REVISTA INVECOM
ISSN en línea: 2739-0063

Quality management in commercial sector companies: a systematic review 2020–2025

Impacto del liderazgo distribuido en el rendimiento de los estudiantes de secundaria en matemáticas: una revisión sistemática

Received: 16/09/2025 - **Accepted:** 15/12/2025

Ursula Soto Robles
https://orcid.org/0009-0009-5597-9096
SUSOTOS@ucvvirtual.edu.pe
Universidad César Vallejo. Lima, Peru

María Luisa Camacho Caycho
https://orcid.org/0000-0001-5020-5133
mcamachoca30@ucvvirtual.edu.pe
Universidad César Vallejo. Lima, Peru

Abstract

This study examines the impact of distributed leadership on secondary school students' academic performance in mathematics, considering the coordinated role of teachers, administrators, students, and families. Through a systematic review conducted under PRISMA guidelines, twenty studies published between 2018 and 2025 were analyzed in databases such as Scopus, ERIC, Redalyc, and Google Scholar, providing a comprehensive and up-to-date overview of the existing evidence. The findings show that distributed leadership—conceived as a collaborative practice based on joint participation, shared responsibility, and collective decision-making—has a positive influence on mathematical performance. The most effective actions are related to cooperation between teachers and collective responsibility, followed by the pedagogical leadership of principals, active student participation, and family involvement. Innovative approaches, such as differentiated instruction and hybrid leadership models, were also identified as contributing to improved student motivation and school climate. Taken together, the evidence demonstrates that distributed leadership is a strategic approach to strengthening learning processes and mathematics achievement in diverse school contexts.

Keywords: distributed leadership, secondary school students, mathematical learning.

Resumen

El presente estudio examina el impacto del liderazgo distribuido en el rendimiento académico en matemáticas de estudiantes de educación secundaria, considerando el rol articulado de docentes, directivos, alumnado y familias. A través de una revisión sistemática realizada bajo las directrices PRISMA, se analizaron veinte estudios publicados entre 2018 y 2025 en bases de datos como Scopus, ERIC, Redalyc y Google Académico, lo que permitió obtener una visión integral y actualizada de las evidencias existentes. Los hallazgos muestran que el liderazgo distribuido —concebido como una práctica colaborativa basada en la participación conjunta, la responsabilidad compartida y la toma de decisiones colectiva— influye positivamente en el desempeño matemático. Las acciones más efectivas se relacionan con la cooperación entre docentes y la responsabilidad colectiva, seguidas por el liderazgo pedagógico de los directores, la participación activa de los estudiantes y el involucramiento familiar. Asimismo, se identificaron enfoques innovadores, como la enseñanza diferenciada y modelos híbridos de liderazgo, que contribuyen a mejorar la motivación estudiantil y el clima escolar. En conjunto, la evidencia demuestra que el liderazgo distribuido constituye un enfoque estratégico para fortalecer los procesos de aprendizaje y el rendimiento en matemáticas en contextos escolares diversos.

Palabras clave: liderazgo distribuido, estudiantes de secundaria, aprendizaje matemático.

Introduction

Distributed leadership in contemporary educational systems has undergone significant transformation, shifting from a model centered around a single authoritative figure to collaborative approaches that recognize the active participation of multiple school stakeholders. According to Harris and Jones (2022), distributed leadership has emerged as a strategy that promotes shared responsibility in pedagogical and organizational decision-making

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processes, fostering a more cohesive institutional culture. This form of leadership has been shown to have a positive impact on school climate and, consequently, on student academic performance.

Nevertheless, substantial deficiencies in pedagogical direction persist in numerous educational institutions, limiting the possibility of achieving adequate performance, particularly in critical areas such as mathematics. Thus, it is essential to identify leadership practices that directly influence student learning and academic outcomes. Leithwood et al. (2020) assert that when school leaders cultivate a culture of collaborative teaching, they establish clear standards for ongoing professional development and optimize the use of pedagogical data, creating conditions conducive to mathematical learning.

The relevance of this study lies in the necessity to strengthen pedagogical leadership as a mechanism for improving student performance in mathematics, an area where notable gaps remain. According to Gallegos and López (2024), creating positive and collaborative school environments contributes to making distributed leadership a strategic resource for addressing academic challenges. However, for this approach to function effectively, its implementation must be tailored to the institutional context, consider the willingness of the involved stakeholders, and be coherent with the pedagogical model of each school (Sallan, 2024).

From a theoretical framework, distributed leadership is conceived as an organizational approach applied to the pedagogical realm that understands leadership as a collective action. In this perspective, various individuals within the school assume leadership tasks through dynamic interactions with institutional structures and everyday practices (Spillane, 2020). Harris and Jones (2022) emphasize that this approach fosters teacher empowerment and facilitates organizational learning, promoting a sustained commitment to the continuous improvement of student performance. Moreover, academic achievement in mathematics serves as a key indicator of cognitive development and problem-solving capability relevant to everyday life; its enhancement depends on both pedagogical leadership and the motivation and active participation of students.

Spillane (2020) also underscores the need to create appropriate support structures that facilitate communication, shared decision-making, and ongoing monitoring of progress achieved through the implementation of distributed leadership. Complementarily, Rodríguez et al. (2022) demonstrate that when this approach is applied in primary and secondary education, it promotes an institutional culture rooted in participation and collaboration by distributing roles and responsibilities among various school staff members.

Furthermore, Solano (2024) argues that distributed leadership actively contributes to the professional development of teaching staff, providing opportunities to assume new leadership roles and additional responsibilities, which increases the effectiveness of educational processes and fosters a collaborative work environment. According to Muñoz and Pérez (2021), this approach enhances school effectiveness and promotes a dynamic culture of learning, provided there is continuous commitment and joint effort among all members of the educational community.

In this context, Sun et al. (2021) show that the implementation of distributed leadership is associated with improvements in teaching quality and student performance, particularly in critical subjects like mathematics. This is attributed to increased teacher collaboration, evidence-based decision-making, and alignment of pedagogical practices with institutional goals.

Given this scenario, it is pertinent to conduct a systematic review that elucidates how distributed leadership influences the mathematical performance of secondary education students, as well as to identify the processes and conditions necessary for its effective implementation in real school contexts.

However, despite its recognized importance, there remains a notable lack of research specifically focused on the impact of distributed leadership on mathematical performance among secondary school students. Most studies tend to concentrate on general contexts or other curricular areas, with limited availability of longitudinal or contextualized research. This gap hinders the understanding of the sustained effects of distributed leadership and the conditions that enable its effectiveness, complicating the design of evidence-based educational strategies aimed at optimizing mathematical learning.

Methodology

This study was developed under the framework of a systematic literature review, understood as a rigorous, structured, and transparent process that allows for the collection, synthesis, and evaluation of existing scientific knowledge on a specific phenomenon (Zunder, 2021). This type of research is essential for providing a comprehensive view of distributed leadership and its relationship with academic performance in mathematics among secondary education students.

The design corresponds to a descriptive review article aimed at analyzing and synthesizing relevant information from prior research (Arias & Covinos, 2021). The documentary review facilitated the identification of the problematic reality, recognition of theoretical trends, and evaluation of empirical evidence concerning the

impact of distributed leadership on mathematical learning, as proposed by Vizcaíno et al. (2023). To ensure adequate organization of the process, an observation guide was employed to aid in the classification and evaluation of each selected article.

Information sources and search strategy

Studies published between 2018 and 2025, indexed in high-value academic databases—Scopus, SciELO, Redalyc, ERIC, and Google Scholar—were considered. This time frame was chosen to ensure the inclusion of recent research on distributed leadership and school performance in mathematics.

The search was conducted using combinations of descriptors and keywords such as "liderazgo distribuido," "distributed leadership," "rendimiento académico," "mathematics," "secondary school," and "achievement in mathematics," among others.

The process identified 802 articles, distributed as follows:

- Scopus: 302 articles related to distributed leadership and pedagogical practices in secondary education.
- ERIC: 243 articles on educational leadership and academic performance.
- Google Scholar: 166 articles linked to leadership and mathematical learning.
- Redalyc: 91 articles focused on distributed leadership in Latin American school contexts.

Inclusion and exclusion criteria

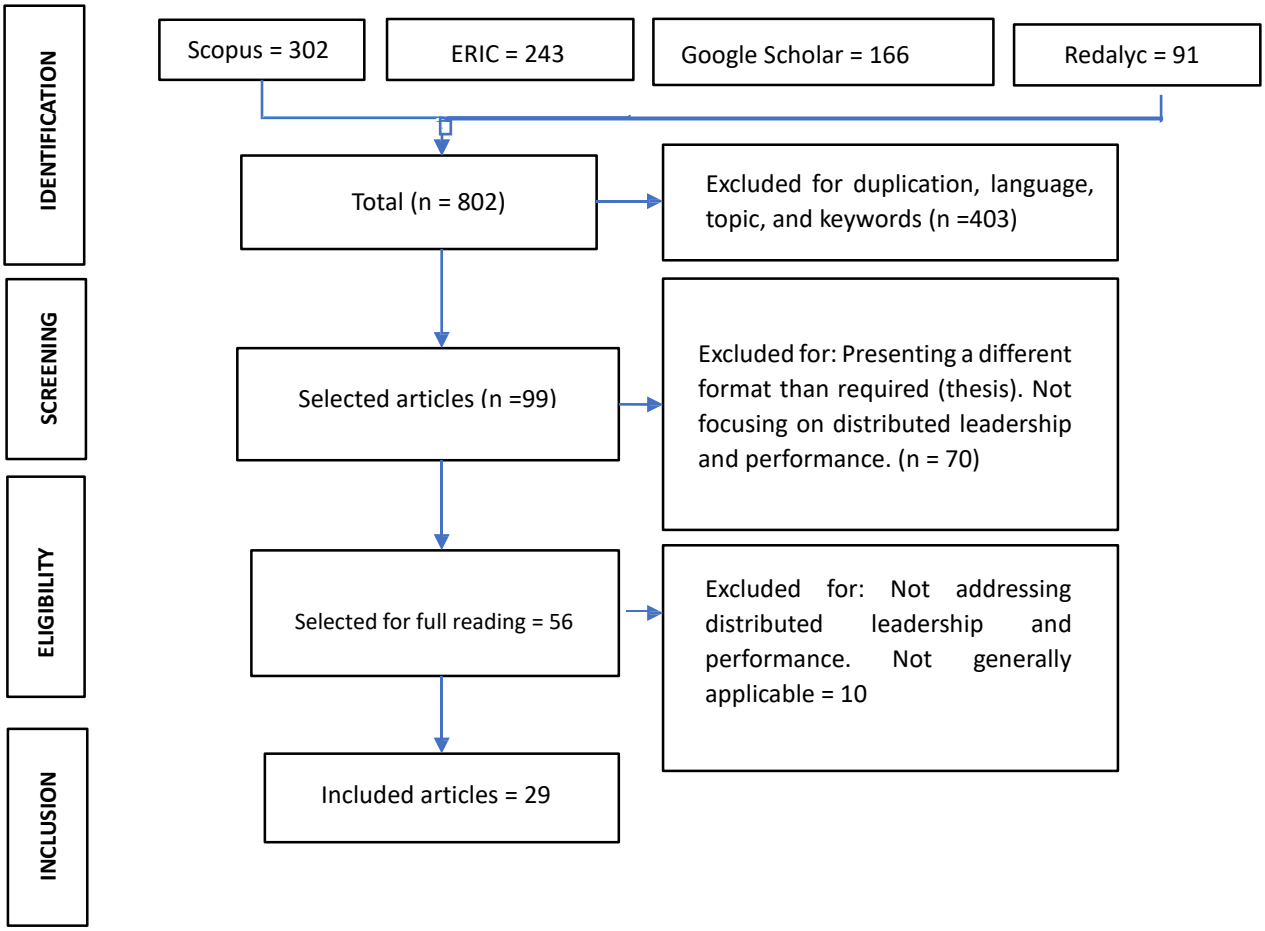
The inclusion criteria were:

1. Articles published between 2018 and 2025.
2. Studies written in Spanish or English.
3. Research related to distributed leadership.
4. Studies whose sample consisted of secondary education students.
5. Articles with access to the full text.
6. Publications that explicitly analyzed the relationship between distributed leadership and mathematics performance.

The exclusion criteria were:

1. Studies prior to 2018.
2. Research conducted with populations other than secondary education.
3. Articles focused on other types of leadership without addressing distributed leadership.
4. Publications that did not evaluate mathematics performance.
5. Documents without full-text access.

Figure 1
PRISMA flow diagram



PRISMA study selection process

The review adhered to the PRISMA 2020 guidelines. The phases were as follows:

- **Identification:** A total of 802 articles were retrieved (Scopus 302; ERIC 243; Google Scholar 166; Redalyc 91)**.**
- **Screening:** 403 duplicate articles were removed. Subsequently, an additional 70 articles were excluded for focusing on leadership in general rather than distributed leadership**.**
- **Eligibility:** Full-text review was conducted for 56 articles, from which those not meeting defined criteria were excluded**.**
- **Inclusion:** Ultimately, 29 articles were selected for systematic analysis.

Synthesis of preliminary results

The analysis revealed that most of the included studies report a positive relationship between distributed leadership and academic performance in mathematics, although variations are noted based on the socio-educational context and the level of participation among school stakeholders. Key findings include:

- Teacher collaboration as the primary driver of enhanced learning outcomes.
- Administrative support and pedagogical leadership as facilitators of effective practices.
- Family involvement, particularly in schools with lower socio-cultural capital.
- The importance of collaborative decision-making and the pedagogical use of data.

The process also identified common trends, such as the need to strengthen collaborative school cultures, promote continuous professional development, and enhance student and family participation. These elements were systematically organized into a comparative analysis matrix, which subsequently led to the creation of Table 1, illustrating the key empirical contributions and limitations of each study.

Results

Table 1

Aspects of distributed leadership identified in selected articles

Aspect of distributed leadership	Brief description
Collaboration and shared responsibility	Refers to the equitable distribution of roles among teachers, administrators, and students, promoting collective work with shared accountability in school decision-making.
Student participation and participative methodologies	Involves the active engagement of students in decision-making processes and the use of methodologies that foster student participation, autonomy, and voice.
Training and administrative support	Highlights the role of principals in guiding, supporting, and training the educational community, fostering both transformational and pedagogical leadership.
Pedagogical and instructional strategies	Refers to the design and implementation of teaching strategies, curricula, and instructional practices that reinforce collaborative learning and academic performance.
School–family relationship	Involves the active participation of parents and families in school life, recognizing their role as allies in the students' learning processes.
Other emerging aspects	Aspects identified in specific cases, such as curricular innovation, school culture, or contextual evidence, which complement the practice of distributed leadership.

As shown in Table 1, the principal aspects of distributed leadership indicate that collaboration and shared responsibility are crucial elements for effective distributed leadership (Mvukiyehe & Oniye, 2025). Various studies suggest that when teachers, students, and administrators work together in decision-making, climates of trust emerge that positively impact learning and institutional cohesion (Kılınç et al., 2023).

Furthermore, student participation and the use of participative methodologies stand out as practices that strengthen student autonomy and motivation, leading to improved academic outcomes, particularly in mathematics (Carranza, 2025; Salifu et al., 2022). In terms of training and administrative support, the reviewed articles indicate that the pedagogical leadership exercised by school principals not only guides teaching practices but also enhances efficiency and student retention, thereby consolidating educational quality (Guerrero & Castillo, 2025).

On the other hand, the pedagogical and instructional strategies reinforce the idea that distributed leadership must translate into concrete teaching practices. Examples such as the LEDD model (Leadership, Teacher Instructional Strategy) have shown significant improvements in learning scores and explain up to 43% of the variability in performance (Elizalde et al., 2025; Fernández et al., 2024). The school–family relationship, while appearing less frequently, remains a key factor in solidifying shared responsibility in learning. Parental involvement, mediated through distributed leadership practices, contributes to academic support and increases student commitment (Erol & Turhan, 2018).

Finally, emerging aspects such as curricular innovation or strengthening school culture enhance the traditional view of distributed leadership and demonstrate its adaptability to different educational contexts (Ullad et al., 2023; Fernández et al., 2024). Thus, the findings confirm that distributed leadership integrates dimensions of collaboration, participation, support, and shared responsibility that, to varying degrees, impact both school management and student academic performance.

Table 2

Distributed leadership strategies and their impact on academic performance

Leadership strategy	Impact on academic performance	% effectiveness reported
Collaboration and shared responsibility	Significant improvements in performance, demonstrated by variance explanations between 54% and 86% in achievement tests; fosters a culture of cooperation with a commitment from teachers and students. (Mvukiyehe & Oniye, 2025; Kılınç et al., 2023)	54% – 86.6%
Student participation and participative methodologies	Engaging students in decision-making through participative methodologies leads to increases in motivation and partial improvement in academic performance. (Carranza, 2025; Salifu et al., 2022)	24% – 48%
Training and administrative support	The role of principals as pedagogical leaders and educators is associated with improvements in retention (97%) and efficiency (92%) of students, albeit with contextual differences. (Guerrero & Castillo, 2025)	92% – 97%
Pedagogical and instructional strategies	The application of specific programs, such as LEDD and differentiated instruction, shows clear increases in learning scores, evidencing the direct effect of distributed leadership on achievements. (Elizalde et al., 2025; Fernández et al., 2024)	43% – 55%
School–family relationship	When parents participate in school life under a distributed leadership model, academic support is strengthened, and greater commitment to learning is reported. (Erol & Turhan, 2018)	In most cases
Other emerging aspects	Curricular and contextual innovations, such as project-based learning or hybrid leadership styles, show positive effects on school climates and motivation, albeit less on quantifiable achievements. (Fernández et al., 2024; Ullad et al., 2023)	55% (positive perception)

As illustrated in Table 2, distributed leadership strategies consistently relate to improvements in student academic performance, particularly in mathematics. Collaboration and shared responsibility emerge as the most prevalent strategy with the highest levels of effectiveness: when teachers, administrators, and students share roles and responsibilities, significant percentages of variance in academic achievements are explained, reaching up to 86.6% (Mvukiyehe & Oniye, 2025; Kılınç et al., 2023).

Student participation and the use of participatory methodologies, in turn, reinforce learners' active role in their own educational process. Evidence shows increased motivation and partial improvements in academic performance when students are involved in decision-making and participatory didactic strategies are implemented, with effectiveness rates ranging from 24% to 48% (Carranza, 2025; Salifu et al., 2022).

With regard to training and administrative support, the pedagogical leadership exercised by school principals emerges as a relevant factor. Retention rates of 97% and graduation efficiency rates of 92% highlight the importance of strong and sustained leadership support (Guerrero & Castillo, 2025). Likewise, pedagogical and instructional strategies demonstrate positive impacts; for example, the LEDD model has achieved significant improvements in learning outcomes and accounts for up to 43% of the variance in academic performance (Elizalde et al., 2025; Fernández et al., 2024).

Concerning the school–family relationship, although the studies do not report specific percentages, the findings indicate that parental involvement under distributed leadership frameworks increases engagement in school processes and strengthens academic support for children (Erol & Turhan, 2018).

Finally, emerging aspects such as the implementation of innovative projects grounded in hybrid leadership styles show positive effects primarily on student motivation and school climate rather than on quantitative achievement indicators (Fernández et al., 2024; Ullad et al., 2023). Overall, the evidence confirms that distributed leadership not only entails the delegation of responsibilities but also transforms institutional dynamics through

collaboration and participation, combined with appropriate pedagogical innovation, thereby generating both direct and indirect effects on academic performance

Discussion

The objective of this systematic review was to analyze the impact of distributed leadership on secondary students' performance in mathematics, considering the roles of teachers, students, administrators, and families. Regarding the role of educators, multiple studies agree that collaboration and shared responsibility are central to distributed leadership. Mvukiyehe and Oniye (2025) demonstrated that this strategy accounts for up to 86.6% of the variance in academic performance, while 82% of educational achievements can be attributed to collaborative practices among teachers and administrators (Kılınç et al., 2023). Complementarily, Guerrero and Castillo (2025) noted that teacher participation in collegial spaces contributes to improved student retention rates (97%) and completion efficiency (92%). Additionally, Carranza (2025) found significant increases in mathematics scores from pre-test (30.92) to post-test (51.16) through the application of an experimental program in distributed teacher leadership. In this vein, Elizalde et al. (2025) reported a positive correlation (r = 0.66) between pedagogical leadership and performance, explaining 43% of the variability in learning outcomes.

Several studies highlight the importance of active student involvement in school life. Kılınç et al. (2023) found that student participation in distributed leadership processes has a positive indirect effect on achievements in reading and mathematics. Similarly, Li and Li (2024) showed that perceptions of distributed leadership are significantly associated with academic self-efficacy and results in mathematics assessments. Hidayati et al. (2023), in a study involving secondary students in Indonesia, found positive perceptions of distributed leadership, with an average of 81.83%, indicating a favorable school environment for learning. Kılınç et al. (2022) confirmed that 56.3% of the variance in performance was explained by factors of shared leadership. Additionally, Fernández et al. (2024) emphasized that project-based learning under distributed leadership frameworks enhances engagement and improves achievements in contexts with high socio-educational complexity.

The role of administrators also emerges as a determining factor. Ullad et al. (2023) reported that practices of distributed leadership exercised by principals positively impact school climate, which indirectly affects student performance. Similarly, Tsuyuguchi et al. (2020) concluded, based on the study of school leadership in Japan, that distributed leadership contributes to students' academic growth through the mediation of school culture. Figueroa and Ávila (2024), in Ecuador, demonstrated through a quasi-experimental design that strengthening educational leadership leads to significant improvements in standardized mathematics assessments. Likewise, DeMarco and Gutmore (2021) found in New Jersey that distributed leadership, combined with a strong school culture, increases teacher self-efficacy, which is reflected in student performance.

Regarding families, empirical evidence is less direct but still consistent. Erol and Turhan (2018), analyzing parental perceptions in Turkey, concluded that distributed leadership fosters greater family involvement, strengthening the school-home relationship as a factor associated with performance. This finding aligns with Pierro (2020), who noted that including families in school leadership dynamics in New Jersey contributes to improved mathematics achievements.

Finally, emerging aspects identified in the literature are noteworthy. Qattan et al. (2025) showed that hybrid styles of distributed leadership positively influence student motivation. Li et al. (2022) found that collaborative cultures based on shared leadership strengthen both teacher satisfaction and student commitment. Likewise, Salifu et al. (2022) reported in Ghana that participative methodologies within the framework of distributed leadership promote student autonomy and are associated with better performance in mathematics. Liu et al. (2024) confirmed that instructional strategies grounded in distributed leadership explain 40.2% of the total effect on academic performance.

In summary, the twenty studies reviewed consistently indicate that distributed leadership has a positive impact, both directly and indirectly, on secondary students' performance in mathematics. Comparative analysis demonstrates that this impact is greater when all educational actors converge: teachers, through collaboration and collegial work; students, as active participants in learning; administrators, as pedagogical guides; and families, as strategic allies in education.

Conclusions

The results of this systematic review lead to the conclusion that distributed leadership enhances educational effectiveness by promoting collaborative and sustainable school cultures, thereby creating a conducive environment for meaningful mathematical learning.

Leadership is understood as a collective endeavor that drives institutional improvement and strengthens the culture of collaboration. The empirical findings analyzed support this perspective, indicating that strategies

centered on collaboration among teachers, active student participation, administrative support, and the relationship between school and family can account for between 43% and 86.6% of the variability in academic achievements in mathematics. Collaboration and shared responsibility between educators and administrators are identified as the most effective strategies, as they foster environments of trust and mutual accountability that optimize performance on standardized assessments.

Ultimately, shared leadership not only improves institutional management but also transforms educational dynamics, fostering collective commitment and significantly contributing to enhanced academic performance. Therefore, it is concluded that the effectiveness of distributed leadership is rooted in its ability to create collaborative structures with clear and sustained strategies that promote equity, innovation, and deep learning in mathematics.

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