Efficacy*. Forfang and Paulsen's [135] Norwegian study found that rural schools in which principals were successful in directing the school goals, enabled collaboration among teachers, supported teacher well-being and professional learning, as well as supervising teachers' instructional practices. These person-centered practices were closely linked to teachers' increased efficacy and confidence, in addition to collaborative learning opportunities.

The SCHOOL-LEADERSHIP theme had a similar focus on school capacity building to enhance instruction and student outcomes as the associated subthemes such as *Teacher-Trust*, *Adaptive-Leadership*, *Teacher-Self-Efficacy*, *Teacher-Leadership Development*, *Teacher-Professional-Learning*, *School-Inspection*, *School-Management*, and *School-Reform* illustrated. In an earlier period, Hallinger [80] asserted that principals' capacity to interpret their contexts accurately was a significant precursor to leadership effectiveness. This capacity, he argued, enabled leaders to adapt their practice to the unique needs of their schools. Consistent with this assertion, Weiner et al. [136] reported that circumstances created by COVID-19 required principals to utilize 'the efforts and skills of their workforce to adapt to changing conditions and perform under pressure' (p. 2), and to facilitate the problem-solving and innovation skills of their colleagues in response to the crisis. Fotheringham et al. [43] noted that government policies implemented during the pandemic urged school leaders to change school routines and practices; the pandemic significantly increased the pressure on principals to follow through. Principals in many jurisdictions were expected to respond in a creative manner to the changing needs of students and teachers [137]. These circumstances may have helped to trigger more research focused on the management, reform, and inspection-related roles of school leadership.

The EDUCATIONAL LEADERSHIP theme, on the other hand, was mostly investigated in relation to specific characteristics (i.e., Emotional-Intelligence) and practices of principals intended to address widely endorsed priorities for schools such as increasing Social-Justice and responding equitably to student diversity. Other subthemes associated with EDUCATIONAL-LEADERSHIP were *Principal-Instructional-Leadership*, *School-Principalship*, *Democratic-Leadership*, and *Leadership-Preparation*. A study by Karakose et al. [138] found that research on social justice leadership increased significantly after 2018, and reached its peak in 2021. Researchers offered two explanations for increased interest in social justice leadership. One explanation was the effect of several well-regarded educational leadership journals that have published special issues about social justice leadership during previous periods. A second explanation was COVID-19; circumstances created by the pandemic shone a light on educational inequities for groups of already vulnerable students. Harris and Jones [44], for example, argued that COVID-19 created significant educational inequities, particularly disparities in accessing the internet and other digital devices, as well as underlining already existing inequities. A better response from those in leadership

positions was warranted in responses to these inequities post-pandemic, if not during the pandemic [42].

Previous research also called attention to the socio-economic status of students' families as a strong determinant of achievement gaps. This research provided evidence that principals' instructional leadership might help narrow the SES-based achievement gap by improving learning-related conditions in schools [138–140]. Shaked [133] suggested that principals' instructional leadership could eliminate injustices through school improvement 'because it strives rigorously to lead all students to high academic performance, regardless of diverse students' potentially marginalizing characteristics' (p.2). Tian and Huber's [8] review of research also found that social justice, equal education, and narrowing achievement gaps were among the prominent themes in the leadership field, particularly in the last decade. These results explain the impetus for subthemes associated with EDUCATIONAL LEADERSHIP developed during this period including *Social-Justice*, *Diversity*, *Principal-Instructional-Leadership*, and *Democratic-Leadership*.

Regarding the *Emotional-Intelligence* subtheme, Delcker and Ifenthaler [141] claimed that emotional intelligence is a key quality required for effective leadership while Noori et al. (2023) found that principal leadership (particularly transformational leadership) significantly enhanced teachers' emotional intelligence. With COVID-19 in mind, Harris and Jones [44] argued that to be effective, principals should not only manage their own emotions but also manage the emotional responses of others to the frustrating outcomes of the pandemic; they should, in fact, 'provide effective emotional and moral leadership in an unfamiliar and rapidly changing territory [in which] they developed pragmatic, versatile, and personally reassuring approaches to communication with parents, staff, students, and various external stakeholders' [133]. These claims could explain the resurgence of interest in emotional intelligence as an aspect of effective educational leadership, something long assumed to be an essential quality of effective leaders [48,95,142]. The *Leadership-Preparation* subtheme, on the other hand, might be either reflecting the sustained policy and research interest in leadership training and development or changing perspectives on needed leadership skills, particularly following the challenges of the pandemic. Crow et al. [95] underlined that leadership training and development documents, globally, focused on technocratic leadership skills which prioritized student achievement scores. However, as Harris and Jones [44] asserted, these leadership programs were no longer fit for purpose and new programs should be developed if principals were to be equipped with the skills and practices for the future. In sum, the rapidly changing context of leadership in the current era, as well as the continuing development of the educational leadership knowledge base, served to maintain interest in the research about leadership preparation.

The PRINCIPALS theme during this period reflected a stronger focus on schools as organizations. Research focused on the school-oriented roles and practices of the principal such as *Organizational-Capacity*, *Principalship*, *Ethical-Decision-Making*, *School-System*, *School-Manager*, *Leadership-Practice*, and *Instructional-Change*. Developing principals as leaders was also the focus of investigation as the subtheme *Leadership-Pedagogies* suggested.

The other motor theme during Period 4 was the DISTRIBUTED-LEADERSHIP, with the associated subthemes of *Integrated-Leadership*, *Leadership-for-Learning*, *Teacher-Job-Satisfaction*, *Visionary-Leadership*, *Educational-Policy*, *Management-Teams*, *Teacher-Collaboration*, and *Educational-Change*. During Period 4, Diamond and Spillane [123] continued to stress the positive effects of 'distributed' instructional leadership on school improvement. Other scholars also asserted that the educational context that emerged under the influence of the COVID-19 pandemic called for such a distributed approach [143]. Indeed, leadership distribution was regarded by some as even the only way to enact effective leadership. These scholars argued that leadership was inevitably practiced through interactions taking place in the proliferation of networks, relationships, and the mobilization of others for collective engagement and action [44].

Period 4 also witnessed an evolution of leadership themes and concepts initiated in earlier periods. At the turn of the 21st century, in 2010, for example, Hallinger and Heck [144] noted that instructional leadership was being reconceptualized as 'leadership

for learning', a change prompted by an increased focus on improving student learning [53]. In the same year, Marks and Printy [57] tested the combined effects of transformational and 'shared' instructional leadership on student achievement, labeling this combination as 'integrated leadership'. This seminal study showed that integrated leadership was more effective than either instructional or transformational leadership alone in contributing to school improvement. Research during Period 4 continued to explore these earlier claims about forms and outcomes of effective leadership. Leadership for learning and integrated leadership became terms used in place of the more traditional and principal-centered 'instructional leadership' [41]. Reflecting a lack of consensus about any one best model of approach to leadership, however, Period 4 also included research about a wide range of such models. While some of this research continued to explore 'integrated leadership' and 'leadership for learning' [19], elements of instructional, transformational, distributed, and situational leadership were examined by Daniëls et al. [16], for example.

The two other Period 4 motor themes were SCHOOL-PERFORMANCE and the JOB-SATISFACTION themes. These themes had strong associations with organizational behavior variables. For instance, the SCHOOL-PERFORMANCE theme was addressed in relation to *Organizational-Culture*, *Teacher-Commitment*, *Educational-Administration*, *Teacher-Effectiveness*, *Instructional-Leadership*, *School-Management*, and *Principal-Practice* while the JOB-SATISFACTION theme was related to *Self-Efficacy*, *Organizational-Commitment*, *Organizational-Citizenship*, *School-Improvement*, *Transformational-Leadership*, *Culture*, *Secondary-Schools*, and *High-School* subthemes. The subthemes of *Secondary-School* and *High-School* indicate an effort to fill the gap created by the almost exclusive focus on elementary schools in earlier periods. Many studies addressed the relationship between transformational leadership and teacher self-efficacy, commitment, and citizenship behavior, with their potential impacts on school improvement [145–150].

There were five emerging/declining themes during Period 4—SCHOOL-PRINCIPALS, STUDENTS, TEACHER-LEADERSHIP, LEADERSHIP-DEVELOPMENT, and EDUCATION. Teacher leadership continued to attract research interest but research focused more on distributed leadership incorporating teacher leadership in many cases [41]. The LEADERSHIP-DEVELOPMENT theme, on the other hand, seems to be an emerging theme as it also revealed itself in relation to principals and educational leadership themes. The themes of STUDENTS and EDUCATION are quite generic, which makes it difficult to interpret whether these themes were emerging or declining; yet, as the student achievement motor theme illustrated, the studies during this period were more inclined to investigate classroom/instruction level aspects of leadership [128,132,151,152] continuing the attention to student-level effects evident in earlier periods. This could even be a late response to Leithwood et al.'s [153] suggestion that studies regarding the direct effects of leadership on students were quite limited in the literature.

Results related to the basic and transversal themes indicate that SCHOOL-CLIMATE and ADMINISTRATION maintained their significant relationship with the ELR field, but did not fuel or guide research during this period. These two themes were in fact more common in early ELR research, with leadership largely overshadowing administration and school culture largely replacing school climate in the later periods. The appearance of these themes might suggest a continuation of interests from earlier periods.

As suggested by Connolly et al. [154], slight differences exist between what school management and administration means. School management is often related to the upper echelons of the hierarchy, and more global functioning of the system while school administration is often related to lower order, daily duties with crucial implications for effective school functioning [154]. Considering this difference, the theme ADMINISTRATION might suggest that the current understanding of the school-based, daily practices of leadership might be limited in the current state of this knowledge base as compared to the other aspects of educational leadership. The SCHOOL-CLIMATE theme also supports our assumption considering that it is mostly related to the particular school atmosphere unique to individual schools.

3.3. Thematic Evolution Structure

SciMAT is a particularly powerful tool for analyzing the evolution of a research field by producing the thematic evolution structure across periods of analysis. Results displayed in Figure 13 identify the strength of the relationships between the themes (straight lines indicate a stronger relationship than the dashed lines).

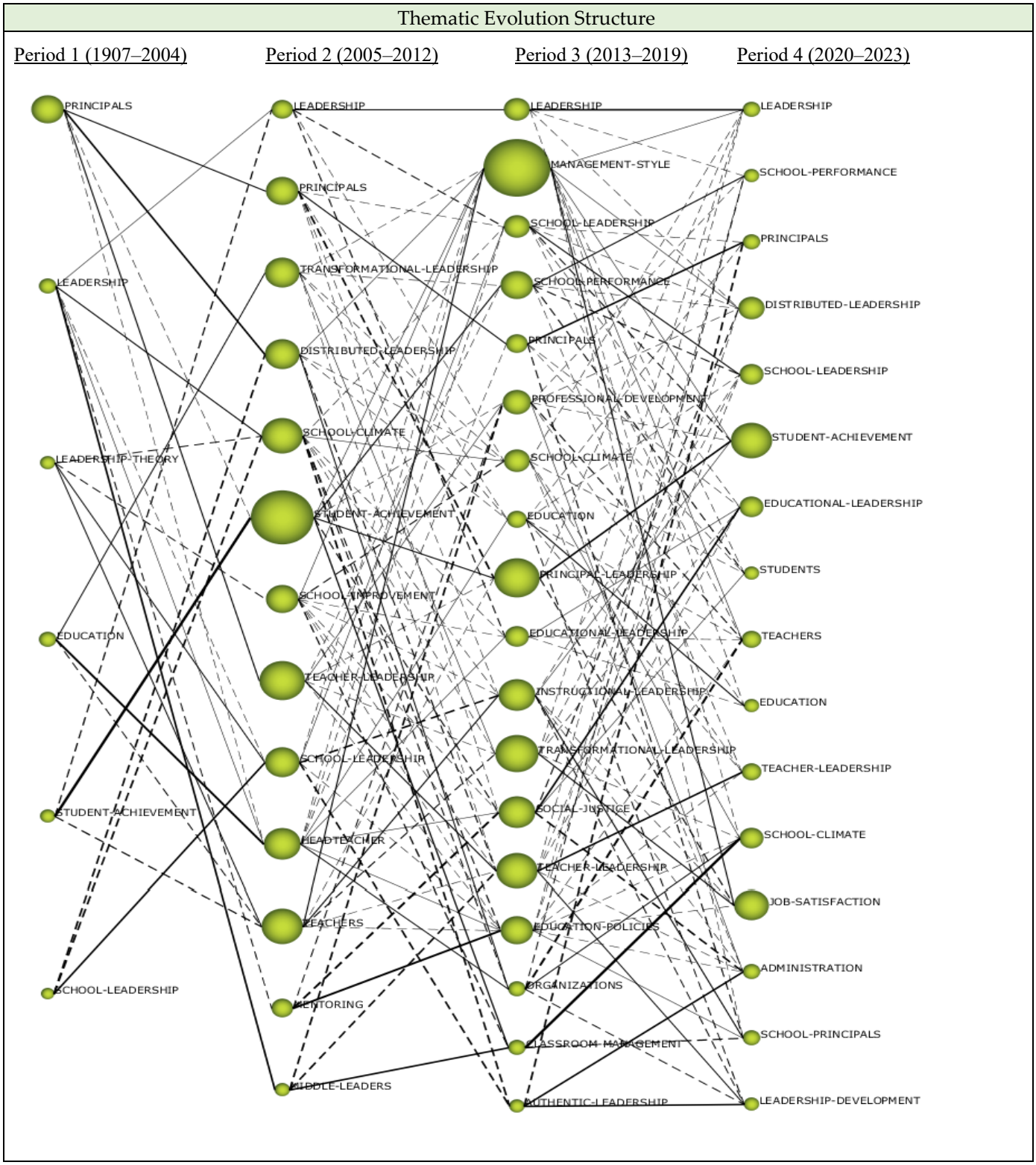


Figure 13. Thematic evolution structure.

Early Period 1 research included studies about Principals aimed at distinguishing between the administrative and leadership functions of principals making the case that "strong leadership" was a significant correlate of effective schools and that strong leaders were largely preoccupied with the classroom practices of their teachers. Period 2's concern about Principal leadership expanded understandings about just what those identified as "strong" actually did. The answer was explored in studies about different models or styles of leadership, initially a broader conception of instructional leadership than in Period 1, along with models of transformational leadership. Period 3 witnessed an increase in these models including the initial studies of "social justice leadership" which had flourished by Period 4.

During Period 2, evidence also began to demonstrate the value of leadership exercised by others in the school including teachers. This evidence prompted more sustained attention to both formal and informal leadership sources captured in the growing literature about distributed leadership. While the leadership of principals remained an active focus for research through all four periods, evidence that others were important sources of leadership accounted for the broader Leadership theme found in all four periods, one which acknowledged that leadership was a "function" rather than a "role".

By Period 2, growing evidence about the important, if not critical, contribution of leadership to educational policy implementation, school improvement, and student success began to generate increased attention to the nature of productive preparation and professional development of leaders, especially principals. This attention continued through Periods 3 and 4.

The dependent variables in studies of leadership were also expanded throughout the four periods. Student achievement (sometimes simply labeled "school performance") remained the dependent variable of greatest interest during all four periods. However, growing agreement about the indirect nature of leadership effects helped to generate sustained efforts to better understand the mediating effects of, for example, school climate and job satisfaction. Considerable research about other potential mediators of leadership effects on students was also evident by Period 4.

4. Conclusions and Implications

Combining bibliometric performance assessment and science mapping analysis, this review examined 7282 quantitative ELR studies published during four periods between 1907 and 2023. In addition to describing growth in the volume of research, as well as its most prominent authors, papers, and journals, the review identified both the dominant and secondary research themes in each of the four periods and how those themes evolved and changed over time.

Results of the review indicate considerable progress in defining the scope and qualities of effective school leadership although there is still much work to be conducted [155]. ELR has established school leadership as a key explanation for variation in student achievement across schools [100,156] "either blocking or promoting changes, acting as the internal change agent, [and] overseeing the processes of growth and renewal' [157] (p. 1072). Results of the review also support Riehl's [46] assertion that "education leadership is enacted by many different kinds of individuals; it comprises many functions and actions that operate contingently in a wide variety of contexts'.

Results of the review suggest that the first half of ELR's history reflects Kuhn's [158] "pre-paradigm stage", a lengthy period devoted to formulating 'legitimate methods, problems, and standards of the solution' (p. 48). This period was significantly influenced by evidence from the general leadership research [159]. Later periods were, though, successful in building a stronger epistemological foundation for ELR, one that more adequately reflects educational leaders' goals, organizational designs, and broader community contexts [23]. The ELR field was not much influenced by the three classical approaches to investigating leadership (traits, behavioral, and contingency/situational approaches). With the exception of "transformational leadership", ELR did not follow the general leadership

research community in advancing a wide array of prominent leadership models such as charismatic and strategic leadership [160]. This feature of ELR's trajectory reflects the results of several previous reviews [7,30] and is consistent with Hoy's [161] warning that 'uncritically borrowing of concepts or models from the social and behavioral sciences does not provide useful theory' (p. 3). As noted by Hallinger and Kovačević [30] specific to the corpus of EMAL, a longstanding journal in the field, many of the most frequently cited and influential studies were conceptual papers, and the field traditionally had a strong theoretical orientation.

The ELR field did, however, build on educational research about other consequential variables related to student learning such as school culture, academic optimism, reciprocal trust, and the like. Through the gradual integration of concepts and evidence from such diverse areas of educational inquiry, the ELR field evolved incrementally from a series of 'intellectual random events' [162] (p. 22) into a more integrated and better-organized body of knowledge. Evidence of this can be found in the increased number of themes that emerged in the last two periods of ELR, along with stronger connections between these themes.

In sum, during the second half of its development, the ELR field made significant progress in advancing its unique epistemological identity developing or further refining its own models of leadership such as teacher leadership and instructional leadership. By now, these evolutionary trends have produced a relatively robust field of study. The current study confirmed previous findings that the thematic landscape of the ELR field revolved around education reforms and change, school improvement, principal (leadership), instructional leadership, distributed leadership, and teacher leadership [8,30]. These results reflect the longstanding interest of scholars in cultivating school performance through increasing the leadership capacity of schools, with a continuing—but not inclusive—interest in the central role of principals. The current study consistently showed that research on educational leadership particularly attempted to understand the mechanisms through which leadership could eventually enhance student achievement and growth. The accumulated evidence underlined the significance of school-wide leadership practice in attaining this central goal of schools. Future research should, then, focus more on understanding the mechanisms underlying or enhancing school leadership capacity in a way that increases schools' abilities to rapidly respond to the changing goals of education. Further studies mapping the scientific development of the ELR field in the coming periods could help reveal whether the field has achieved this expected mission, and could reveal the trajectory taken by the educational leadership scholars.

The COVID-19 pandemic, however, created unique challenges for schools and their leaders, challenges neither anticipated nor addressed by ELR's accumulated knowledge base. The motivation to better understand the nature of effective educational leadership in the face of potential future crises such as COVID-19 may signal the beginning of a new era in the ELR field. Technological breakthroughs such as wide-spectrum internet connections, digital networking, vertical reality, and artificial intelligence all became more integral to people's lives following COVID-19; they have become a ubiquitous feature of many schools. The ELR field has barely begun to explore what the availability and use of these technologies in schools will mean for school improvement and the leadership required for such improvement. This has certainly significant implications for the further study of educational leadership in this post-COVID era, with a special focus on the beneficial use of recent technologies to enhance school outcomes.

COVID-19 also prompted schools to attend more systematically to foster student outcomes in addition to student achievement. Adding to longstanding advocacy for attention to the so-called "21st-century skills", many schools discovered that attention to their student's well-being, mindfulness, and engagement was crucial if their students were to cope with COVID-19 conditions and to make progress toward achieving well-established academic goals [163,164]. With well-established academic goals as the dependent variable in the vast majority of quantitative educational leadership studies to date, much has yet to

be learned about what leaders need to do to advance their students' nonacademic goals. This might be a starting point for efforts to turn schools from systems of bureaucratic management to more professional and/or community-like systems that collaboratively respond to the ever-changing demands of society [6,165].

Limitations of the Study

The most obvious limitation of this review is the limitation of any review using bibliometric analysis. The estimate of an author's or paper's influence on a field is determined by the frequency of citations and co-citations. However, as Belter [166] points out:

> *Authors cite other papers for all kinds of reasons: to refer to a particular methodology, to point out examples of other work done on the same topic, to reinforce a point they make in the text, to give credit to their mentors or experts in the field, or even to discuss examples of flawed methods or misleading results. Current bibliometric indicators cannot account for this variety; they count all citations equally, regardless of the actual reason for the citation (pp. 219–220).*

Notwithstanding this limitation, the current analysis of citations and co-citations in the ELR field offers rigorous results based on quantitative analysis and helps picture the growing landscape of the field. Yet, the results should be interpreted with caution, and warrants further support from similar studies.

A second limitation of the study is that it only included studies published in English, and therefore, some quality research addressing leadership in the educational field was likely missed from the analysis. Given that these studies probably reflect their own regional context, knowledge from some regions of the world could have been also missed.

Finally, as already noted, the restriction of selected papers for review to those "leadership" in their titles likely overlooked studies that were about leadership or included important components about leadership. As the current study included a wide variety of studies indexed in two global databases, missing some of such research might have had only slight influences on the results, which should still be taken into consideration while interpreting the results.

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