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Critical thinking in contemporary education: a systematic review from teaching practice and pedagogical training

Pensamiento crítico en la educación contemporánea: una revisión sistemática desde la práctica docente y la formación pedagógica

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Abstract

Critical thinking has established itself as an essential skill for responding to the challenges of education in the 21st century. The aim of this study was to systematically analyze recent scientific output on the development of critical thinking in educational contexts. Through a qualitative systematic review, based on the PRISMA 2020 protocol, 25 studies published between 2020 and 2025 were selected from databases such as Scopus, SciELO, institutional repositories, and other indexed sources. The thematic synthesis identified three recurring themes: pedagogical strategies employed, teacher training processes, and specific skills associated with critical thinking. The results show that the application of active methodologies, the strengthening of initial and continuing teacher training, and the promotion of complex cognitive skills are key factors for its effective integration. However, there is weak institutionalization of these practices in education systems. It is concluded that critical thinking must transcend its theoretical dimension to become a structural pedagogical practice, accompanied by coherent educational policies and transformative teacher training. This study provides an integrated view of the current state of critical thinking in Latin American education and suggests lines of action for its strengthening.

Keywords: critical thinking, teacher training, teaching strategies.

Resumen

El pensamiento crítico se ha consolidado como una competencia esencial para responder a los desafíos de la educación en el siglo XXI. El presente estudio tuvo como objetivo analizar sistemáticamente la producción científica reciente sobre el desarrollo del pensamiento crítico en contextos educativos. A través de una revisión sistemática cualitativa, basada en el protocolo PRISMA 2020, se seleccionaron 25 estudios publicados entre 2020 y 2025 en bases de datos como Scopus, SciELO, repositorios institucionales y otras fuentes indexadas. La síntesis temática permitió identificar tres ejes recurrentes: estrategias pedagógicas empleadas, procesos de formación docente y habilidades específicas asociadas al pensamiento crítico. Los resultados evidencian que la aplicación de metodologías activas, el fortalecimiento de la formación inicial y continua del profesorado, y la promoción de competencias cognitivas complejas constituyen factores clave para su integración efectiva. No obstante, se detecta una débil institucionalización de estas prácticas en los sistemas educativos. Se concluye que el pensamiento crítico debe trascender su dimensión teórica para convertirse en una práctica pedagógica estructural, acompañada de políticas educativas coherentes y una formación docente transformadora. Este estudio aporta una visión integradora sobre el estado actual del pensamiento crítico en la educación latinoamericana y sugiere líneas de acción para su fortalecimiento.

Palabras clave: pensamiento crítico, formación docente, estrategias pedagógicas.

Introduction

In recent decades, research on critical thinking skills among university students has gained significant relevance among educators and researchers in the educational field. This cognitive ability is essential in higher professional training, as it underpins the generation of rigorous knowledge in education. Intellectual activities such as problem-solving, evidence-based decision-making, scientific creativity, hypothesis analysis, and structured inquiry require the effective use of critical thinking, understood as a rational, reflective, and methodical process of

human reasoning (Altamirano, 2021; Austin & Pinkleton, 2016). This competency enables emerging researchers to clearly adopt the scientific paradigms that guide their work, select appropriate methodological approaches, design inquiry processes aligned with their objectives, and ultimately interpret results from an analytical, logical, and ethical perspective.

Critique, as an inherent manifestation of human thought, constitutes an invaluable tool in various fields, including education, politics, economics, and culture (Ennis, 2018; Facione, 1990). Consequently, contemporary society requires citizens capable of independent thought, committed to reflective analysis and a constructive view of reality. In this context, institutions dedicated to initial teacher training bear the responsibility of shaping professionals who cultivate a critical attitude in their students, free from dogma and pseudoscientific discourse. Therefore, the development of critical thinking is not merely a desirable competency but a fundamental requirement of the modern educational system (Blair, 2021).

Critical thinking entails analyzing, evaluating, and synthesizing information reflectively, avoiding the mechanical reproduction of knowledge. This skill allows students to question assumptions, contrast perspectives, identify argumentative errors, and reason logically. The evidence generated from these processes translates into deeper, transferable learning outcomes (Mango-Quispe et al., 2024). In this framework, John Dewey, through his proposal of "reflective thinking" in How We Think, laid the groundwork for a pedagogy centered on deliberate reasoning, conceived as the active and careful disposition to examine ideas and their consequences (Dewey, 1989). His approach was pivotal for the subsequent development of critical thinking as a transversal axis in education.

A foundational reference in this area is Facione (1990), who proposes an integrated model that articulates cognitive skills—such as inference, evaluation, analysis, and self-regulation—with intellectual dispositions such as open-mindedness, commitment to truth-seeking, and respect for others' ideas. According to his proposal, critical thinking encompasses not only technical skills but also attitudes that foster conscious reflection, rational argumentation, and evidence-based decision-making. This framework is particularly useful in the educational realm, as it establishes clear parameters for promoting and evaluating critical thinking from a formative perspective.

From a constructivist approach, critical thinking is viewed as a complex cognitive competency oriented toward problem-solving, closely linked with meaningful learning (Cubides et al., 2017; Ossa-Cornejo et al., 2017; Oliveras & Sanmartí, 2009; Campos, 2007). This vision promotes an integration of academic knowledge and students' prior experiences, fostering an autonomous development of critical judgment. Conversely, from a positivist perspective, quantitative models have also been proposed to measure critical thinking using standardized instruments. In both cases, the knowledge society, characterized by the constant flow of information, demands that professionals and university students develop a critical and reflective stance toward the content they consume and produce (Turpo-Gebera et al., 2023; López-Gonzales et al., 2023).

The proliferation of unverified information, especially in digital environments, has highlighted the need to educate citizens capable of discerning between reliable sources and manipulative discourse. Thus, ethical communication practices become imperative in combating misinformation. From a formative research perspective, fostering critical thinking involves teaching students to identify ideological intentions, recognize biases, and analyze messages with conceptual depth (Santisteban et al., 2020). In this regard, educators must play a leading role in promoting strong argumentative skills based on scientific evidence. Ennis (2018) emphasizes that developing critical thinking requires teaching students to inquire judiciously, formulate relevant questions, construct coherent explanations, debate substantively, and generate ideas supported by reliable evidence.

This systematic review addresses the need to understand how critical thinking is approached in teacher training processes, both initial and ongoing, in higher education. Through the analysis of 25 studies published between 2020 and 2025, three major intervention axes are identified: the pedagogical strategies employed, the approaches in teacher training, and the cognitive skills developed by students, such as interpretation, evaluation, and self-regulation. In this context, the guiding question was formulated: How is critical thinking promoted in teacher training processes in higher education? The main objective was to identify and systematize the methodological strategies, formative approaches, and cognitive competencies associated with critical thinking implemented in contemporary educational contexts.

Methodology

This research was conducted under the framework of a qualitative systematic review, guided by the PRISMA 2020 model (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The aim was to identify, select, and analyze studies addressing the development of critical thinking in educational contexts, published between 2020 and 2025.

The bibliographic search was executed in two phases. In the first phase, 64 articles were identified through searches in high-impact academic databases, specifically Scopus (n = 41) and SciELO (n = 23).

In the second phase, 30 additional records were located through complementary sources, including institutional repositories (n = 13) and other indexed databases such as Redalyc, Dialnet, and Latindex (n = 17). The following criteria were established for the inclusion of studies:

- Focused on the development of critical thinking in educational environments.
- Presenting empirical data or rigorous theoretical foundations.
- Being peer-reviewed publications in recognized academic journals or repositories.
- Published between 2020 and 2025.
- Written in Spanish or English.

After eliminating duplicates, 53 unique articles were obtained, which proceeded to the screening stage. In this initial stage, the titles and abstracts of the 53 studies were reviewed, excluding 21 records for being unrelated to the topic, lacking academic relevance, or for duplication in different formats.

Subsequently, a full-text evaluation of the remaining 32 articles was conducted, from which 7 were excluded for not being directly linked to the development of critical thinking. Finally, a corpus of 25 studies that fully met the established inclusion criteria was consolidated.

The selected studies were analyzed following an open coding strategy and thematic grouping, based on three predefined analytical axes:

1. Pedagogical strategies used to foster critical thinking.
2. Teacher training as a context for developing critical competencies.
3. Specific skills that constitute critical thinking as a transversal competency.

Table 1

Qualitative cross-tabulation matrix

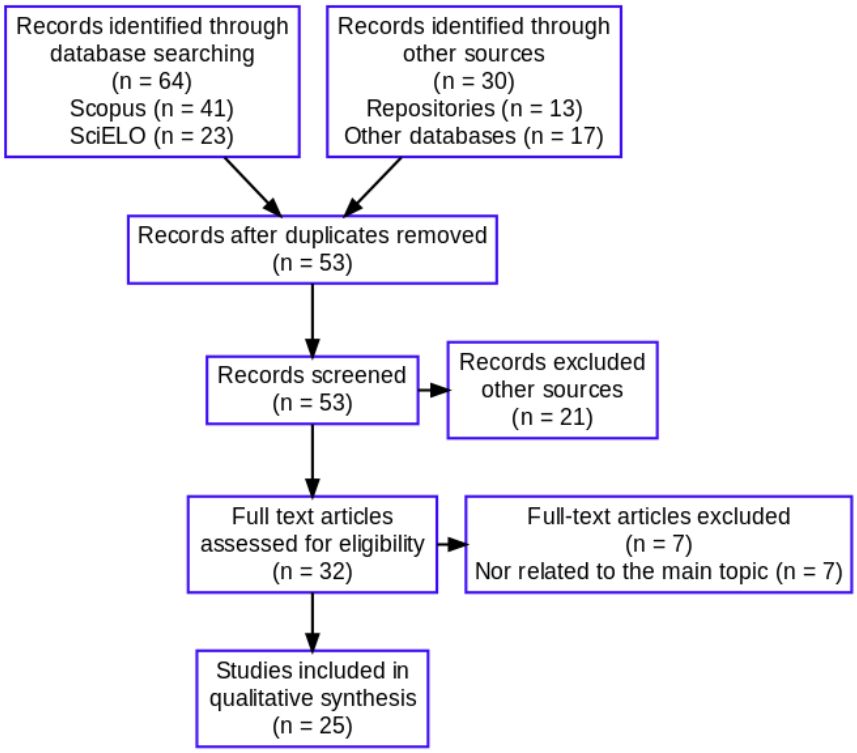
Author and year	Pedagogical strategies	Teacher training	Specific skills
Bermeo Berrú et al. (2025)	X		X
Quispe Anchayhua (2025)	X		X
Gómez et al. (2025)		X	
Ponce Tigua & Santa María Romero (2025)	X	X	X
Yanchatipán-Hinojosa (2025)			X
Fondón-Ludeña (2024)	X	X	X
Ding (2024)			X
Escribano-Muñoz et al. (2024)		X	
Mango-Quispe et al. (2024)	X	X	X
Masarah Revuelta et al. (2024)	X		
Pazos-Yerovi & Aguilar-Gordón (2024)	X	X	X
Guaña & Cevallos (2024)	X	X	
Escobar Domínguez (2024)	X	X	X
Gewerc et al. (2023)	X	X	
Pedraja-Rejas & Rodríguez (2023)	X	X	X
Cobo-Huesa et al. (2022)	X	X	X
Hierrezuelos Osorio et al. (2022)	X	X	X
Suárez Cretton & Castro (2022)	X	X	X
Díaz Herrera et al. (2022)		X	
Santana et al. (2022)	X	X	X
Cornejo & Ruiz-Tagle (2022)		X	
Benavides & Ruíz (2022)	X		X
López Mendoza et al. (2022)		X	
Vilcamango et al. (2021)		X	X

Rodríguez Sandoval (2020)		X	X

Source. Author's own elaboration.

This classification allowed for the organization of findings into comparable dimensions, facilitating their interpretation from a rigorous qualitative approach.

Figure 1
Flow diagram for the review process



Note. Content generated from https://hollyhartman.shinyapps.io/PRISMAFlowDiagram/

The review was based on a qualitative thematic synthesis, which allowed for the identification of recurring patterns, contrasting methodological approaches, and constructing a comprehensive view of the treatment of critical thinking in the educational field during the analyzed period.

Results

Systematic analysis according to three thematic axes

Based on the analysis of 25 studies published between 2020 and 2025, three recurrent thematic axes were established: (1) pedagogical strategies applied to critical thinking, (2) teacher training as a context for critical development, and (3) specific skills that constitute critical thinking as a transversal competency. The systematization allows for observing both the frequency and depth with which these dimensions are addressed.

Table 2

Systematization by indexing category

Indexing category	Number of articles	Included studies
Scopus	9	Cobo-Huesa et al. (2022), Escribano-Muñoz et al. (2024), Fondón-Ludeña (2024), Gewerc et al. (2023), Hierrezuelos Osorio et al. (2022), Mango-Quispe et al. (2024), Masarah Revuelta et al. (2024), Pedraja-Rejas & Rodríguez (2023), Zelaieta Anta et al. (2019)* ✗
SciELO	6	López Mendoza et al. (2022), Pazos-Yerovi & Aguilar-Gordón (2024), Escobar Domínguez (2024), Bermeo Berrú et al. (2025), Quispe Anchayhua (2025), Gómez et al. (2025)
Institutional repositories	3	Rodríguez Sandoval (2020), Díaz Herrera et al. (2022), Ponce Tigua & Santa María Romero (2025)
Other databases (Latindex, DOAJ, etc.)	7	Ding (2024), Cornejo & Ruiz-Tagle (2022), Benavides & Ruíz (2022), Vilcamango et al. (2021), Guaña & Cevallos (2024), Santana et al. (2022), Yanchatipán-Hinojosa (2025)

Source. Author's own elaboration.

1. Pedagogical strategies for the development of critical thinking

Nineteen studies highlight the implementation of active teaching methodologies as the foundation of critical thinking. The most recurrent strategies include problem-based learning (PBL) (Suárez Cretton & Castro, 2022; Pazos-Yerovi & Aguilar-Gordon, 2024), edu-communication (Ponce Tigua & Santa María Romero, 2025), narrative resources such as comics or reports (Masarah Revuelta et al., 2024), and the use of graphic organizers, role-playing, or ethical dilemmas (Zelaieta Anta et al., 2019; Hierrezuelos Osorio et al., 2022; Cobo-Huesa et al., 2022).

Additionally, studies by Guaña and Cevallos (2024) and Cornejo and Ruiz-Tagle (2022) propose strategic frameworks based on problem-solving and teacher mediation, while Gómez et al. (2025) emphasize the value of formative assessment as an integrative teaching tool. Other works, such as Ding (2024), explore more indirect forms of critical intervention through the promotion of mindfulness in educational contexts, recognizing its impact on reflective cognitive disposition.

In more specific contexts, Bermeo Berrú et al. (2025) and Quispe Anchayhua (2025) examine teaching practices applied at the secondary level, demonstrating their impact on student autonomy. Finally, Gewerc et al. (2023), Vilcamango et al. (2021), and Mango-Quispe et al. (2024) agree that methodological innovation not only enhances critical thinking but also improves the educational climate and student engagement.

2. Teacher training as a context for the development of critical thinking

Twenty-one studies position teacher training, whether initial or ongoing, as a crucial dimension in cultivating critical thinking. This line of analysis ranges from teachers' pedagogical conceptions to the training policies of institutions. For instance, López Mendoza et al. (2022) and Díaz Herrera et al. (2022) explore how trainers perceive their role in promoting critical thinking, revealing deficiencies in reflective planning and the use of critical evaluation tools.

At a structural level, Pedraja-Rejas and Rodríguez (2023) and Gewerc et al. (2023) link this training to leadership competencies and gender perspectives, while Escobar Domínguez (2024) and Mango-Quispe et al. (2024) propose approaches that integrate cultural psychology and media literacy as pedagogical mediations.

Moreover, studies by Santana et al. (2022), Escribano-Muñoz et al. (2024), and Benavides and Ruíz (2022) highlight that critical thinking does not develop spontaneously but requires systematic planning, accompanied by processes of self-reflection by the teacher. In this same vein, Ponce Tigua and Santa María Romero (2025) and Pazos-Yerovi and Aguilar-Gordon (2024) emphasize training experiences that integrate teaching practice with media analysis and narratives.

In Latin American university contexts, studies by Rodríguez Sandoval (2020), Cornejo and Ruiz-Tagle (2022), and Hierrezuelos Osorio et al. (2022) show how initial training is still marked by traditional models, which limits the critical development of future educators.

3. Specific skills of critical thinking

The third axis groups 17 studies that analyze the cognitive and metacognitive skills that constitute critical thinking, primarily: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 1990). These skills are addressed from both an evaluative perspective and their incorporation into the curriculum.

Rodríguez Sandoval (2020), Cobo-Huesa et al. (2022), and Quispe Anchayhua (2025) emphasize the need for explicit strategies for developing these skills at various educational levels. Bermeo Berrú et al. (2025) and Vilcamango et al. (2021) demonstrate advancements in inferential skills at the secondary level, while Yanchatipán-Hinojosa (2025) introduces a neurological approach that relates critical thinking to brain development, opening a new line of research.

Other works, such as those by Fondón-Ludeña (2024) and Ding (2024), position critical thinking within contexts of self-evaluation, metacognition, and emotional regulation, proposing that these skills should be stimulated from an early age through meaningful experiences. In this sense, López Mendoza et al. (2022) and Suárez Cretton and Castro (2022) insist on integrating these capabilities within curricular design and formative assessment.

Synthesis of findings

The analysis reveals that the reviewed studies agree on considering critical thinking as an indispensable educational competency, although still underdeveloped in many formative contexts. Pedagogical strategies are recognized as the most effective means to stimulate it, but their effectiveness is conditioned by the teacher's preparation. Teacher training, in turn, appears as the key space from which a critical culture can be built. Finally, the development of specific critical thinking skills remains a challenge in terms of curricular systematization, authentic assessment, and longitudinal follow-up.

Discussion

The systematic review reveals that critical thinking is conceived, in a transversal manner, as an essential competency in teaching and learning processes, particularly in contexts that promote active, student-centered methodologies. Empirical evidence shows that strategies such as problem-based learning (Pazos-Yerovi & Aguilar-Gordón, 2024; Suárez Cretton & Castro, 2022), the use of communicative and narrative resources (Masarah Revuelta et al., 2024; Ponce Tigua & Santa María Romero, 2025), and metacognitive approaches (Guaña & Cevallos, 2024; Ding, 2024) activate reflective processes that strengthen critical judgment. The design of activities deliberately oriented toward analysis, argumentation, and decision-making, as proposed by Hierrezuelos Osorio (2022), Cobo-Huesa (2022), and Quispe Anchayhua (2025), expands the possibilities for appropriating critical thinking as both a cognitive and ethical tool. In this sense, pedagogical strategies are not only a means for cognitive activation but also a space for the cultural construction of thought.

Regarding teacher training, there is a consensus in the literature on the need to consolidate training spaces that not only transmit content but also model reflective and critical practices. Studies by Gewerc et al. (2023), López Mendoza et al. (2022), and Díaz Herrera et al. (2022) highlight that many practicing teachers recognize the importance of critical thinking but lack the didactic or epistemological tools to effectively incorporate it into their practices.

Moreover, research by Mango-Quispe et al. (2024), Cornejo and Ruiz-Tagle (2022), and Rodríguez Sandoval (2020) indicates that initial training proposals often remain within traditional frameworks, hindering the establishment of a critical pedagogical culture. In contrast, innovative training experiences, such as those reported by Escobar Domínguez (2024) and Pedraja-Rejas and Rodríguez (2023), demonstrate that when interdisciplinary approaches—such as cultural psychology, teacher leadership, or media literacy—are integrated, teachers are more inclined to engage in critical, transformative, and contextually situated teaching.

Concerning the specific skills of critical thinking, common categories are identified across the 25 studies reviewed, with interpretation, analysis, inference, and self-regulation highlighted as essential dimensions. Bermeo Berrú et al. (2025), Vilcamango et al. (2021), and Gómez et al. (2025) agree that these skills do not emerge spontaneously but require intentional didactic strategies, reflective support, and formative assessments focused on processes rather than products. Additionally, Escribano-Muñoz et al. (2024) and Benavides and Ruíz (2022) argue that the lack of clear indicators of critical thinking in assessment tools constitutes a barrier to its development in the classroom. A disruptive contribution comes from Yanchatipán-Hinojosa (2025), who links the development of critical thinking with neurodevelopment, opening new avenues for interdisciplinary research among neuroscience, education, and critical cognition. This line complements Ding's (2024) focus on the impact of mindfulness on students' reflective disposition.

Finally, it is important to note that the analyzed studies, despite their different geographical contexts and educational levels, converge in criticizing the absence of clear institutional policies regarding the promotion of critical thinking. The review indicates that while there are isolated practices with significant impacts—such as those of Santana et al. (2022), Pazos-Yerovi and Aguilar-Gordón (2024), and Masarah Revuelta et al. (2024)—these do not always achieve systematic scaling or replication. Furthermore, the diversity of sources consulted (Scopus, SciELO, repositories, and other databases) confirms the robustness of the field while also highlighting a conceptual dispersion that could be addressed through more solid integrative frameworks. Therefore, the discussion opens the necessity to propose articulating models that integrate pedagogical strategies, teacher training, and the development of critical skills under a more coherent and sustained educational policy.

Conclusions

The findings of this systematic review allow us to conclude that the development of critical thinking in educational contexts requires effective articulation between pedagogical strategies, teacher training, and the intentional promotion of complex cognitive skills. Far from being a secondary competency, critical thinking emerges as a transversal and urgent capability in response to contemporary educational challenges. However, its consolidation depends on institutional and curricular decisions that recognize it as a structural axis of educational practice.

Despite the methodological and conceptual diversity of the 25 studies analyzed, there is a convergence around the need to redesign teaching according to more reflective, participatory, and contextualized criteria. In summary, fostering critical thinking involves training critical teachers, designing dialogical learning environments, and proposing policies that transcend mere declarations to become real and sustained pedagogical transformations.

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