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The adaptive evolution of instructional leadership: A science mapping analysis of research on educational leadership and student learning outcomes

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Abstract

For more than four decades, research has shown that educational leadership is positively associated with student learning outcomes, yet predominantly through indirect and mediated pathways. At the same time, the conceptual frameworks used to explain this relationship have multiplied and diversified. This study addresses the paradox of empirical stability alongside conceptual proliferation by examining how instructional leadership has evolved within leadership-learning research. Using a longitudinal science mapping approach, 420 articles published between 1974 and 2025 were analyzed across three developmental periods. The findings indicate increasing structural integration among leadership-related themes rather than evidence of complete thematic replacement across successive periods. Transformational, distributed, and related leadership themes exhibited increasing structural overlap around mediating mechanisms such as teacher capacity, professional learning, trust, and organizational climate. Within this process, instructional leadership retained structural centrality. Its persistence is not explained by superior effect sizes, but by conceptual adaptability. Over time, instructional leadership expanded beyond a narrow supervisory model to incorporate relational, emotional, and distributed dimensions. Taken together with previous research, these structural patterns may be interpreted as supporting the argument that instructional leadership has evolved into an adaptive meta-framework that organizes mediated and context-sensitive explanations of how leadership shapes conditions for teaching and learning.

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Introduction

For more than four decades, scholars have examined whether and how educational leadership influences student learning. The accumulated evidence has produced a persistent paradox. On the one hand, findings consistently indicate that leadership effects on student outcomes are positive yet predominantly indirect (e.g., Grissom et al., 2021; Leithwood et al., 2020b; Louis et al., 2010; Robinson et al., 2008). On the other hand, the conceptual frameworks used to explain these effects have multiplied and diversified. Instructional, transformational, distributed, and teacher leadership have each been advanced as explanatory models, generating an increasingly complex theoretical landscape.

This coexistence of empirical stability and conceptual diversification raises important questions. If leadership effects are consistently mediated, why have new leadership models continued to emerge? If no single approach demonstrates clear superiority, why has instructional leadership remained structurally central? Does this proliferation reflect fragmentation, or gradual conceptual integration?

This study explores the proposition that the answer may lie in the adaptive reconceptualization of instructional leadership. Specifically, it examines whether the structural patterns identified through longitudinal science mapping are consistent with the interpretation that instructional leadership has expanded its conceptual boundaries and evolved into a framework capable of organizing the field's changing explanations of how leadership influences learning.

Early research emerging from the school effectiveness movement positioned instructional leadership as a direct driver of school improvement (Bossert et al., 1982; Hallinger and Murphy, 1986). As empirical methods advanced, however, direct effect assumptions weakened. Meta-analytic and multilevel studies demonstrated that leadership influences student achievement primarily through mediated pathways operating via teacher practices, professional capacity, and school climate (Leithwood et al., 2020b; Louis et al., 2010; Robinson et al., 2008). In parallel, transformational and distributed leadership frameworks gained prominence, emphasizing motivational, relational, and collective dimensions of influence.

Although these reviews have substantially advanced understanding of the magnitude and mechanisms of leadership effects on student learning, they primarily treat the literature as a cumulative body of findings. In contrast, the present study adopts a science mapping approach that reconstructs the structural and conceptual evolution of the field over time. Rather than aggregating results, it identifies patterns of thematic emergence, convergence, and reconfiguration, enabling a longitudinal analysis of how ideas evolve and interact. This approach is particularly suited to examining not only what is known about leadership effects, but how the conceptual architecture of leadership research has been formed and transformed across decades.

To address this gap, the present study adopts a science mapping approach to analyze the thematic and intellectual evolution of research on educational leadership and student learning outcomes from 1974 to 2025. This time frame reflects the historical emergence of instructional leadership research in the mid-1970s and enables the examination of its development across five decades of conceptual and empirical evolution. By combining bibliometric analysis with conceptual interpretation, the

study reconstructs how dominant themes have emerged, converged, and transformed, offering a longitudinal account for the persistence and adaptive transformation of instructional leadership within an increasingly integrative landscape. While the analysis identifies structural patterns in the literature, their interpretation as evidence of conceptual integration remains theoretically informed.

This study advances three central contributions. First, it shows that the relationship between leadership and student learning is consistently mediated, with mediation emerging as the dominant explanatory logic across decades. Second, it demonstrates that the proliferation of leadership models reflects conceptual convergence rather than theoretical fragmentation. Third, it advances the interpretation that instructional leadership may have retained structural centrality through its evolution toward an adaptive meta-framework, that is, a higher-order conceptual structure that integrates multiple leadership perspectives by organizing shared explanatory mechanisms rather than replacing them.

Literature review

Over several decades, a substantial body of empirical research has examined whether, how, and under what conditions school leadership influences students' academic outcomes. This sustained scholarly attention has generated numerous systematic reviews and meta-analyses that synthesize accumulated findings and clarify the magnitude and mechanisms of leadership effects. Across these syntheses, instructional leadership frequently emerges as a structurally prominent or the reference framework for interpreting leadership influence, even as alternative leadership models have gained prominence.

Recent reviews converge on the conclusion that educational leadership is positively associated with student achievement primarily through indirect and mediated processes (Grissom et al., 2021; Leithwood et al., 2020b; Özdemir et al., 2024; Wu and Shen, 2022). These syntheses have strengthened causal inference, compared effect sizes across leadership models, and identified organizational, relational, emotional, and teacher-level pathways through which leadership may influence student outcomes. Despite their different analytical emphases, however, they generally approach the literature as a cumulative body of findings rather than examining how its conceptual organization has changed over time.

This limitation is significant because bibliometric studies of educational leadership have shown that the field's knowledge base is not static. Rather, it develops through the emergence, decline, recombination, and increasing interconnection of research themes (Hallinger and Kovačević, 2019a, 2019b; Tian and Huber, 2019). Science mapping research on instructional leadership has similarly demonstrated that the construct has broadened considerably over time, incorporating organizational, contextual, and relational concerns beyond its original emphasis on supervision and curriculum coordination (Hallinger et al., 2020). These studies establish the value of examining intellectual development longitudinally, but they do not focus specifically on how leadership frameworks have been reorganized around explanations of student learning outcomes.

This gap is particularly relevant to the continuing prominence of instructional leadership. Although transformational, distributed, teacher, and other leadership frameworks have expanded substantially, instructional leadership has neither disappeared nor been displaced. Previous scholarship has described its durability and documented changes in its knowledge base (Hallinger, 2005; Hallinger et al., 2020), while systematic reviews have identified its continued prominence in research on student outcomes (Gümüş et al., 2018; Özdemir et al., 2024). However, less attention

has been given to the structural relationships through which instructional leadership has remained connected to newly emerging leadership models and mediating mechanisms.

Addressing this question requires a longitudinal approach capable of tracing thematic continuity, differentiation, and recombination across successive periods. Science mapping is suited to this purpose because it examines the relational organization of a knowledge domain rather than merely aggregating the findings of individual studies (Cobo et al., 2011, 2012; Hallinger and Kovačević, 2019a). By analyzing co-word structures and thematic evolution, it can identify whether leadership models develop as separate research traditions, replace one another, or become increasingly interconnected around shared concepts.

Accordingly, the present study applies longitudinal science mapping to research on educational leadership and student learning outcomes published between 1974 and 2025. It seeks to reconstruct changes in the thematic organization of this literature and, more specifically, to examine the changing structural position of instructional leadership within it. The bibliometric findings are subsequently interpreted in relation to the substantive literature on leadership and student learning. The study therefore distinguishes between patterns directly demonstrated by the science-mapping analysis and the theoretical interpretations advanced to explain those patterns.

Method

Research design

The aim of the present study is not to estimate the magnitude of leadership effects or to synthesize empirical findings across studies. Rather, it is to examine how the conceptual organization of research on educational leadership and student learning has evolved over time. This objective requires an approach capable of analysing relationships among concepts, identifying patterns of thematic continuity and change, and reconstructing the intellectual development of the field. Bibliometric science mapping is particularly well suited to this purpose because it focuses on the structural organization of a body of literature rather than on aggregating study outcomes.

This study employs a bibliometric science-mapping methodology to examine the thematic structure and longitudinal evolution of research on the relationship between educational leadership and student learning outcomes. Science mapping enables researchers to reconstruct the intellectual architecture of a research field by analysing relationships among concepts as reflected in bibliographic metadata. Rather than synthesizing empirical findings, it identifies the structural organization of a knowledge domain, including the emergence, persistence, convergence, and transformation of research themes over time.

The analyses were conducted using the SciMAT software (Cobo et al., 2011, 2012), which supports longitudinal thematic comparison through co-word networks, strategic diagrams, and thematic evolution mapping. This approach is particularly suitable for the present study because it enables a systematic comparison of thematic centrality and density across consecutive periods, thereby capturing structural reconfiguration rather than simply cumulative publication growth.

Longitudinal science mapping requires the division of the dataset into successive time periods so that changes in thematic structures can be examined across different stages of a field's development (Cobo et al., 2012; Hallinger and Kovačević, 2019b). The selection of periods involves balancing sufficient data within each interval to produce stable thematic networks while preserving adequate temporal resolution to detect meaningful conceptual change.

To capture temporal heterogeneity in the field's development, the dataset was divided into three consecutive periods. The division into three time periods (1974–2012; 2013–2019; 2020–2025)

was based on a combination of empirical and substantive criteria. Preliminary analysis of publication and citation trends revealed clear inflection points in growth trajectories, particularly around 2013 and 2020, corresponding to shifts in both research volume and thematic diversification. These temporal boundaries were selected to capture distinct developmental phases of the field rather than arbitrary intervals and were further validated through preliminary inspection of thematic shifts in the literature. The final periods were defined as follows: Period 1: 1974–2012; Period 2: 2013–2019; Period 3: 2020–2025.

Data collection

Data were collected from Web of Science and Scopus due to their wide disciplinary coverage and the reliability of their bibliographic metadata (Hallinger, 2018). The search strategy combined keywords related to educational leadership and student learning outcomes. The search string included variations of terms such as educational leadership, school leadership, principal leadership, combined with student achievement, student performance, and learning outcomes.

The search was limited to peer-reviewed journal articles published in English within the selected time frame. Conference papers, book chapters, dissertations, and non-scholarly materials were excluded to ensure comparability of bibliometric indicators. The search and screening process followed PRISMA guidelines to ensure transparency and replicability. The overall search and screening procedure is summarized in Figure 1.

The initial search yielded 1041 documents from Web of Science and 1354 from Scopus. After removal of 1136 duplicates (568 from each database), 1259 records remained for screening. Titles and abstracts were evaluated against predefined inclusion and exclusion criteria, and articles were excluded if they did not explicitly address the relationship between leadership and student outcomes, or if they focused on non-educational content or examined leadership only tangentially. Following full-text screening, 420 articles met all inclusion criteria and were retained for the final bibliometric analysis. The full screening process is illustrated in Figure 2.

Data preparation

Before analysis, bibliographic data from both databases were merged into a single dataset. Keyword normalization was conducted within SciMAT using a controlled thesaurus approach to reduce semantic fragmentation. This process involved unifying singular and plural forms (e.g., teacher and teachers), merging synonymous terms (e.g., "student achievement" and "academic achievement"), and manually reviewing ambiguous terms to avoid conflating conceptually distinct constructs. The normalization criteria were applied consistently across all periods to ensure comparability over time.

Data analysis

The science mapping analysis was conducted in three analytically sequential stages to identify thematic structures, evaluate their internal development, and trace their longitudinal transformation (Cobo et al., 2012; Martínez et al., 2015; Murgado-Armenteros et al., 2015).

First, co-word analysis was performed to construct networks based on the co-occurrence of author keywords. Consistent with previous science mapping studies, minimum frequency thresholds were selected iteratively to balance the inclusion of conceptually meaningful terms with the exclusion of infrequently occurring keywords that contribute little to the stability and

Search Date	28.12.2025
Search String	"leader*" OR "leadership" OR "educational leadership" OR "principal*"OR "school principal*" OR "middle manager*" OR "head*" OR "headship*" OR "headteacher*" OR "head teacher*" OR "school administrator*" OR "school administration" OR "school manager*" OR "school management" OR "administration" OR "management" OR "administrator*" OR "manager*" OR "vice-principal*" OR "vice principal*" OR "assistant principal*" OR "deputy principal*" OR "deputy head*" OR "deputy head teacher" OR "deputy headmaster") AND ("student* learning" OR "learning outcome*" OR "learning performance" OR "student* achievement" OR "academic achievement" OR "academic performance" OR "student* performance" OR "academic success" OR "student* success" OR "academic attainment" OR "student* attainment" OR "academic outcome*" OR "student* outcome*" OR "student* math*" OR "student* read*")
Search Target	Web of Science; Scopus – document title
Included	Refereed journal articles; all school levels; all leadership models; English language
Excluded	Conference proceedings; books; book chapters; non-educational context; non-English language

Figure 1. Data search and screening process (PRISMA).

interpretability of co-word networks (Cobo et al., 2012; Hallinger and Kovačević, 2019b). This procedure seeks to reduce analytical noise while preserving recurring concepts that represent substantive themes within the field. A standardized association strength measure was then applied to normalize the co-occurrence matrix.

Second, themes were identified using clustering algorithms implemented within SciMAT. SciMAT identifies themes by applying established co-word clustering procedures that group strongly associated concepts into coherent thematic structures (Cobo et al., 2012). Clustering enables the reconstruction of the intellectual organization of a research field by identifying sets of concepts that consistently co-occur within the literature. When overlapping constructs appeared across clusters, decisions were guided by co-occurrence patterns and contextual usage, ensuring that thematic grouping reflected both semantic proximity and structural positioning within the network. For each period, strategic diagrams were generated based on two structural indicators: centrality, reflecting the degree of interaction between a theme and other themes in the field, and density, reflecting the internal cohesion and developmental maturity of a theme.

These indicators enabled the classification of themes into motor themes, basic themes, emerging or declining themes, and highly developed but isolated themes. Motor themes are characterized by high centrality and high density, indicating that they are both well developed and highly connected to other themes in the field. Basic themes have high centrality but low density, reflecting their importance despite limited internal development. Emerging or declining themes are characterized by low centrality and low density, suggesting either early development or diminishing relevance. Highly developed but isolated themes exhibit high density but low centrality, indicating strong internal development but limited integration with the broader thematic network. The interpretative

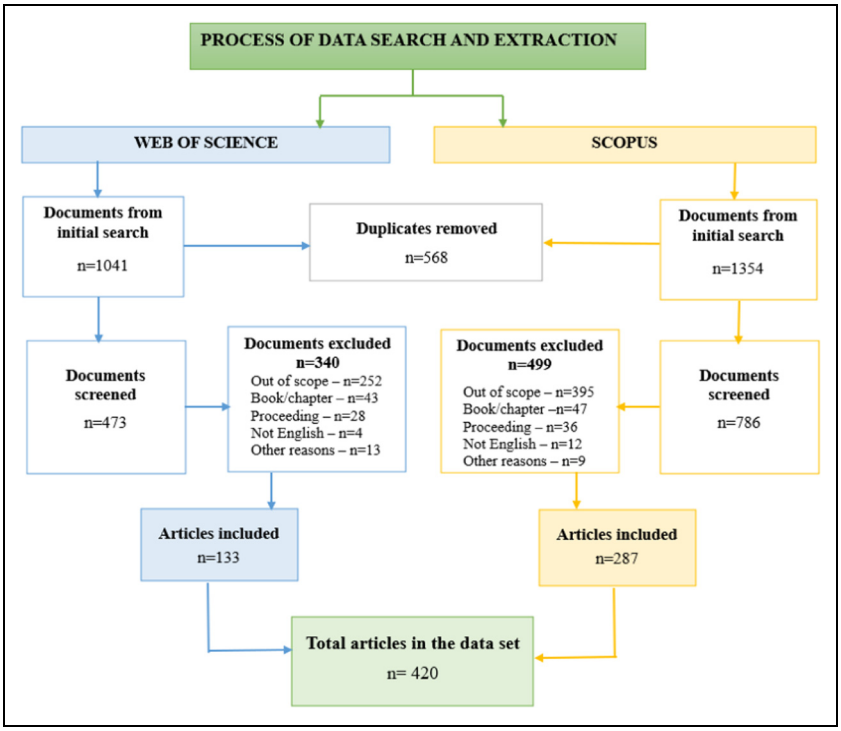


Figure 2. PRISMA flow diagram of study selection.

framework used to categorize themes according to centrality and density values is presented in Figure 3.

Third, thematic evolution analysis was conducted to trace conceptual continuity and transformation across periods. This procedure maps shared keywords between periods and identifies patterns of thematic persistence, convergence, and reconfiguration over time.

Reliability and analytical rigor

Following recommendations in the science mapping literature (Cobo et al., 2012; Hallinger and Kovačević, 2019b; Murgado-Armenteros et al., 2015), several steps were taken to enhance the reliability and analytical rigor of the bibliometric analysis. First, using two major databases reduced potential coverage bias and increased the comprehensiveness of the dataset. Second, keyword normalization was conducted systematically to improve semantic consistency across records. Third, thematic interpretation was grounded in structural indicators derived from centrality and density metrics rather than solely on subjective categorization. Together, these procedures enhance the transparency, stability, and reproducibility of science mapping analyses. Importantly, while these procedures strengthen the robustness of the mapping, the interpretation of thematic relationships remains analytically guided and theoretically informed.

Nevertheless, the methodological literature also recognizes important limitations of bibliometric science mapping (Cobo et al., 2012; Hallinger and Kovačević, 2019b). Bibliometric analyses depend on authors' keyword selections, database coverage, and indexing practices, all of which

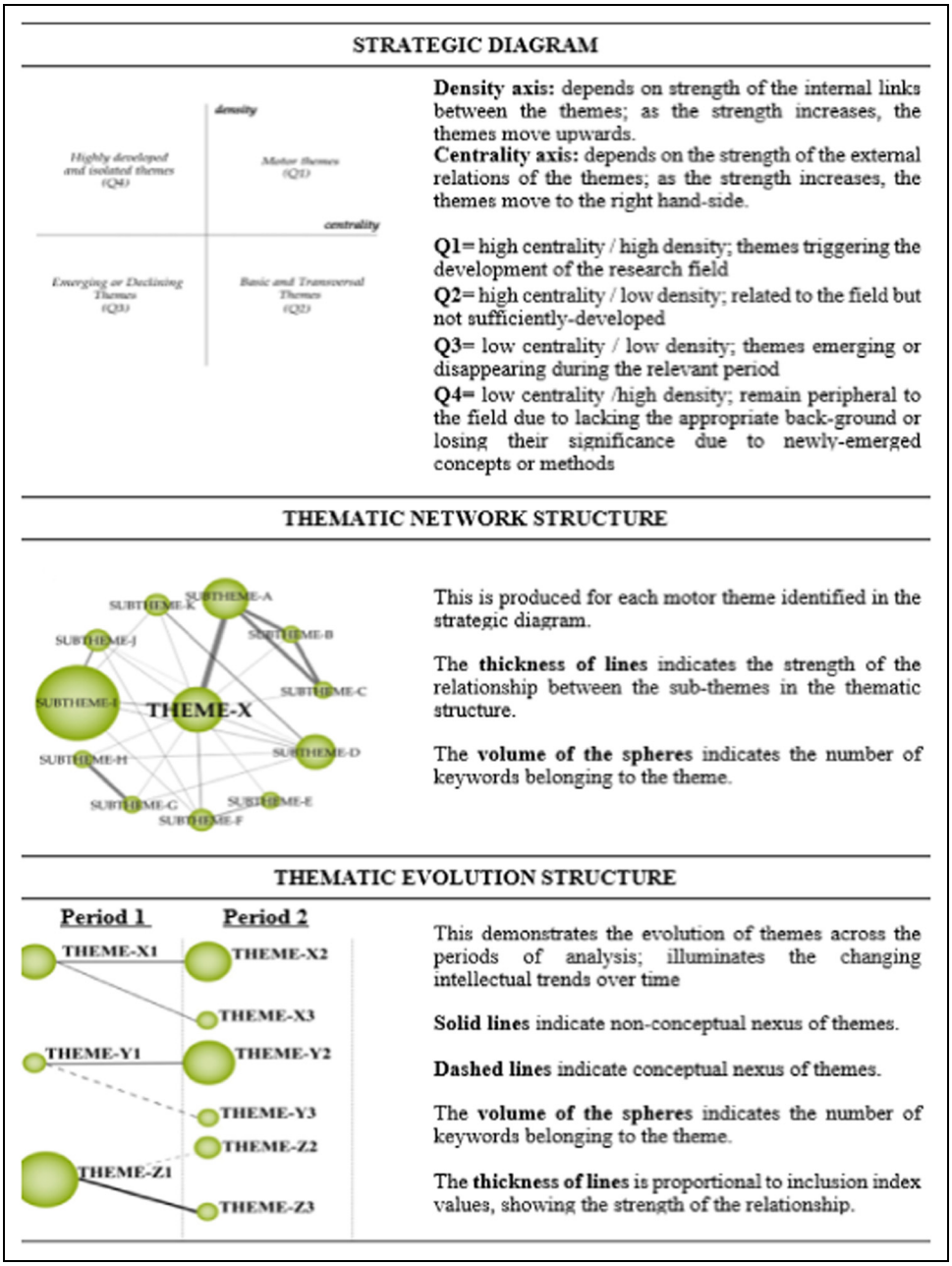


Figure 3. Classification of themes based on centrality and density (adapted from Karakose and Papadakis, 2025; Sott et al., 2021).

may influence clustering outcomes and thematic structures. In addition, science mapping reconstructs the conceptual organization of a research field but does not directly evaluate the methodological quality, theoretical validity, or causal strength of individual studies. These limitations were

taken into account when interpreting the findings, and the conceptual claims advanced in this study should therefore be understood within the scope of bibliometric evidence.

More specifically, the thematic networks identify structural relationships among concepts rather than causal or theoretical relationships. Accordingly, interpretations of thematic continuity, convergence, and conceptual development were informed by the substantive educational leadership literature and are presented as theoretically grounded interpretations of the bibliometric patterns rather than as direct findings of the science mapping analysis itself.

Results

Publication and citation trends

Publication and citation trends in research on the relationship between educational leadership and student learning were examined using metadata from 420 articles indexed in Web of Science and Scopus. The temporal distribution of publications and citations is presented in Figure 4.

Figure 4 illustrates a clear three-phase developmental trajectory of the field between 1974 and 2025. Period 1, spanning 1974–2012, represents the foundational stage of the literature. Publication output remained modest for several decades, reflecting the gradual emergence of leadership as a distinct explanatory factor in student learning research. Citation peaks in 2008 and 2010 indicate that a small number of highly influential studies shaped subsequent scholarship and consolidated core theoretical contributions.

Period 2, covering 2013–2019, marks an accelerated expansion phase. Publication volume and citation frequency increased substantially, signaling growing scholarly attention and conceptual diversification.

Period 3, from 2020 to 2025, shows the highest publication output and cumulative citations. Despite fluctuations in annual citations due to shorter citation windows, overall accumulation suggests increasing integration and maturity of the field.

Overall, research on educational leadership and student learning evolved from a relatively specialized strand within school effectiveness research into a structurally consolidated field. Within this expanding landscape, instructional leadership emerged as a structurally central reference theme within the co-word network.

Thematic structure analysis

Period 1 (1974–2012). An analysis of 94 articles published between 1974 and 2012 identified eight major themes structuring the field's early development. The strategic diagram for this period is presented in Figure 5.

Figure 5 reveals a relatively dispersed thematic configuration, with themes distributed across all four quadrants. Four themes emerged as motor themes during this foundational stage: student performance, leadership behavior, teacher self-efficacy, and student achievement. Their high centrality and density values indicate that they were both structurally influential and internally developed, functioning as organizing anchors of early scholarship.

To examine the internal composition and relational structure of these motor themes, their cluster network configurations were analyzed (see Figure 6).

Figure 6 illustrates that the student performance cluster was strongly connected to reform-oriented and accountability-related constructs, including decentralization, support mechanisms, and measurable student outcomes. This configuration is consistent with the policy-driven

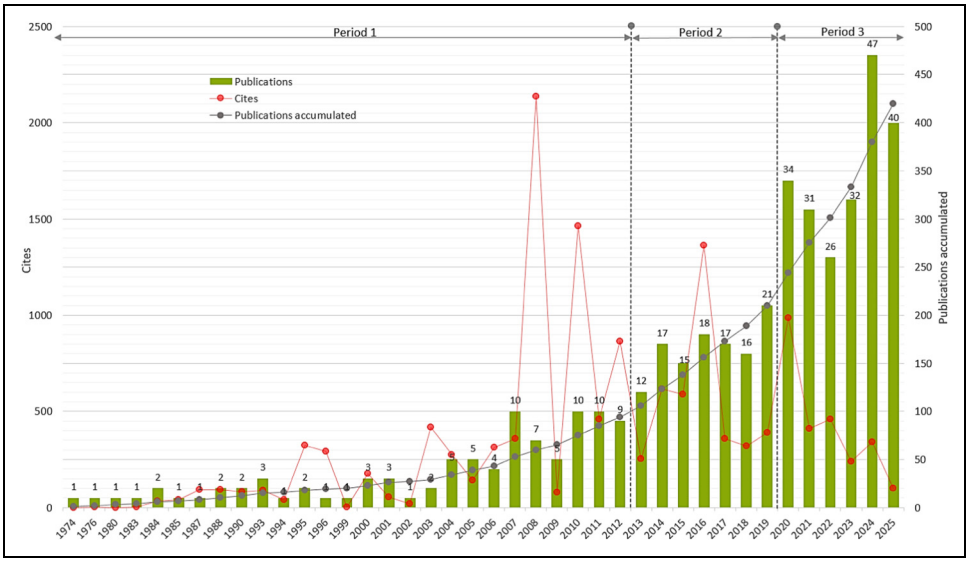


Figure 4. Publication and citation trends, 1974–2025.

orientation that characterized early leadership research and its close alignment with school effectiveness agendas.

The leadership behavior cluster emphasizes leadership theory, leadership effects, school improvement, and professional learning communities. This configuration is consistent with research examining behavioral mechanisms through which principals influenced instructional processes.

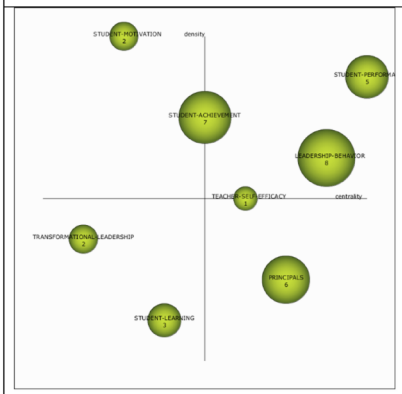
Teacher self-efficacy appears as a centrally positioned theme linking leadership to teacher-level mediators. Although its internal configuration suggests a measurement-oriented emphasis, its structural location indicates early recognition that leadership effects operate through teachers' beliefs and professional capacity.

Similarly, the student achievement cluster was connected to constructs such as collective efficacy, trust, shared leadership, and teacher empowerment. These structural connections suggest increasing thematic associations between student achievement and organizational and relational constructs within the literature.

Beyond the motor themes, student motivation emerged as a highly developed yet relatively isolated theme, indicating conceptual maturity but limited integration with the broader field. Transformational leadership and student learning emerged as transitional themes, signaling early exploration of alternative leadership models that would gain prominence in subsequent periods. The theme of principals functioned as a basic and transversal theme, reflecting the continued centrality of the principal as the primary unit of analysis.

Overall, the thematic structure of Period 1 reflects a foundational stage characterized by principal-centered leadership models, strong alignment with accountability discourses, and an emerging shift toward mediated explanations linking leadership to teacher capacity and collective processes. Although not yet explicitly framed as integrative, instructional leadership occupied a structurally significant position within these early configurations, foreshadowing the stronger structural connections observed in subsequent periods.

a. Period 1 (1974-2012)



b. Performance measures for Period 1

Cluster	Documents Count	Sum Citations	Centrality Range	Density Range
STUDENT-PERFORMANCE	5	24	1	0.88
LEADERSHIP-BEHAVIOR	8	0	0.88	0.62
PRINCIPALS	6	24	0.75	0.25
TEACHER-SELF-EFFICACY	1	0	0.62	0.5
STUDENT-ACHIEVEMENT	7	0	0.5	0.75
STUDENT-LEARNING	3	0	0.38	0.12
STUDENT-MOTIVATION	2	0	0.25	1
TRANSFORMATIONAL-LEADERSHIP	2	0	0.12	0.38

Figure 5. Strategic diagram for Period 1(1974–2012).

Period 2 (2013–2019). The analysis of 116 articles published between 2013 and 2019 identified 13 themes structuring the field's second developmental stage. The strategic diagram for this period is presented in Figure 7.

Figure 7 shows a denser, more interconnected thematic configuration than in Period 1. While leadership behavior remained structurally central, two additional themes, academic performance and instructional leadership, emerged as motor themes. Their positioning suggests a shift from foundational structuring toward conceptual diversification and consolidation.

The continued prominence of leadership behavior reflects sustained interest in leadership practices. Its thematic configuration during this period, however, reveals an expanded focus. The cluster now emphasizes student engagement, teacher job satisfaction, professional development, and leadership for learning, moving beyond an exclusive emphasis on leadership theory and school improvement. This shift suggests growing recognition of mediated pathways linking leadership to student outcomes.

Academic performance also emerged as a motor theme, reflecting a more refined focus on measurable outcomes. Its network configuration, illustrated in Figure 8, highlights connections to teacher support, student leadership, and teacher self-efficacy. Compared to Period 1, this indicates a stronger integration of teacher-level and student-level mediators within outcome-oriented research.

Instructional leadership gained greater structural prominence during this period. As shown in Figure 8, the instructional leadership cluster was connected to distributed leadership, transformational leadership, trust, and student outcomes, occupying a more central and highly connected structural position than in Period 1.

Beyond the motor themes, several themes occupied the highly developed but relatively isolated quadrant, including principal preparation, gamification, principal leadership, and school performance. Their placement indicates conceptual maturity but limited structural integration with the core leadership-learning nexus. At the same time, student achievement, principals, school leadership, and school climate appeared as basic and transversal themes, reinforcing the continued centrality of the principal while signaling diversification in contextual and organizational considerations.

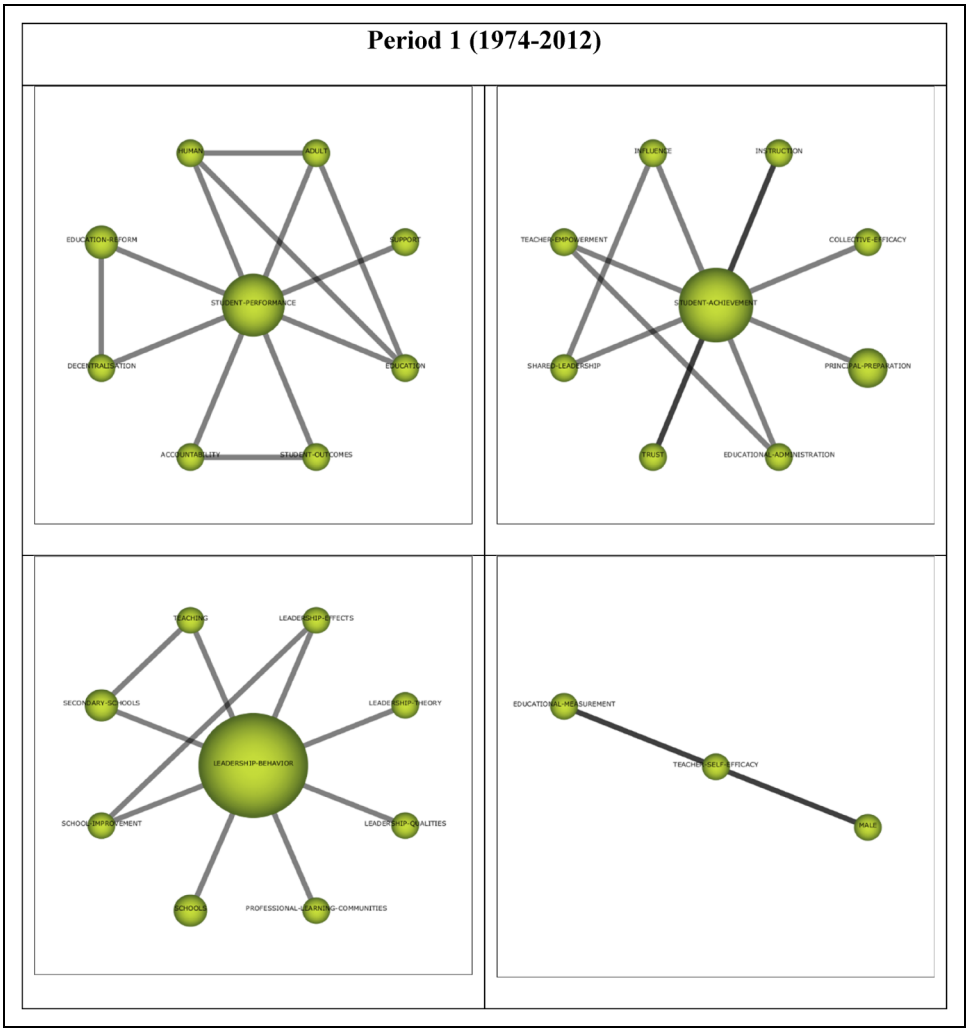
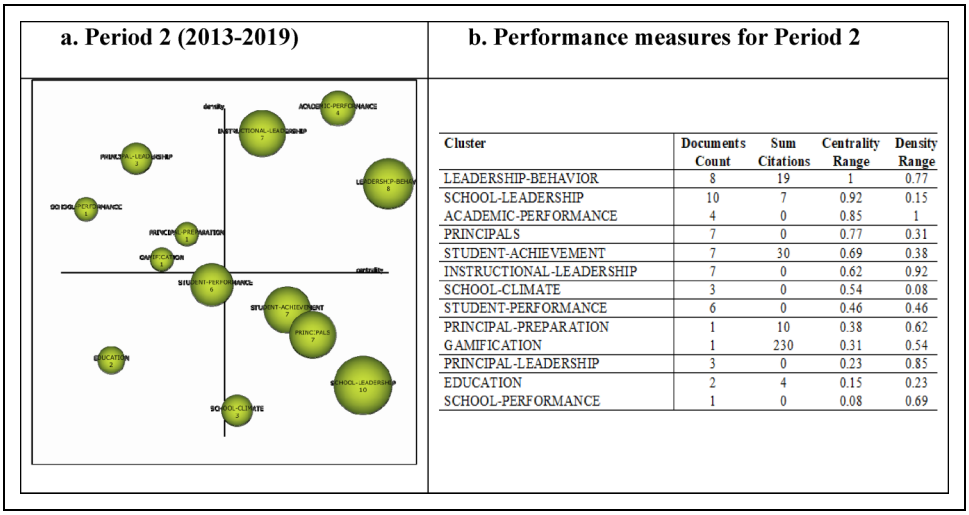


Figure 6. Thematic network structures for Period 1 (1974–2012).

Compared to Period 1, the thematic structure of Period 2 reflects a clear transition. The field moved from principal-centered, reform-oriented configurations toward more explicitly mediated and diversified thematic structures. The co-word network shows stronger connections between leadership-related themes and concepts such as teacher capacity, engagement, and organizational climate. Within this shift, instructional leadership occupied a structurally central position and exhibited stronger connections with multiple leadership-related themes than in the previous period.

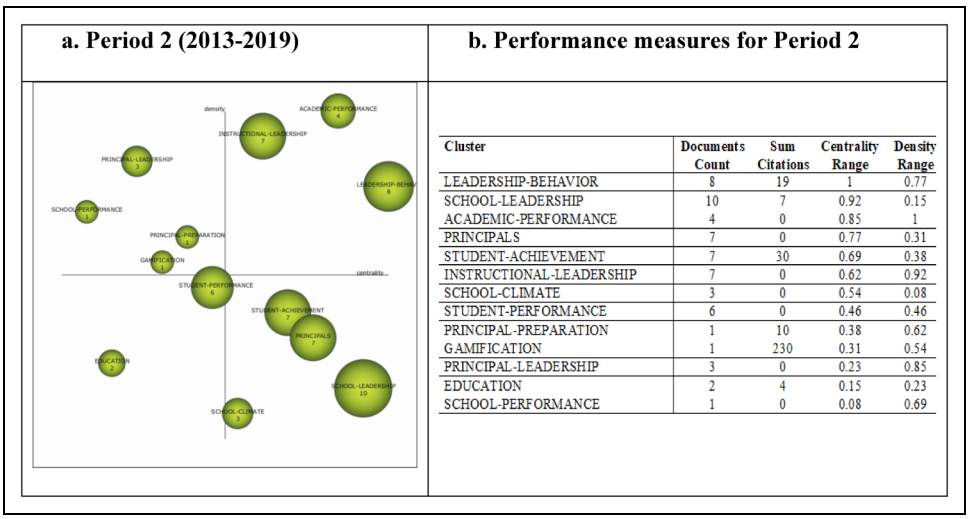
Period 3 (2020–2025). The analysis of 210 articles published between 2020 and 2025 identified seventeen themes structuring the most recent stage of the field. The strategic diagram for this period is presented in Figure 9.

Figure 9 reveals the most complex and densely interconnected configuration observed across the three periods. Five themes emerged as motor themes: emotion, academic achievement, instructional



Cluster	Documents Count	Sum Citations	Centrality Range	Density Range
LEADERSHIP-BEHAVIOR	8	19	1	0.77
SCHOOL-LEADERSHIP	10	7	0.92	0.15
ACADEMIC-PERFORMANCE	4	0	0.85	1
PRINCIPALS	7	0	0.77	0.31
STUDENT-ACHIEVEMENT	7	30	0.69	0.38
INSTRUCTIONAL-LEADERSHIP	7	0	0.62	0.92
SCHOOL-CLIMATE	3	0	0.54	0.08
STUDENT-PERFORMANCE	6	0	0.46	0.46
PRINCIPAL-PREPARATION	1	10	0.38	0.62
GAMIFICATION	1	230	0.31	0.54
PRINCIPAL-LEADERSHIP	3	0	0.23	0.85
EDUCATION	2	4	0.15	0.23
SCHOOL-PERFORMANCE	1	0	0.08	0.69

Figure 7. Strategic diagram for Period 2 (2013–2019).

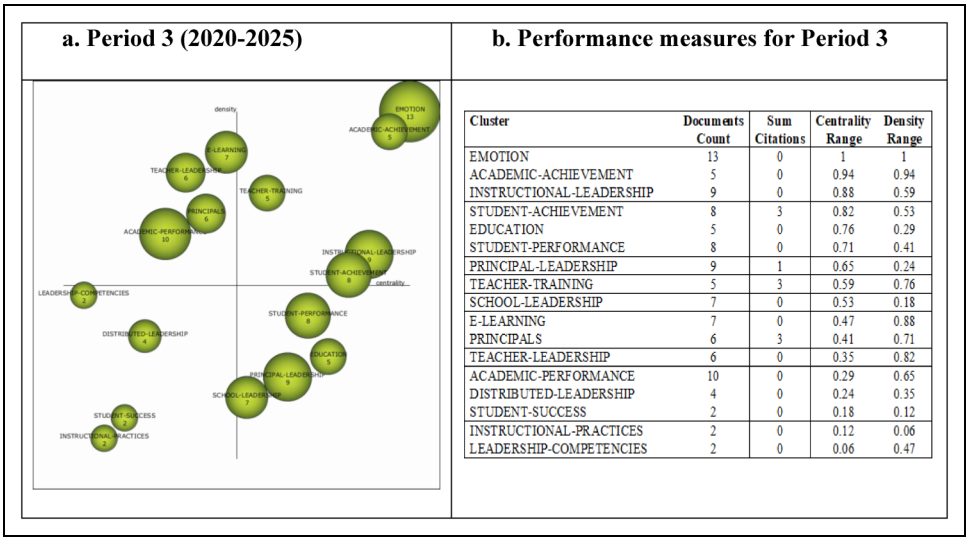


Cluster	Documents Count	Sum Citations	Centrality Range	Density Range
LEADERSHIP-BEHAVIOR	8	19	1	0.77
SCHOOL-LEADERSHIP	10	7	0.92	0.15
ACADEMIC-PERFORMANCE	4	0	0.85	1
PRINCIPALS	7	0	0.77	0.31
STUDENT-ACHIEVEMENT	7	30	0.69	0.38
INSTRUCTIONAL-LEADERSHIP	7	0	0.62	0.92
SCHOOL-CLIMATE	3	0	0.54	0.08
STUDENT-PERFORMANCE	6	0	0.46	0.46
PRINCIPAL-PREPARATION	1	10	0.38	0.62
GAMIFICATION	1	230	0.31	0.54
PRINCIPAL-LEADERSHIP	3	0	0.23	0.85
EDUCATION	2	4	0.15	0.23
SCHOOL-PERFORMANCE	1	0	0.08	0.69

Figure 8. Thematic network structures for Period 2 (2013–2019).

leadership, student achievement, and teacher training. Compared to earlier periods, this structure reflects both thematic expansion and increased integrative density.

A particularly notable development is the emergence of emotion as a motor theme. As illustrated in Figure 10, the emotion cluster is strongly connected to student outcomes, leadership behavior, and learning-related constructs. Unlike earlier configurations that emphasized structural and behavioral mechanisms, this pattern signals a conceptual broadening of leadership research toward relational and affective dimensions. The emotion cluster is increasingly associated with themes relating to emotional climate, teacher well-being, and learning environments.



Cluster	Documents Count	Sum Citations	Centrality Range	Density Range
EMOTION	13	0	1	1
ACADEMIC-ACHIEVEMENT	5	0	0.94	0.94
INSTRUCTIONAL-LEADERSHIP	9	0	0.88	0.59
STUDENT-ACHIEVEMENT	8	3	0.82	0.53
EDUCATION	5	0	0.76	0.29
STUDENT-PERFORMANCE	8	0	0.71	0.41
PRINCIPAL-LEADERSHIP	9	1	0.65	0.24
TEACHER-TRAINING	5	3	0.59	0.76
SCHOOL-LEADERSHIP	7	0	0.53	0.18
E-LEARNING	7	0	0.47	0.88
PRINCIPALS	6	3	0.41	0.71
TEACHER-LEADERSHIP	6	0	0.35	0.82
ACADEMIC-PERFORMANCE	10	0	0.29	0.65
DISTRIBUTED-LEADERSHIP	4	0	0.24	0.35
STUDENT-SUCCESS	2	0	0.18	0.12
INSTRUCTIONAL-PRACTICES	2	0	0.12	0.06
LEADERSHIP-COMPETENCIES	2	0	0.06	0.47

Figure 9. Strategic diagram for Period 3 (2020–2025).

Academic achievement retained central structural importance, but its internal configuration shifted. The cluster connects strongly to principal efficacy, teacher efficacy, and the educational environment, suggesting that outcome-oriented research in this period became more closely integrated with capacity building and contextual considerations. Compared to Period 2, achievement is no longer primarily framed in isolation but embedded within a broader network of mediating constructs.

Instructional leadership continued to function as a structurally central theme. As shown in Figure 10, its network structure revealed stronger connections with distributed leadership, integrated leadership, school culture, and principal evaluation.

Student achievement remained prominent, yet its connections emphasize professional development, leadership for learning, principal preparation, and teacher empowerment. This reinforces the sustained movement toward mediated and capacity-oriented explanations that began in Period 2 but appears more consolidated in this stage.

Teacher training also emerged as a motor theme, linked to learning outcomes, organizational behavior, and collaboration. Its positioning indicates heightened attention to leadership development and institutional capacity-building as mechanisms that influence student learning.

Several themes emerged as either increasing or decreasing, including distributed leadership and leadership competencies. Their presence reflects conceptual experimentation and responsiveness to contemporary challenges, particularly those posed by digital transformation and system complexity. At the same time, education, student performance, principal leadership, and school leadership occupied basic and transversal positions, suggesting continued foundational relevance but reduced thematic centrality.

Compared to earlier periods, the thematic structure of Period 3 reflects a field that has moved beyond foundational structuring and diversification toward integrative and context-sensitive configurations. Leadership-related themes were increasingly connected with emotional, relational, and professional development processes associated with learning environments. Within this configuration, instructional leadership occupies a central position in an increasingly interconnected thematic structure.

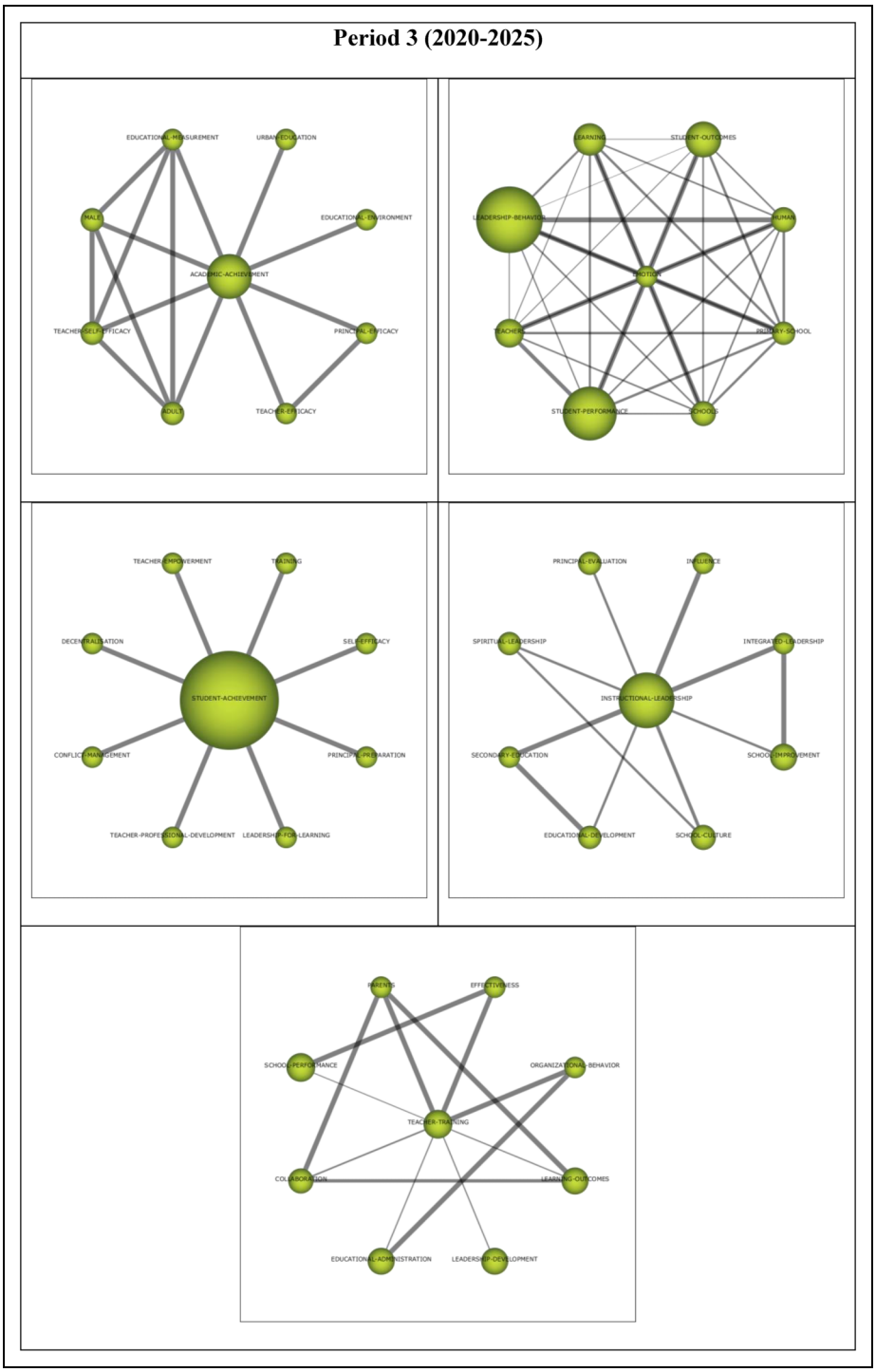


Figure 10. Thematic network structures for Period 3 (2020–2025).

Thematic evolution analysis

The thematic evolution analysis traces the continuity and transformation of research themes across the three periods. The thematic evolution map is presented in Figure 11.

Figure 11 visualizes the longitudinal connections between themes through shared keywords and structural overlap. The thickness and type of connecting lines represent the strength of thematic continuity across periods, enabling identification of persistence, convergence, and thematic reconfiguration.

A central pattern emerging from the evolution map is the sustained continuity of student performance and student achievement across all three periods. These themes function as longitudinal anchors of the field. While their internal configurations shift, their structural persistence indicates that outcome-oriented inquiry has remained the organizing core of leadership research.

However, the nature of this continuity changes over time. During the transition from Period 1 to Period 2, student performance becomes increasingly interconnected with instructional leadership, school leadership, and academic performance. This shift reflects movement away from reform-driven accountability toward more differentiated leadership models.

The transition from Period 2 to Period 3 reveals further consolidation and integration. Student achievement becomes more closely linked to academic achievement, instructional practices, and professional development themes. This indicates that the field increasingly conceptualizes outcomes as embedded in instructional and capacity-building processes, moving beyond treating them as isolated performance indicators.

Leadership behavior, initially central in Period 1, persists into Period 2 and subsequently connects to emotion, instructional leadership, and distributed leadership in Period 3. This trajectory illustrates a gradual reorientation from behavioral descriptions of leadership toward more relational and integrative conceptualizations.

The evolution of instructional leadership is particularly noteworthy. Emerging as a central theme in Period 2, it becomes increasingly interconnected in Period 3 with distributed leadership, school leadership, and emotional dimensions. Rather than being structurally displaced by alternative models, instructional leadership appears as an increasingly interconnected node within the evolving thematic network.

Similarly, transformational leadership, initially peripheral in Period 1, became embedded within broader leadership configurations in Period 2 and Period 3. This pattern suggests increasing structural overlap among leadership-related themes across successive periods, while displacement appears to have played only a limited structural role within the thematic network. Across all three periods, instructional leadership remained a persistent and structurally central theme, maintaining connections with multiple evolving thematic clusters**.**

At the same time, certain themes appeared only in the most recent period, including leadership competencies and student success. Their limited structural connection to earlier themes suggests ongoing conceptual experimentation that has not yet been fully incorporated into the field's core architecture.

Overall, the thematic evolution analysis reveals a field characterized by structural continuity in its focus on student outcomes alongside increasing structural interconnectedness among leadership-related themes. Early principal-centered and reform-oriented configurations gradually gave way to stronger connections with mediated, relational, and capacity-oriented themes. Across successive periods, instructional leadership remained a persistent and structurally central theme within the evolving thematic network.

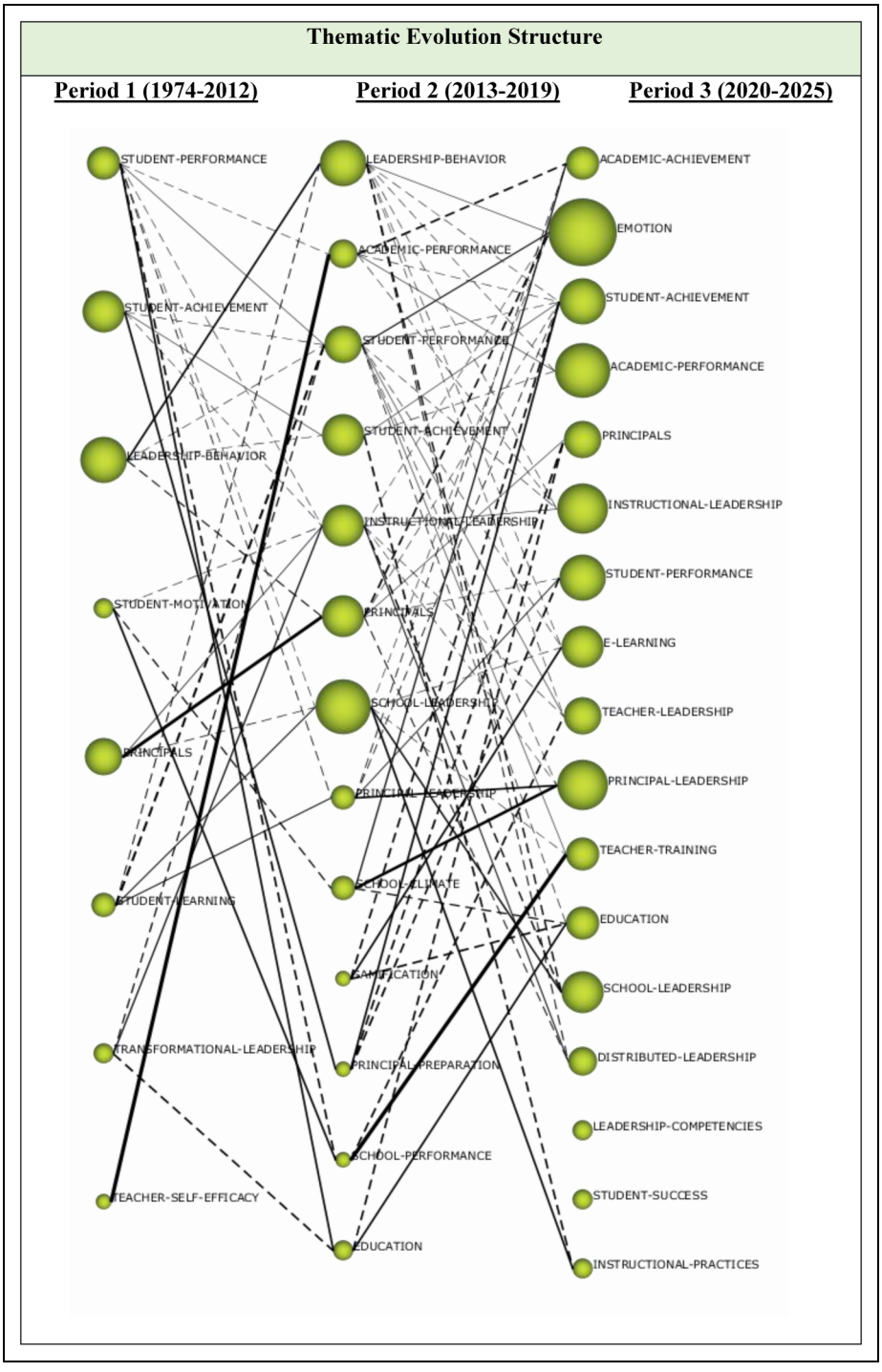


Figure 11. Thematic evolution across periods.

Discussion

This study applies a science-mapping approach to reconstruct the intellectual evolution of research on the relationship between educational leadership and student learning outcomes. The analysis spans three developmental stages from 1974 to 2025. Beyond documenting growth, the findings reveal a gradual but systematic reconfiguration of how instructional leadership has structured explanations of leadership influence within the field. The following interpretation builds on structural patterns identified through bibliometric analysis, while advancing a theoretically informed account of their conceptual significance. Taken together, these structural patterns may be interpreted, when considered alongside previous educational leadership research (Hallinger et al., 2020; Hitt and Tucker, 2016; Özdemir et al., 2024), as supporting three broader conclusions regarding the evolution of leadership research.

Period 1: Foundational structuring and the emergence of mediated explanations (1974–2012)

During the first period, research on leadership and student achievement was deeply embedded in school effectiveness and reform-oriented discourses. Leadership was largely conceptualized through principal-centered models emphasizing instructional supervision, coordination, and goal alignment. Yet empirical findings increasingly pointed toward mediated rather than direct pathways of influence.

Evidence demonstrated that student achievement was shaped less by direct principal intervention and more by collective and school-level processes. Studies linked achievement to teacher collaboration, professional learning communities, trust climates, and organizational capacity (Leithwood et al., 2010; Louis et al., 2010; Supovitz et al., 2010). Leadership influence was thus understood as operating through teachers' professional autonomy, collective efficacy, and participatory structures, with unilateral control playing a comparatively limited role.

The recurring characterization of principal influence as a "black box" (Kythreotis et al., 2010) captured this tension: leadership mattered, yet its mechanisms were indirect and relational. Teacher self-efficacy emerged as a key intermediary between leadership and student outcomes (Karadağ et al., 2015; Leithwood et al., 2010), reinforcing the mediation logic that defined this stage.

The rise of transformational leadership further reflected efforts to specify motivational and cultural dimensions of influence. While instructional leadership emphasized mission and supervision (Hallinger et al., 1996), transformational leadership foregrounded teacher commitment and empowerment (Dutta and Sahney, 2016; Gümüş et al., 2018). Meta-analytic evidence later indicated stronger associations between instructional leadership and student outcomes (Robinson et al., 2008), positioning it as increasingly aligned with measurable improvements in learning.

Overall, Period 1 represents a foundational stage in which leadership remained principal-centered but was progressively theorized as operating through relational, collective, and organizational mechanisms rather than through direct causal control.

Period 2: Diversification, mediation, and integrative consolidation (2013–2019)

The second period marks a transition from foundational structuring toward diversification and conceptual consolidation. Instructional leadership emerged as the most structurally central framework for explaining student achievement, yet it operated within an increasingly pluralistic landscape.

Empirical research consistently linked instructional leadership to improved student outcomes (Agasisti et al., 2020; Chen et al., 2022), though primarily through indirect pathways that strengthened teacher capacity, organizational coherence, and school climate. Mediation, already evident in Period 1, became more theoretically refined and stabilized.

During this phase, transformational and distributed leadership increasingly converged with instructional leadership rather than displacing it. Studies highlighted the coexistence of leadership practices within schools and emphasized relational and interaction-based understandings of leadership (Day et al., 2016; Hitt and Tucker, 2016; Sebastian et al., 2016). Leadership effects were repeatedly shown to operate through professional learning, job satisfaction, trust, and collective efficacy (Dutta and Sahney, 2016; Karadağ et al., 2015; Leithwood et al., 2020a), shifting attention from model comparison to shared mediating mechanisms.

Outcome conceptualizations also broadened. Research moved beyond narrowly defined academic achievement toward multidimensional notions of performance and engagement, influenced in part by global accountability pressures (Karakose et al., 2024; Gümüş et al., 2018). At the same time, contextual differentiation, particularly between primary and secondary schools, reinforced the indirect, capacity-oriented character of leadership influence (Sebastian and Allensworth, 2012).

Although themes such as principal preparation gained visibility, they remained somewhat peripheral to the core leadership-learning nexus. Overall, Period 2 reflects theoretical diversification accompanied by integrative consolidation. Instructional leadership retained structural centrality by aligning with complementary perspectives, while mediation became the dominant explanatory logic guiding research on leadership and student learning.

Period 3: Emotional turn, contextual sensitivity, and conceptual reconfiguration (2020–2025)

The third period reflects intensified integration and conceptual broadening. Instructional leadership remained structurally central, yet the thematic configuration expanded toward emotional, contextual, and system-oriented dimensions of influence.

A defining development of this phase is the emergence of emotion as a central theme. Research increasingly emphasizes teachers' emotional experiences, trust, and psychological safety as mediators of leadership effects on student learning (Gurr et al., 2025; Wu and Shen, 2022). Rather than replacing earlier mediation logic, this shift deepened it by positioning leadership as shaping the relational and emotional conditions under which instruction occurs. The renewed emphasis on trust, building on earlier scholarship (Tschannen-Moran and Hoy, 2001), reinforced the view that leadership operates through interconnected rational, organizational, and emotional pathways, consistent with Leithwood's Four Paths Model (Leithwood, 2021; Leithwood et al., 2020b). The COVID-19 pandemic further accelerated attention to adaptive and context-sensitive leadership.

At the same time, academic achievement regained prominence, though now embedded within networks of principal efficacy, teacher efficacy, professional development, and instructional coherence. Outcomes were increasingly framed within integrated, capacity-oriented processes rather than as isolated performance indicators.

Instructional leadership also became increasingly intertwined with transformational and distributed perspectives (Karakose et al., 2023, 2024). This growing interconnectedness may be interpreted as reflecting a broadening of its conceptual boundaries and a movement toward a more adaptive and integrative framework capable of accommodating diverse leadership logics.

Although distributed leadership and leadership competencies gained visibility, they remained partly peripheral, indicating ongoing conceptual experimentation. Overall, Period 3 represents a stage of conceptual reconfiguration in which leadership research consolidated around interconnected frameworks that integrate instructional focus, emotional mediation, and contextual responsiveness. Instructional leadership retained centrality because of its adaptive capacity to coordinate these expanding dimensions of influence.

Integrative interpretation across periods

Viewed longitudinally, the findings do more than document thematic expansion; they reveal a systematic reorganization of the field's conceptual architecture. Across decades, research has consistently emphasized the predominantly indirect nature of leadership effects on student learning. What evolved was not the presence of mediation, but its theoretical centrality and explanatory sophistication.

In Period 1, mediation was largely treated as an empirical complication. Leadership appeared influential, yet its mechanisms were diffuse and framed through trust, collective efficacy, and organizational climate. In Period 2, mediation became theoretically consolidated as leadership models diversified but increasingly converged around shared constructs such as teacher capacity, engagement, professional learning, and school climate. By Period 3, mediation deepened further into relational and emotional integration, with leadership conceptualized as shaping emotional climates, adaptive capacity, and system responsiveness alongside instructional processes.

Viewed together with previous reviews of educational leadership (Hallinger et al., 2020; Hitt and Tucker, 2016; Özdemir et al., 2024), this trajectory suggests that the field advanced not by displacing leadership models, but by progressively aligning them. Transformational, distributed, and instructional leadership did not unfold as competing paradigms; instead, they increasingly overlapped around common mediating mechanisms. Within this evolving configuration, instructional leadership retained structural centrality. Its persistence is not best explained by superior effect sizes, but by conceptual adaptability. As mediation logic matured, instructional leadership expanded beyond supervision and curriculum coordination to incorporate professional learning, collective efficacy, relational trust, distributed practices, and emotional dimensions of schooling.

This interpretation is consistent with previous syntheses of educational leadership research (Hallinger et al., 2020; Hitt and Tucker, 2016; Özdemir et al., 2024). Viewed in light of these previous syntheses, this expansion may represent more than an accumulation of associated constructs; it may reflect a shift in the level of explanation carried by the concept itself. Initially framed as a behavioral description of principal actions, instructional leadership may subsequently be understood as assuming a broader organizational role in structuring teaching conditions. In more recent research, its increasing connections with relational, emotional, and collective processes are consistent with a higher-order organizing role. From this perspective, the concept appears to have shifted from specifying what leaders do toward explaining how leadership contributes to the conditions under which learning occurs. Such a shift may reflect substantive conceptual redefinition rather than mere terminological continuity.

In interpreting these patterns, it is important to distinguish between structural centrality as identified through bibliometric analysis and theoretical dominance as a conceptual claim. While the present findings indicate that instructional leadership occupies a central position within the co-word network, this reflects its structural embeddedness in the literature rather than a direct measure of theoretical superiority. Accordingly, the interpretation of instructional leadership as an adaptive

meta-framework is offered as a theoretically informed reading of these structural patterns, rather than a direct bibliometric conclusion.

Viewed through this interpretive lens, instructional leadership may be understood as having moved from a bounded behavioral construct toward an adaptive meta-framework capable of organizing diverse leadership logics under a shared instructional purpose. The paradox introduced at the outset of the study, empirical stability alongside conceptual proliferation, may thus reflect adaptive reconfiguration rather than theoretical fragmentation. As leadership frameworks increasingly share mediating pathways and organizational logics, comparative model superiority may become less analytically meaningful.

Overall, the field has shifted from seeking stronger leadership behaviors toward clarifying how leadership structures the professional, relational, and emotional conditions that enable learning. From this perspective, instructional leadership may be understood not as a static model, but as an evolving integrative framework through which leadership influence has increasingly been theorized and understood.

Implications

The findings suggest that future research on educational leadership and student learning should move beyond model comparison and focus on clarifying the mechanisms through which leadership shapes learning environments.

If instructional leadership has evolved into an integrative and adaptive framework, theoretical work may benefit from examining shared mediating pathways rather than differentiating among competing labels. Instructional, transformational, and distributed leadership can be more productively understood as overlapping explanatory systems that converge around teacher capacity, organizational coherence, relational trust, and professional learning.

The increasing prominence of emotional and contextual dimensions further indicates the need for leadership theories that integrate relational and adaptive processes. Emotional climate, teacher well-being, and trust function not as peripheral outcomes but as central mechanisms linking leadership to instruction and student learning. The longitudinal mapping suggests that leadership research increasingly conceptualizes influence through interconnected rational, organizational, and emotional pathways, and theoretical frameworks should reflect this multidimensional structure.

Methodologically, the persistent indirect nature of leadership effects highlights the value of research designs capable of modeling complex mediation. Multilevel and longitudinal approaches, structural equation modeling, and mixed methods designs are well-suited to capturing layered pathways of influence. Greater precision in defining student learning outcomes, including multidimensional indicators beyond test-based achievement, would further strengthen the assessment of leadership effects.

Implications also extend to leadership preparation and policy. As influence increasingly operates through professional capacity building and school climate, preparation programs may place greater emphasis on relational competence and adaptive leadership. Evaluation systems that incorporate indicators of organizational learning and collective capacity are better aligned with the mediated nature of leadership effects.

Future research may also examine how gender intersects with evolving conceptualizations of instructional leadership. In particular, the role of female leadership in shaping relational, emotional, and collaborative dimensions of leadership warrants further attention. Given the increasing prominence of these dimensions in recent research, exploring gendered patterns of leadership enactment may provide valuable insights into how leadership influences teaching and learning across diverse school contexts.

Limitations

The findings of this study should be interpreted in light of several methodological limitations. First, the dataset was derived exclusively from Web of Science and Scopus and limited to publications in English. Although these databases provide broad international coverage and reliable bibliographic metadata, relevant high-quality scholarship that is indexed elsewhere or published in other languages may not have been captured. Consequently, the mapping presented here reflects the dominant indexed literature rather than the entirety of global research on educational leadership and student learning.

Second, bibliometric science mapping relies on authors' keywords, titles, and abstracts as primary units of analysis. Variations in terminology, inconsistent keyword selection, and shifts in conceptual labeling across decades may influence clustering patterns and thematic identification. While normalization procedures were implemented to reduce semantic fragmentation, some conceptual nuances may not be fully represented in co-word networks.

Third, the methodological design centers on reconstructing the field's structural and thematic evolution. It prioritizes mapping intellectual organization over detailed synthesis of individual empirical findings. While this approach illuminates patterns of convergence and reconfiguration, it does not directly evaluate the methodological rigor or causal strength of specific studies. The analysis, therefore, offers a macro-level account of knowledge development rather than a study-level critique of empirical evidence**.** Accordingly, the interpretation of instructional leadership as an adaptive meta-framework should be understood as a conceptual synthesis derived from structural patterns, rather than a direct empirical finding.

Future research may build upon these findings by combining bibliometric approaches with systematic reviews, meta-analyses, or qualitative meta-syntheses to integrate structural mapping with a deeper examination of empirical mechanisms and contextual variations. Such complementary designs may further clarify how evolving conceptual frameworks relate to the substantive strength of leadership effects on student learning.

Conclusion

This study moved beyond the question of whether educational leadership influences student learning to examine how the conceptual architecture of this relationship has evolved across five decades. By integrating bibliometric science mapping with theoretical interpretation, the analysis reconstructs not only the expansion of the field but the transformation of its core explanatory logic. Taken together, the findings highlight three key contributions: the consolidation of mediation as the dominant explanatory logic, the increasing convergence of leadership frameworks, and structural patterns that support an interpretation of instructional leadership as an evolving, integrative meta-framework.

Across all three periods, the literature consistently characterized leadership effects on student learning as positive yet predominantly indirect. What evolved was not the existence of mediation, but its theoretical centrality. Mediation shifted from an empirical complication to the organizing principle of leadership theory, foregrounding professional capacity, relational trust, emotional climate, and organizational coherence as key pathways of influence.

The observed patterns suggest progressive alignment rather than model replacement. Transformational, distributed, and instructional leadership appear to have increasingly converged around shared mediating mechanisms, rendering comparative claims of model superiority less meaningful. The apparent proliferation of leadership models may be interpreted as reflecting conceptual consolidation rather than fragmentation.

Within this consolidation, instructional leadership retained structural centrality. Its persistence may be best explained by conceptual adaptability. Initially framed as a supervisory model centered on curriculum and instruction, it expanded to incorporate relational, distributed, and emotional dimensions. It may be understood as having evolved from a bounded behavioral construct into a higher-order organizing framework capable of integrating diverse leadership logics under a shared instructional purpose.

The central contribution of this study lies in showing structural patterns consistent with the possibility that conceptual centrality can be preserved through theoretical transformation. Leadership frameworks became progressively interconnected, with instructional leadership occupying a position that may be interpreted as coordinating complementary perspectives. From this perspective, the field's development may reflect vertical conceptual integration rather than paradigm displacement.

The paradox of empirical stability alongside conceptual diversification may therefore be understood as a process of adaptive theoretical integration. From this perspective, the persistence of instructional leadership may reflect its expanding explanatory scope and its capacity to accommodate increasingly mediated and context-sensitive accounts of leadership influence.

Ultimately, the value of educational leadership research lies less in identifying a superior model and more in refining an integrative understanding of how leadership shapes the professional, relational, and emotional conditions that enable learning within complex educational systems.

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