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Implications of didactic transposition in the educational context: A systematic review

Implicancias de la transposición didáctica en el contexto educativo: una revisión sistemática

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Abstract

This systematic review, guided by the PRISMA methodology, analyzed the implications of didactic transposition in the educational context. The Scopus and SciELO databases were consulted, including articles published between 2020 and 2025 in Spanish and English, and excluding those with closed access. Of a total of 300 articles identified, 13 from Scopus and 7 from SciELO were selected for analysis. The results highlight that didactic transposition transcends mere disciplinary knowledge, integrating the praxeology of the teacher-trainer. Thus, the interaction between researchers and trainers reveals how the ability to articulate research and teaching influences the interpretation and adaptation of content by future educators. Institutional, cultural, and training factors modulate its effectiveness, positioning it as a key strategy in contemporary education, especially in light of the impact of generative artificial intelligence. Consequently, it is consolidated as an essential process for transforming disciplinary knowledge into teachable knowledge.

Keywords: adaptation, scientist, strategies, didactic transposition.

Resumen

Esta revisión sistemática, guiada por la metodología PRISMA, analizó las implicancias de la transposición didáctica en el contexto educativo. Se consultaron las bases de datos Scopus y SciELO, incluyendo artículos publicados entre 2020 y 2025 en español e inglés, y excluyendo aquellos de acceso cerrado. De un total de 300 artículos identificados, se seleccionaron 13 de Scopus y 7 de SciELO para el análisis. Los resultados destacan que la transposición didáctica trasciende el mero conocimiento disciplinar, integrando la praxeología del docente-formador. Así, la interacción entre investigadores y formadores revela cómo la capacidad para articular investigación y enseñanza influye en la interpretación y adaptación de contenidos por parte de futuros educadores. Factores institucionales, culturales y formativos modulan su efectividad, posicionándola como estrategia clave en la educación contemporánea, especialmente ante el impacto de la inteligencia artificial generativa. En consecuencia, se consolida como un proceso esencial para transformar el saber disciplinar en conocimiento enseñable.

Palabras clave: adaptación, científico, estrategias, transposición didáctica.

Introduction

Didactic transposition, the process through which scientific knowledge is reshaped into forms that are accessible and meaningful for teaching and learning, has become increasingly complex within contemporary educational settings. One of the most pressing challenges concerns the effective incorporation of scientific narratives into classroom practice. Integrating these activities into everyday instruction requires teachers to adopt new approaches to analyzing, interpreting, and producing texts that differ substantially from conventional literacy practices. At the same time, educators must determine how both curricular content and instructional approaches can be adapted to rapidly evolving digital environments where active reading, reflective writing, and student participation operate as interconnected dimensions of learning. These conditions create inherent tensions within the process of didactic transposition while simultaneously raising fundamental questions about the design of innovative pedagogical strategies capable of responding to the interactive and multimodal nature of contemporary scientific narratives (Bouchardon et al., 2022).

Comparable challenges have been identified in mathematics education, where preparing disciplinary knowledge for classroom instruction remains a persistent concern. Different theoretical traditions have interpreted this process through diverse conceptual metaphors, each reflecting a particular understanding of the relationship between formal mathematical knowledge and the pedagogical processes that render it teachable. Despite these differences, most perspectives continue to portray knowledge preparation as a largely one-way transformation in which disciplinary content is merely adapted for students. Such a view overlooks the reciprocal influence exerted by educational contexts on mathematical knowledge itself, thereby limiting a comprehensive understanding of didactic transposition. A more systemic perspective is therefore required, one that conceives mathematics instruction as a dynamic interaction in which both disciplinary knowledge and the educational environment continuously shape one another rather than as a simple act of knowledge transmission (Scheiner et al., 2022).

Teacher education likewise faces enduring structural and functional challenges associated with instructional practice. Although teacher preparation programs increasingly include discipline-specific pedagogy in response to national and international quality standards, a substantial gap remains between theoretical preparation and the realities of classroom teaching. This disconnect is reflected in the limited and fragmented use of instructional strategies, where conceptual discussions frequently outweigh opportunities for meaningful classroom application. These circumstances underscore that pedagogical expertise does not emerge automatically through the accumulation of theoretical knowledge. Instead, it develops through an ongoing professional learning process that requires sustained integration of pedagogical theory, instructional practice, and the educational contexts in which teaching occurs (Bahamondes et al., 2021).

A similar disconnect has been documented in history education, particularly between specialized university training and classroom practice in primary and secondary schools. This institutional divide complicates the implementation of innovative instructional approaches and weakens the connection between historical research and school teaching. Despite efforts to promote a reconstructivist approach to history education that encourages critical engagement with the past, conventional models of didactic transposition continue to dominate. Under this model, historical knowledge produced in universities is frequently transferred to schools in fragmented and decontextualized forms with limited relevance to students' sociocultural realities. Addressing this disconnect requires a fundamental rethinking of teacher education by fostering stronger collaboration between universities and schools so that historical knowledge can be constructed through a shared and dialogic process (Nicolini & Marciano, 2023).

Within this evolving educational landscape, research skills have assumed strategic importance as an integrated set of cognitive, methodological, reflective, intellectual, and socio-emotional competencies that enable students to conduct systematic, autonomous, and critical inquiry. These competencies extend far beyond the technical ability to locate and analyze information. They also encompass the capacity to connect theory with practice, formulate meaningful research questions, construct coherent arguments, and critically evaluate evidence from multiple perspectives. When intentionally cultivated through educational practice, these abilities are strengthened by learning environments that encourage metacognitive reflection, intellectual autonomy, interdisciplinary collaboration, rigorous critical thinking, epistemic curiosity, logical reasoning, methodological creativity, and responsible academic leadership. Consequently, well-developed research competencies not only enhance academic performance but also foster transferable capabilities that remain essential for success in higher education and professional practice throughout the twenty-first century (Ziska et al., 2025; Gharaibeh et al., 2025).

Against this backdrop, the present systematic review aims to examine the implications of didactic transposition within contemporary educational contexts.

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Methodology

This study employed a systematic review design grounded in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. PRISMA provides a transparent and structured approach to identifying, selecting, appraising, and reporting scientific evidence, thereby enhancing the reproducibility of the review process while minimizing potential sources of bias.

The literature search was designed to maximize the retrieval of relevant studies through a comprehensive and systematic strategy. The review was guided by the following research question: What are the implications of didactic transposition in educational contexts?

Studies were eligible for inclusion if they met the following criteria: (a) publication in the Scopus or SciELO databases; (b) availability as open-access articles; (c) publication between 2020 and 2025; and (d) publication in English, Spanish, or Portuguese. The search strategy combined controlled keywords related to *didactic transposition* and *students* using the Boolean operators *AND* and *OR* to maximize retrieval while maintaining relevance.

The exclusion criteria comprised studies published before 2020, publications with restricted access, and document types other than peer-reviewed journal articles, including books, conference proceedings, and theses. These criteria ensured methodological consistency and focused the review on high-quality scientific evidence.

The search process yielded 300 records. After applying the predefined eligibility criteria and completing the screening process, 20 studies were retained for the final synthesis, including 13 articles indexed in Scopus and seven indexed in SciELO. Table 1 summarizes the search strategy and study selection process.

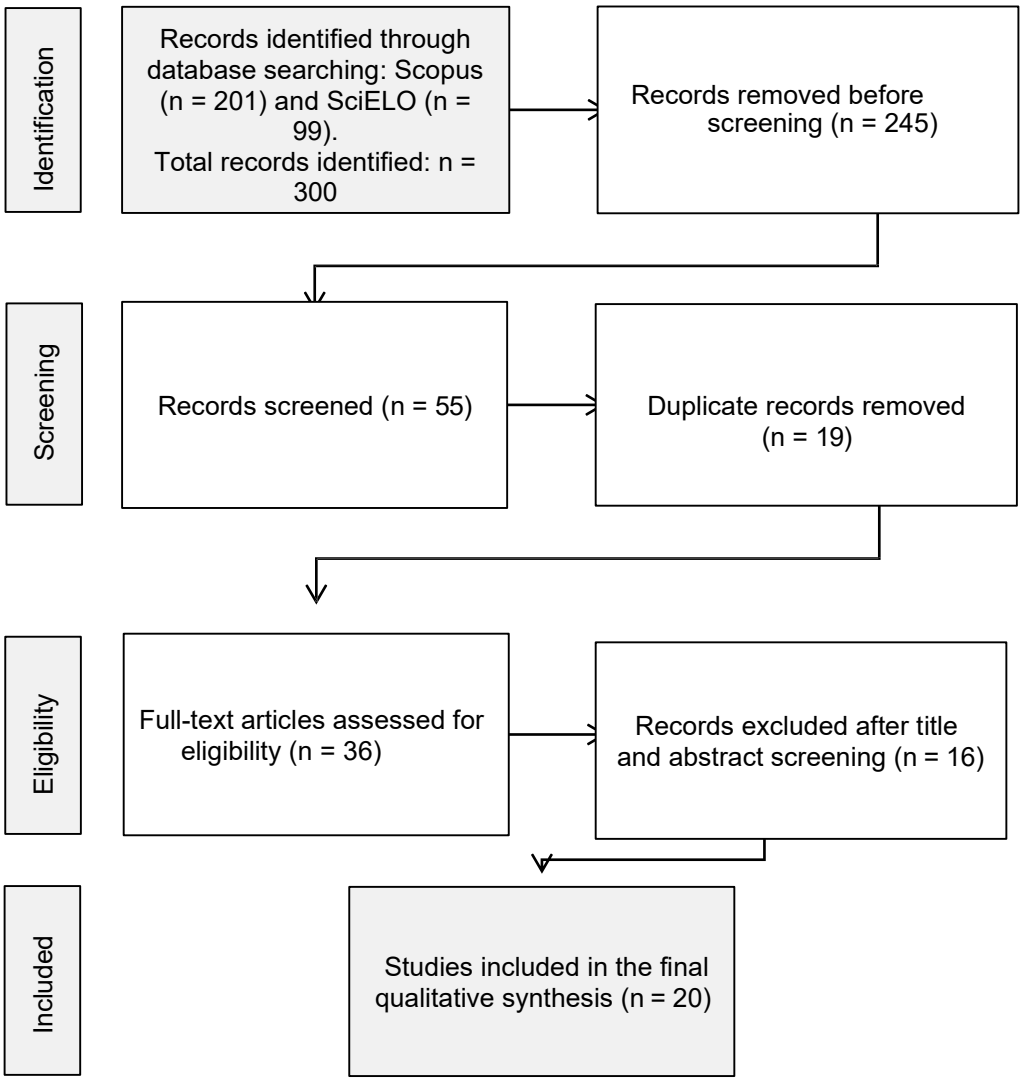
Table 1

Search strategy across the selected databases

Database	Search String	Records Retrieved	Studies Included
Scopus	" Didactic transposition " AND “students”	201	13
Scielo	" Didactic transposition" AND “students” OR Strategies	99	7
	Total	**300**	**20**

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Figure 1
PRISMA flow diagram of the study selection process



Note. Adapted from the PRISMA reporting framework using data generated for the present study

Results and discussion

Table 2
Implications of didactic transposition in educational contexts

No.	Author	Implications of Didactic Transposition
1	Hazzan & Erez (2025)	The emergence of generative artificial intelligence underscores the growing importance of didactic transposition as a process for reinterpreting and adapting academic knowledge to new learning environments. Beyond improving instructional efficiency and accessibility, its integration calls for a fundamental reconsideration of how knowledge is constructed, communicated, and taught. Didactic transposition therefore serves as the bridge between highly specialized knowledge and students' cognitive needs, ensuring that technological innovations become pedagogically meaningful rather than merely technological additions.
2	Borges et al. (2025)	In contemporary education, didactic transposition has become increasingly important in response to the rapid expansion of generative artificial intelligence. By reshaping academic knowledge to fit emerging learning contexts, it enables technology to transform not only instructional practices but also the ways knowledge is generated, shared, and understood. Through this mediating role, didactic transposition aligns technological complexity with students' learning needs, supporting meaningful educational innovation.
3	Pache et al. (2025)	Employing didactic transposition as a teacher education strategy enables prospective teachers to transform disciplinary knowledge into teachable content while developing a critical, context-sensitive understanding of the subject matter. Assuming the teacher's perspective encourages future educators to reconstruct knowledge pedagogically while strengthening the competencies required to connect academic theory with classroom practice.
4	Serpe (2025)	Didactic transposition facilitates the transformation of disciplinary knowledge into interdisciplinary learning experiences that promote deeper conceptual understanding. By integrating fields such as mathematics and physics, students develop broader and more critical perspectives on the historical and conceptual foundations of knowledge.
5	Focant et al. (2025)	Students' understanding of genetics depends substantially on how educational programs and teachers present the discipline. Persistent reliance on reductionist, decontextualized, and outdated approaches reflects shortcomings in didactic transposition, limiting the development of the complex reasoning required to understand the dynamic and multifactorial nature of genetics.
6	Cardona et al. (2025)	Didactic transposition plays a central role in transforming complex scientific knowledge into accessible learning, fostering curiosity, critical thinking, and the social appropriation of scientific knowledge among both students and the broader community.
7	San-Martín & Santisteban-Fernández (2025)	Persistent stereotypes of masculinity in educational resources on prehistory hinder the accurate transposition of current scientific knowledge by perpetuating biased representations of gender relations in ancient societies. This limits students' critical understanding of the past and weakens the transformative potential of history education.
8	Jennings et al. (2025)	Evidence from structured and progressive pedagogical training demonstrates that effectively translating theoretical knowledge into practice significantly enhances the acquisition of complex skills while strengthening prospective teachers' autonomy and professional confidence in authentic educational settings.

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9	Gascón (2024)	Didactic transposition provides a meaningful connection between school mathematics and its epistemological foundations, promoting richer, more coherent, and conceptually grounded mathematical understanding.
10	Soudani (2024)	Transforming literary narratives into scientific learning experiences illustrates the pedagogical potential of didactic transposition. Reframing children's literature as inquiry-based scientific problems encourages prospective teachers to assume the complementary roles of researcher and educator, fostering epistemological understanding, collaborative learning, and reflective teaching practice.
11	Guevara-Herrero et al. (2024)	Environmental education benefits from instructional strategies that translate scientific knowledge into meaningful learning from the earliest stages of schooling. Case-based learning, supported by didactic transposition, enables students to connect theoretical concepts with practical situations while cultivating critical thinking and a systemic understanding of environmental and global health issues.
12	Wadrawane (2024)	Incorporating ceremonies, cultural calendars, and traditional practices into educational activities allows students and prospective teachers to connect community knowledge with formal education. Such an approach strengthens cultural identity, contextual understanding, and social sustainability while recognizing the educational value of local knowledge systems.
13	Minisola et al. (2024)	Collaboration between researchers and teacher educators demonstrates that successful didactic transposition depends not only on disciplinary expertise but also on the professional praxeology of teacher educators. Their ability to integrate research with teaching substantially influences how prospective teachers interpret, reconstruct, and adapt disciplinary knowledge. Institutional, cultural, and educational conditions therefore play a decisive role in determining the effectiveness of didactic transposition.
14	Strømskag & Chevallard (2024)	In mathematics education, didactic transposition illustrates how university-level concepts such as concave and convex functions are simplified at the secondary level, often leading to institutional fragmentation of knowledge. The concept of an *archeorganization* provides a framework through which teacher education institutions can preserve epistemological continuity while structuring mathematical knowledge coherently across educational levels.
15	Maciel et al. (2025)	Encouraging fathers to participate actively during the postpartum period illustrates the need to transform theoretical principles of gender equality and shared responsibility into everyday educational and social practices. This form of transposition contributes to sustainable cultural change, comprehensive human development, and the reduction of gender inequalities through education and critical reflection.
16	Lima et al. (2025)	Fathers' active involvement from pregnancy through the postpartum period strengthens family relationships and promotes more equitable and reflective fatherhood. Greater participation in caregiving supports emotional development, reduces gender inequalities, and enhances family support systems.
17	Cruz et al. (2025)	The effective integration of health policies requires careful consideration of the sociocultural conditions shaping both practice and knowledge. Ignoring these contextual factors hinders meaningful knowledge appropriation and limits genuine behavioral change, revealing challenges analogous to those encountered in didactic transposition within educational settings.

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18	Rocha & Zucchi (2025)	Social constructions of masculinity strongly influence men's perceptions of mental health. Associating emotional suffering with personal or professional failure discourages self-care and help-seeking, creating tensions between treatment needs and prevailing ideals of self-reliance.
19	Costa et al. (2025)	The interaction among different forms of reasoning and action demonstrates that flexibility, adaptation, and the integration of diverse approaches transform complex processes into meaningful learning. Within education, this finding suggests that effective didactic transposition relies on strategies that combine planning, experimentation, and reflection, enabling students to apply knowledge creatively and contextually rather than merely reproducing fixed procedures.
20	Kaneko & Pistoni (2025)	Implementing English as a medium of instruction in higher education represents an effective strategy for adapting academic knowledge to an increasingly global educational landscape. Integrating English into the curriculum enhances intercultural competence, supports internationalization, and prepares students for professional mobility, illustrating how didactic transposition can connect educational practice with global demands while promoting inclusive, relevant, and contemporary learning experiences.

Factors influencing didactic transposition among students

The way scientific topics are presented by educational programs and classroom teachers has a direct bearing on the depth and quality of students' understanding. Genetics provides a clear example of this relationship. Persistent reliance on reductionist, decontextualized, and outdated instructional approaches reflects shortcomings in the process of didactic transposition and, in turn, constrains students' ability to develop the complex systems thinking needed to appreciate the dynamic and multifactorial nature of contemporary genetics (Focant et al., 2025). Likewise, the continued presence of stereotypical representations of masculinity in educational resources on prehistory undermines the accurate translation of current scientific knowledge into classroom instruction. Such portrayals perpetuate unbalanced interpretations of gender relations in ancient societies and restrict students' capacity to engage critically with the historical record (San-Martín & Santisteban-Fernández, 2025).

The interaction between researchers and teacher educators further demonstrates that effective didactic transposition extends beyond disciplinary expertise. Equally important is the professional praxeology of teacher educators, the reflective knowledge, instructional judgment, and pedagogical decisions that shape their everyday practice. Their ability to integrate research with teaching largely determines how prospective teachers interpret, reconstruct, and adapt disciplinary knowledge for educational purposes. Consequently, institutional conditions, cultural influences, and the quality of teacher education emerge as decisive factors in the success of didactic transposition (Minisola et al., 2024). Along similar lines, fathers' active participation throughout pregnancy and the postpartum period illustrates how educational and social environments can reshape understandings of masculinity by promoting more equitable, emotionally engaged, and co-responsible models of parenthood (Lima et al., 2025).

Evidence from health policy research likewise highlights the importance of sociocultural contexts in determining how knowledge is interpreted and applied. When these contextual dimensions are overlooked, meaningful knowledge appropriation becomes more difficult, limiting the possibility of sustained changes in practice. This dynamic closely parallels the challenges associated with didactic transposition in educational settings, where contextual relevance is fundamental to effective learning (Cruz et al., 2025). Similarly, culturally embedded constructions of masculinity influence how men perceive and manage their emotional well-being. Norms emphasizing self-reliance and emotional restraint discourage self-care and professional help-seeking, illustrating how cultural beliefs mediate learning, adaptation, and behavioral change (Rocha & Zucchi, 2025).

Finally, persistent gender stereotypes within technical disciplines such as Information Technology significantly shape how women in training interpret, internalize, and apply disciplinary knowledge. These biases not only limit the appropriation of technical expertise but also hinder the development of entrepreneurial and professional competencies. The evidence therefore illustrates how structural inequalities and limited representation function as hidden barriers that interfere with didactic transposition, reinforcing the need for more

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inclusive, equitable, and representative educational environments capable of supporting the full potential of every learner (Borges et al., 2025).

Importance of didactic transposition

Didactic transposition has become an indispensable component of contemporary education, particularly in response to the transformative influence of generative artificial intelligence. As digital technologies continue to reshape educational practice, this process enables academic knowledge to be reinterpreted and adapted to emerging forms of teaching and learning. Rather than serving merely as technological support, artificial intelligence has begun to redefine how knowledge is created, communicated, and collaboratively constructed within educational environments. In this context, didactic transposition provides the pedagogical mediation required to align technological sophistication with students' cognitive needs, ensuring that technological innovation contributes meaningfully to learning rather than functioning as a superficial instructional enhancement (Hazzan & Erez, 2025).

Its significance also lies in its capacity to transform highly specialized scientific knowledge into learning that is accessible, relevant, and intellectually engaging. Through this process, learners develop genuine curiosity, critical thinking, and the ability to appropriate scientific knowledge in socially meaningful ways. These outcomes are essential for cultivating autonomous, reflective individuals who actively construct knowledge instead of passively receiving information (Cardona et al., 2025).

Within mathematics education, didactic transposition performs an equally important function by linking school mathematics to its epistemological foundations. Establishing this connection enables students to develop a deeper and more coherent understanding of mathematical concepts, encouraging them to appreciate not only procedural solutions but also the historical, logical, and conceptual structures that give mathematics its intellectual coherence (Gascón, 2024).

The relevance of didactic transposition extends well beyond formal educational settings into broader processes of social learning and cultural transformation. Promoting fathers' active participation during the postpartum period exemplifies how theoretical principles related to gender equality and shared responsibility can be translated into meaningful social practices. Such educational processes contribute to long-term cultural change, strengthen holistic human development, and support the reduction of gender inequalities through reflective and contextually grounded learning experiences (Maciel et al., 2025).

strategies for implementing didactic transposition

Didactic transposition has become a foundational instructional strategy for transforming disciplinary knowledge into knowledge that can be effectively taught. By adopting the role of teachers, students do more than reinterpret academic content from an educational perspective; they also cultivate the critical and practical competencies needed to connect theoretical understanding with pedagogical action (Pache et al., 2025). This process becomes even more effective when knowledge from different disciplines, such as mathematics and physics, is intentionally integrated, creating interdisciplinary learning experiences that foster broader, historically informed, and conceptually rich understandings of complex phenomena (Serpe, 2025).

Structured and progressive pedagogical preparation represents another highly effective strategy for translating theoretical knowledge into classroom practice. Such training enhances the acquisition of complex professional competencies while promoting greater autonomy and confidence among prospective teachers as they engage with authentic educational settings (Jennings et al., 2025). Likewise, reimagining literary narratives as vehicles for scientific inquirí, for example, transforming a children's story into a research problema, encourages pedagogical creativity, collaborative learning, and reflective practice. This approach helps future educators understand how scientific knowledge can be adapted into engaging and meaningful classroom experiences (Soudani, 2024).

In environmental education, didactic transposition enables complex scientific concepts to become meaningful learning experiences from the earliest stages of schooling. Case-based instructional approaches, in particular, help students integrate theoretical knowledge with practical application while fostering critical thinking and a systemic understanding of ecological and global health challenges (Guevara-Herrero et al., 2024). Complementing these strategies, the incorporation of cultural practices, including ceremonies, traditional calendars, and community customs, creates more contextually grounded learning experiences that strengthen the relationship between knowledge, culture, and social sustainability while recognizing the educational value of Indigenous and local knowledge systems (Wadrawane, 2024).

In mathematics education, carefully planned didactic transposition is essential for preserving the coherence of disciplinary knowledge across educational levels. Translating advanced concepts such as concave and convex functions into secondary school curricula requires institutional coordination capable of maintaining

epistemological continuity. The notion of *archeorganization* offers a valuable framework for achieving this continuity while supporting a more coherent progression of mathematical learning (Strømskag & Chevallard, 2024). More broadly, the evidence suggests that the most effective approaches to didactic transposition combine careful planning, instructional experimentation, and ongoing reflection, thereby creating learning experiences that are flexible, context-sensitive, and responsive to students' educational needs (Costa et al., 2025).

Finally, adopting English as a medium of instruction in higher education represents a strategic approach to adapting academic knowledge within an increasingly interconnected world. Incorporating English into university curricula promotes the internationalization of knowledge, strengthens intercultural competence, and expands students' opportunities for academic and professional mobility. In this way, didactic transposition functions as a bridge between educational practice and global expectations, fostering learning experiences that are more inclusive, internationally relevant, and responsive to the demands of contemporary society (Kaneko & Pistoni, 2025).

Conclusions

The findings of this systematic review demonstrate that didactic transposition extends beyond mastery of disciplinary content. Its effectiveness depends equally on the professional praxeology of teacher educators, the ways in which they interpret, make instructional decisions, and enact their pedagogical practice. The ability to integrate research with teaching substantially shapes how prospective teachers interpret, critically examine, and adapt disciplinary knowledge for educational purposes. Consequently, institutional conditions, cultural influences, and the quality of teacher education emerge as key determinants of successful didactic transposition.

Within this framework, didactic transposition assumes an increasingly central role in contemporary education, particularly in light of the rapid expansion of generative artificial intelligence and the emergence of new digital learning ecologies. As educational contexts continue to evolve, the process provides an essential mechanism for recontextualizing academic knowledge so that it remains relevant, accessible, and pedagogically meaningful. Rather than simply supporting instruction, digital technologies are reshaping how knowledge is created, communicated, and collaboratively constructed. Didactic transposition ensures that these transformations are accompanied by sound pedagogical mediation, enabling complex scientific knowledge to be translated into meaningful learning experiences that foster intellectual curiosity, critical thinking, and the social appropriation of knowledge. These capacities constitute essential foundations for the development of autonomous, reflective, and ethically responsible learners.

The evidence further indicates that didactic transposition functions as a comprehensive pedagogical strategy capable of bridging disciplinary knowledge and educational practice across diverse instructional settings. Its relevance spans educational levels, from primary and secondary education to teacher preparation and higher education, as well as multiple disciplinary domains, including mathematics, science, environmental education, language instruction, and gender studies. Conceiving didactic transposition merely as the simplification of content fails to capture its educational significance. Instead, it should be understood as an intentional, creative, and context-sensitive process that requires careful planning, critical reflection, and sustained dialogue among educational stakeholders. Strengthening teacher preparation in didactic transposition therefore represents a strategic priority for designing learning experiences that are more inclusive, intellectually rigorous, and responsive to the social, cultural, and technological challenges of the twenty-first century.

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