REVISTA INVECOM
ISSN en línea: 2739-0063

Research skills as a catalyst for teacher professional development: A systematic review

Habilidades investigativas como catalizador del desarrollo profesional docente: una revisión sistemática

Received: 15/05/2025 - **Accepted:** 25/09/2025

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Abstract

This systematic review aimed to analyze the impact of research skills on teachers' professional development and their ability to transform educational practice. To this end, a comprehensive search was conducted in the databases Scopus, Web of Science, ERIC, and SciELO, including publications in English, Spanish, and Portuguese from 2020 to 2025, following the PRISMA guidelines. Of a total of 1,275 records, 25 studies were selected that met the quality and relevance criteria. The analysis showed that skills such as formulating contextualized research questions, applying data collection and analysis methods, critical thinking with an ethical perspective, systematic reflection, and dissemination of research findings act as essential drivers for teachers' professional growth. These skills strengthen self-regulation and self-efficacy, foster a culture of pedagogical innovation, and promote the creation of sustainable professional learning communities. Furthermore, their incorporation facilitates curriculum changes, enhances professional confidence, and promotes the adoption of active learning methodologies, although challenges related to digital literacy and equitable access to resources persist. In conclusion, it is essential to develop policies and training programs that systematically integrate these competencies, ensuring conditions for their sustained implementation over time, and thus contributing to comprehensive educational transformation.

Keywords: teacher professional development, research skills, pedagogical innovation.

Resumen

Esta revisión sistemática tuvo como objetivo analizar el impacto de las habilidades investigativas en el desarrollo profesional docente y su capacidad para transformar la práctica educativa. Para ello, se realizó una búsqueda exhaustiva en las bases de datos Scopus, Web of Science, ERIC y SciELO, incluyendo publicaciones en inglés, español y portugués entre 2020 y 2025, siguiendo los lineamientos PRISMA. De un total de 1,275 registros, se seleccionaron 25 estudios que cumplían con los criterios de calidad y relevancia. El análisis mostró que competencias como la formulación de preguntas contextualizadas, la aplicación de métodos para la recolección y análisis de datos, el pensamiento crítico con perspectiva ética, la reflexión sistemática y la socialización de resultados funcionan como motores esenciales para el crecimiento profesional docente. Estas habilidades fortalecen la autorregulación y la autoeficacia, fomentan una cultura de innovación pedagógica y promueven la creación de comunidades de práctica sostenibles. Además, su incorporación facilita cambios curriculares, eleva la confianza profesional y favorece la adopción de metodologías activas, aunque persisten retos relacionados con la alfabetización digital y el acceso equitativo a recursos. Finalmente, se concluye que es fundamental desarrollar políticas y programas de formación que integren de manera estructurada estas competencias, asegurando condiciones para su mantenimiento en el tiempo y contribuyendo así a una transformación educativa integral.

Palabras clave: desarrollo profesional docente, habilidades investigativas, innovación pedagógica.

Introduction

Continuous training and professional development for teachers have become a fundamental pillar in the 21st century, given the profound social, technological, and pedagogical transformations facing educational systems. In a globalized context characterized by diversity and complexity among students, educators assume the responsibility of incorporating practices grounded in scientific evidence that effectively meet current demands. In this scenario, research skills emerge as a strategic cornerstone, enabling education professionals to generate, interpret, and apply knowledge in their daily practice, thereby strengthening professional autonomy, methodological innovation, and the capacity to adapt to constantly changing environments (Fernández-Batanero et al., 2022; Haug & Mork, 2021).

Indeed, current demands not only require mastery of theories and concepts but also necessitate that teachers design and implement research projects that address real classroom issues. Skills such as formulating relevant questions, selecting appropriate methods, and critically analyzing data are essential for linking empirical findings with curriculum design. Likewise, the efficient management of academic sources and the use of specialized digital tools ensure access to up-to-date information and contribute to the generation of rigorous knowledge, thus improving the quality of teaching and learning processes (Caroca-Guzmán & Yancovic-Allen, 2024; Colás Bravo & Hernández de la Rosa, 2021).

Closely related to these competencies, critical thinking plays a transversal role that ensures the coherence of the research process, guiding both the formulation of questions and the interpretation of results. This ability to identify biases, question assumptions, and assess the relevance of information strengthens the validity of educational research, enriching pedagogical decision-making and promoting a culture of continuous improvement (Lambirth et al., 2021; Bergmark, 2023). Furthermore, the creation and validation of data collection instruments, such as surveys, rubrics, and observation protocols, are key competencies for ensuring the reliability and validity of findings, providing a solid foundation for pedagogical innovation (Ríos Cabrera et al., 2023; Aparicio-Molina & Sepúlveda-López, 2023).

On another note, the incorporation of digital tools in research processes has transformed teaching practice, establishing itself as an indispensable component in the digital age. The use of software for bibliographic management, platforms for data analysis, and online collaborative environments not only improves the systematization of information but also facilitates the dissemination and exchange of experiences among peers, thereby strengthening the formation of communities of practice and consolidating a research culture within educational institutions (Brenis-García et al., 2021; Fernández-Batanero et al., 2022).

Consequently, understanding the impact of research skills on teacher professional development is crucial for designing continuous training programs that are relevant, sustainable, and aligned with current challenges. Therefore, this systematic review aims to achieve three main objectives: (i) to describe the most common research skills developed by teachers in various educational contexts and their relationship with professional growth; (ii) to analyze how these competencies influence self-regulation, self-efficacy, and pedagogical innovation; and (iii) to synthesize the most relevant results associated with the implementation of these skills as drivers of teacher professionalization. Through this analysis, the intention is to provide guidance for the development of teacher training programs and the formulation of educational policies that strengthen the research culture in the school context.

Methodology

This study is based on a systematic review aimed at analyzing the research skills that enhance teacher professional development, evaluating their impact and the results obtained in formal educational contexts through a systematic and replicable process, following the proposal of Newman and Gough (2020). To ensure transparency and reproducibility of the search, the PRISMA statement was applied (Page et al., 2021).

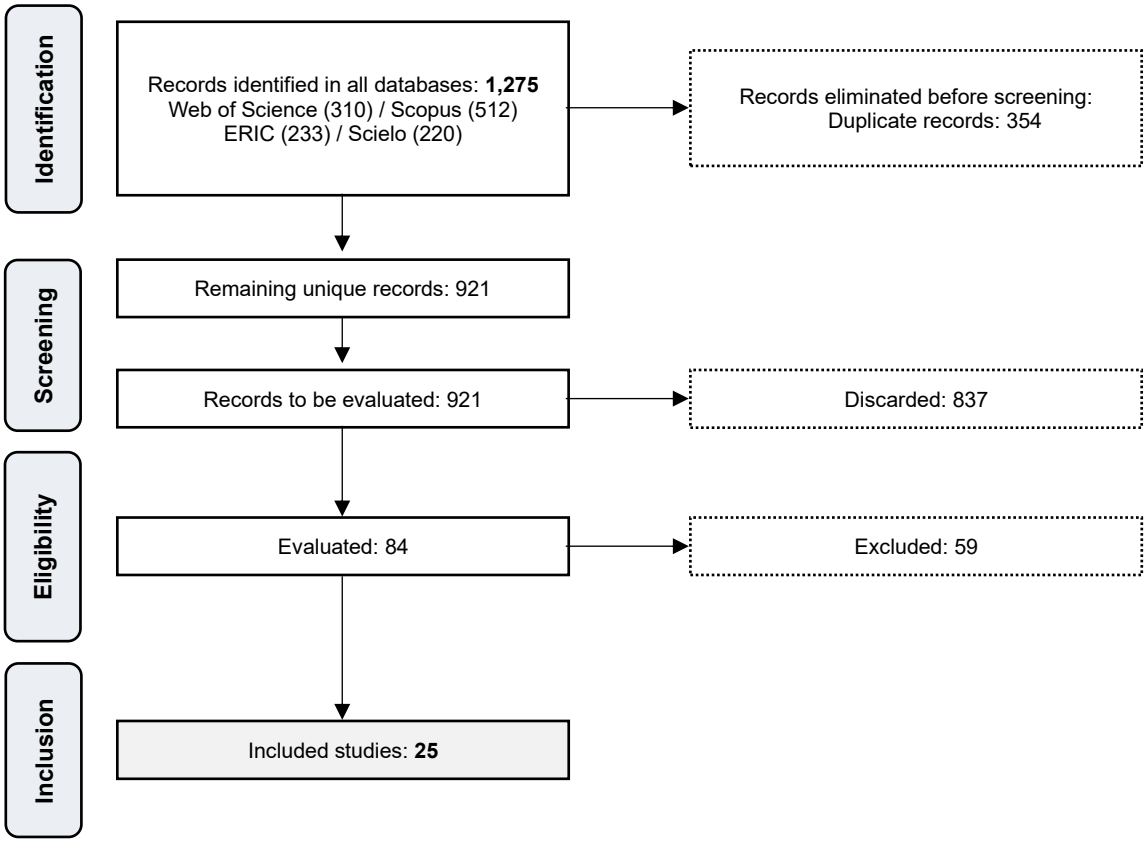
The search strategy combined the terms (“investigative skills” OR “research skills” OR “investigative competence”) AND (“professional development” OR “teacher development” OR “teaching practice”) in the databases Scopus, Web of Science, ERIC, and SciELO. To guarantee relevance and quality, specific inclusion criteria were established, selecting empirical or theoretical articles published in indexed journals between 2020 and 2025, with an explicit focus on teacher research skills and their link to professional development, in English, Spanish, or Portuguese, and with full text access. On the other hand, non-indexed documents, studies addressing competencies without a research dimension, research centered exclusively on student learning without exploring the teacher's role, works outside the established period, and duplicate publications among the consulted databases were excluded.

During the identification phase, 1,275 records were located from Scopus (512), Web of Science (310), ERIC (233), and SciELO (220). Subsequently, with the help of Zotero software, 354 duplicates were removed, consolidating 921 unique documents. In the screening stage, the titles and abstracts were independently examined, discarding 837 studies for not meeting the inclusion criteria, such as theoretical investigations, those outside the established period, in non-formal contexts, or without full text access. This allowed for the selection of 84 articles for thorough evaluation. Finally, after analyzing the full texts, 59 studies were removed for not directly addressing teacher professional development from the perspective of action research, leaving 25 articles for in-depth analysis.

To organize and compare the selected studies, a template was developed in Microsoft Excel that incorporated key variables, such as APA format references, methodological design, population and sample, as well as the instruments used for data collection and analysis. This matrix recorded the research skills described in the articles—formulating questions, applying surveys, qualitative analysis, systematic reflection, and socializing results—along with their impacts on self-regulation, self-efficacy, pedagogical innovation, and curricular changes (Moreira et al., 2023; Caroca-Guzmán & Yancovic-Allen, 2024). Additionally, it included the main results, conclusions, and limitations of each study, which were processed through a double coding cycle (independent and consensual) to ensure reliability. The analysis combined thematic coding, data triangulation (Bergmark, 2023; Lambirth et al., 2021), and descriptive counts, allowing for the identification of patterns, contextual variations, and methodological trends, providing a comprehensive perspective on the role of research skills in teacher professional development.

Figure 1

Flowchart of phases according to the PRISMA model



Results and discussion

Table 1 summarizes the identifying data of the 25 studies included in this review, indicating authorship, year of publication, country of origin, and methodological approach. The sample comprises research from Latin America, Europe, North America, Asia, and Oceania, thus demonstrating a global interest in understanding and strengthening teachers' research skills in formal educational contexts (Brew & Saunders, 2020; Moreira et al., 2023).

Table 1

Distribution of studies according to research skills and methodological approach

Author(s)	Year	Country	Study design	Identified research skills	Impacts on teacher professional development
Haug & Mork	2021	Norway	Qualitative	Instructional strategies, critical thinking, 21st-century skills	Increased motivation, confidence, and active methodologies.
Fongkanta et al.	2021	Thailand	Quasi-experimental	Research projects, systematic reflection	Improvement in attitudes and research competencies.
Espejo et al.	2020	Chile	Qualitative	Curricular reflection, program redesign	Strengthens curricular innovation and collegial work.
Dasoo	2020	South Africa	Qualitative	Teacher participation in continuous training	Reinforces autonomy and decision-making among teachers.
Byrd & Alexander	2020	United States	Qualitative	Data evaluation, effective communication	Enhances decision-making, empathy, and educational inclusion.
Aparicio-Molina & Sepúlveda-López	2023	Chile	Qualitative	Collaboration, learning communities	Boosts teacher agency and collaborative culture.
Brew & Saunders	2020	Australia/UK	Qualitative	Inquiry-based learning	Reinforces autonomous learning and inquiry strategies.
Sims & Fletcher-Wood	2021	UK	Qualitative	Use of evidence in PD	Defines characteristics of PD with a higher likelihood of success.
Macaro & Han	2020	China	Qualitative	Training needs, self-assessment competencies	Improves effective teaching and teacher skills.
Lambirth et al.	2021	UK	Qualitative	Action research, collaboration, co-design	Greater teacher agency and coherence in development processes.
Chen et al.	2021	Taiwan	Qualitative	Self-assessment of PD, questionnaires, and SEM	Relationship between self-efficacy and professional development needs.
Bergmark	2023	Sweden	Qualitative	Action research, collaborative work	Changes in teaching, collaboration, and teacher professionalism.
Beck	2020	United States	Mixed	Inquiry in "third space", guided evidence	Strengthens professional development and university-school links.

Alwaqdani	2024	Saudi Arabia	Quantitative	Integration of AI in education	Improves PD with AI, ethical competencies, and methodological skills.
Badillo Pérez et al.	2023	Cuba	Qualitative	Situated inquiry, action research	Reinforces teacher agency and professional learning.
Berrocal et al.	2024	Colombia	Mixed	Curriculum planning, learning communities	Advances in scientific competencies and teacher agency.
Brenis-García et al.	2021	Peru	Mixed	Information management, digital competencies	Boosts self-efficacy and reflection in virtual environments.
Caroca-Guzmán & Yancovic-Allen	2024	Chile	Qualitative	Research questions, critical analysis	Recognizes the importance of research, but barriers persist.
Colás & Hernández	2021	Spain	Quantitative	Problematic design and project formulation	Identifies training gaps in research competencies.
Coşgun & Taşgın	2025	Turkey	Quantitative	Information management, digital literacy, and competencies	Digital and research literacy for teacher development.
Palencia & Verdugo	2023	Colombia	Qualitative	Problematic design, inquiry, reflection	Reaffirms research as a teacher responsibility.
Ma-Ui & Phrak…	2025	Thailand	Quantitative	Evidence-based training programs	Improves quality indicators and strengthens competencies.
Tantawy	2020	United Arab Emirates (Dubai)	Qualitative	Situated inquiry and use of evidence	Improves performance and teacher career.
Ríos Cabrera et al.	2023	Venezuela	Mixed	Projects, teamwork, formative evaluation	Improves research competencies and teacher satisfaction.
Ríos Cabrera et al.	2023	Venezuela	Quantitative	Problematic design, methodological design, data analysis	Valid scale (α=0.967) for diagnosing research competencies.

The analysis of the 25 included studies allowed for the identification of a set of research skills that function as catalysts for teacher professional development. Evidence indicates that these competencies do not operate in isolation but rather form an interdependent framework connecting pedagogical practice with the generation of educational knowledge. Among the most prominent skills are the formulation of contextualized research questions, the systematic use of methods for data collection and analysis, ethical critical thinking, systematic reflection on teaching practice, and the socialization of findings within communities of practice (Brew & Saunders, 2020; Lambirth et al., 2021; Fernández-Batanero et al., 2022). Each of these dimensions contributes to transforming teaching work, providing tools to diagnose problems, design improvement strategies, and validate pedagogical changes supported by empirical evidence.

Regarding the formulation of questions, this represents the starting point for any research process. In nineteen studies, it was evident that teachers managed to transform specific classroom difficulties—such as low reading comprehension or lack of motivation in science—into concrete questions, leading to targeted and relevant pedagogical interventions (Caroca-Guzmán & Yancovic-Allen, 2024; Aparicio-Molina & Sepúlveda-López, 2023). Furthermore, the ability to adjust the scope of questions according to available time and resources is identified as an indicator of research maturity, ensuring that initiatives translate into concrete actions rather than remaining abstract proposals.

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The structured use of data collection and analysis methods was a constant across all reviewed studies. Surveys and questionnaires, validated by local experts, were used to capture student perceptions and examine the relationship between participation and academic performance (Fongkanta et al., 2021; Ma-Ui & Phrakhrusutheejariyawattana, 2025). Other methods, such as systematic classroom observation and focus groups, enriched the interpretation of information based on testimonies from students and families (Berrocal Contreras et al., 2024; Palencia Salas & Verdugo Peñaloza, 2023). Additionally, the analysis of digital portfolios emerged as a valuable resource for documenting progress and justifying changes in the teaching sequence (Ríos Cabrera et al., 2023). These results demonstrate that methodological diversity strengthens the validity of findings and enhances teachers' capacity to substantiate their pedagogical decisions.

Regarding critical thinking with an ethical approach, eighteen studies emphasized its importance as a transversal competency. Practices of questioning pedagogical assumptions were identified, facilitating the adoption of new methodologies adapted to cultural contexts (Beck, 2020; Bergmark, 2023). Furthermore, confidentiality protocols were implemented to strengthen participant trust and ensure the legitimacy of the collected data (Gesel et al., 2021). The reflective application of evidence empowered teachers to recognize biases and evaluate the suitability of methods, advancing toward more rigorous and self-regulated research (Byrd & Alexander, 2020).

Systematic reflection on practice was consolidated as a frequent competency. Research in Latin American contexts shows how strategies such as reflective journals, electronic portfolios, and collegial meetings allow for documenting experiences, sharing evidence, and generating continuous pedagogical adjustments (Corona Meza, 2023; Ríos Cabrera et al., 2023). When institutionalized, these practices promote a cycle of improvement that transcends individual work and fosters collaboration among peers.

Finally, the socialization of findings is evidenced as a key dimension for strengthening communities of practice. Experiences in Spain demonstrate that internal academic forums validate and enrich projects through feedback from colleagues and students (Haug & Mork, 2021). Similarly, in Colombia, inter-institutional networks have been formed for the exchange of instruments and results, driving pedagogical innovation (Berrocal Contreras et al., 2024). Additionally, institutional newsletters have motivated novice teachers to share their experiences, generating dynamics of recognition and collaborative improvement (Palencia Salas & Verdugo Peñaloza, 2023).

In relation to impact, the studies demonstrate transformations in four major areas. First, self-regulation and self-efficacy are strengthened through research routines that allow real-time adjustments to content and methodologies, as well as validation of pedagogical decisions based on evidence (Chen et al., 2021; Gesel et al., 2021). Second, a reflective and innovative institutional culture is consolidated, driven by organizational support and the creation of collaborative networks that amplify best practices (Brenis-García et al., 2021; Espejo Leupin et al., 2020). Third, the development of transversal competencies such as critical thinking, data analysis, and effective communication of results extends the reach of research beyond the classroom (Moreira et al., 2023; Alwaqdani, 2024). Lastly, curricular and institutional changes are noted, including the incorporation of specific modules and the reorientation of resources toward active methodologies, with tangible improvements in student performance and participation (Dasoo, 2020; Polonia, 2020).

In summary, the findings confirm that research skills are a strategic axis for teacher professionalization and educational transformation. Their incorporation fosters pedagogical innovation, strengthens self-efficacy, and promotes the construction of practice communities that ensure the sustainability of achieved advances. However, challenges persist related to the heterogeneity in digital literacy and the limited availability of resources in certain contexts, underscoring the need for educational policies that ensure equitable conditions and continuity in training processes (Coşgun Demirdağ & Taşgın, 2025; Fernández-Batanero et al., 2022).

Conclusions

The systematic review conducted highlights the wide diversity of conceptual frameworks used to structure training interventions aimed at developing research skills in teachers. While some studies have focused on designing ad hoc models tailored to specific institutional realities, others have drawn on recognized international frameworks related to digital and research competencies. This duality reflects a constant tension between local flexibility and global standardization: on one hand, contextual models allow for a more precise response to specific needs; on the other, the absence of common references complicates the comparison of results and the transfer of successful practices. In this sense, the evidence indicates that no single framework can encompass the cultural, pedagogical, and technological diversity present in various settings, making it necessary to advance toward a body of teacher research competencies that combines methodological coherence with contextual relevance.

The collected data show a positive and consistent impact of research skills in three key dimensions: self-efficacy, pedagogical innovation, and collegial collaboration. The reviewed studies report significant increases in

teachers' confidence to design and execute research projects, as well as a greater adoption of active methodologies derived from research training, such as project-based learning and flipped classrooms. Similarly, there is documented growth in participation in communities of practice, albeit conditioned by technological limitations and institutional support, highlighting gaps between urban and rural contexts. These results confirm that action research not only constitutes a strategy for individual innovation but also serves as a catalyst for building collaborative networks with institutional impact.

However, the review also identifies persistent limitations and challenges in strengthening these competencies. Only 45% of studies incorporated formative assessments systematically, reflecting a deficit in the ongoing support of teacher research processes. Although more than 80% of teachers positively valued the training experiences, significant barriers remain related to heterogeneity in digital literacy and the lack of institutional incentives, noted in more than half of the analyzed works. These difficulties highlight the need for comprehensive educational policies that not only facilitate access to technological resources but also formally recognize research work as an essential part of teacher professional development.

Finally, the findings underscore the importance of conceptualizing research skills as a systemic framework, where the formulation of contextualized questions serves as a fundamental starting point. The rigorous adoption of data collection and analysis methods, along with the integration of an ethical and reflective approach, lends legitimacy to teacher research and transforms it into a powerful tool for improving educational practice. Consequently, it is recommended to consolidate structured training programs in phases that encompass everything from question formulation to dissemination of results, incorporating mentoring, communities of practice, and digital certifications, as well as ensuring curricular time and specific resources for action research. Only then will it be possible to ensure the sustainability and full integration of the research culture into teaching practice, enhancing the quality of education in diverse contexts.

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