Systematic review on the implications of critical thinking in students

Revisión sistemática sobre las implicancias del pensamiento crítico en estudiantes

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Abstract

The main objective of this study was to analyze the implications of critical thinking for university students. To achieve this goal, a systematic review based on the PRISMA methodology was conducted. Inclusion criteria were applied to document selection, considering articles published between 2021 and 2025 in databases such as Scopus, WoS, and Scielo, using the keywords "critical thinking" AND "students." The findings show that critical thinking is an essential skill in university education, as it allows students to analyze, argue, and make informed decisions in different academic and professional contexts. To enhance these capacities, it is necessary to implement innovative teaching strategies and pedagogical approaches that promote in-depth analysis and complex argumentation. Furthermore, the incorporation of technological tools—such as artificial intelligence—and the promotion of self-regulated learning, critical reflection, and informed decision-making can strengthen students' autonomy and depth of reasoning. Among the most effective teaching strategies are concept mapping, problem-based learning, technology-based simulation, educational games, reading promotion, and the development of argumentative skills. Likewise, promoting critical thinking among teachers is key to increasing student participation and engagement in the classroom.

Keywords: argumentation, strategies, critical thinking.

Resumen

El objetivo principal de este estudio fue analizar las implicancias del pensamiento crítico en estudiantes universitarios. Para alcanzar este propósito, se realizó una revisión sistemática basada en la metodología PRISMA. En la selección de los documentos, se aplicaron criterios de inclusión que consideraron artículos publicados entre 2021 y 2025 en bases de datos como Scopus, WoS y Scielo, utilizando como palabras clave "*critical thinking*" *AND* "*students*". Los hallazgos evidencian que el pensamiento crítico constituye una habilidad esencial en la formación universitaria, ya que permite a los estudiantes analizar, argumentar y tomar decisiones fundamentadas en distintos contextos académicos y profesionales. Para potenciar estas capacidades, es necesario implementar estrategias didácticas innovadoras y enfoques pedagógicos que promuevan el análisis profundo y la argumentación compleja. Además, la incorporación de herramientas tecnológicas —como la inteligencia artificial—, el fomento del aprendizaje autorregulado, la reflexión crítica y la toma de decisiones informadas pueden fortalecer la autonomía y la profundidad del razonamiento de los estudiantes. Entre las estrategias didácticas más efectivas se destacan el mapeo conceptual, el aprendizaje basado en problemas, la simulación con tecnología, los juegos didácticos, el fomento de la lectura y el desarrollo de la capacidad argumentativa. Asimismo, promover el pensamiento crítico entre los docentes resulta clave para incrementar la participación y el compromiso de los estudiantes en el aula.

Palabras clave: argumentación, estrategias, pensamiento crítico.

Introduction

Critical thinking (CT) plays an essential role not only in academic settings but also in everyday life. However, the challenge of effectively integrating it into educational systems persists, as many methodologies continue to favor passive learning. Therefore, it is necessary for educational policies to focus on training active and autonomous students capable of analyzing, questioning, and making well-founded decisions, thus promoting a learning environment based on reflection and the development of critical thinking (Elera-Castillo et al., 2023).

This type of thinking is a cognitive process that enables individuals to analyze, argue, evaluate, and make reasoned decisions. Its origins can be traced back to Socrates, who encouraged inquiry and questioning among his students as tools for intellectual growth (Peña et al., 2016). In addition to involving analytical and reflective skills, critical thinking encompasses metacognition, which is the self-regulation of one's own thinking through the recognition of strengths, limitations, and intellectual biases (Cangalaya, 2020). Consequently, it is characterized by a continuous exercise of self-analysis and self-correction, elements essential for decision-making and problem-solving in various contexts (Chavez-Angulo et al., 2021).

Moreover, critical thinking is a multidimensional concept whose definition varies depending on the discipline from which it is approached, whether psychology, education, or philosophy (Puig et al., 2023). However, there is consensus in considering it a key skill for analyzing, arguing, and generating solutions through a reflective process (Tapia & Castañeda, 2022). In the educational sphere, its relevance lies in the construction of reference frameworks and viewpoints, making it a fundamental competency for evaluating student learning (Aray et al., 2023). Its development is also associated with improved academic performance, as it allows students to tackle intellectual challenges with greater depth and autonomy (Sotomayor, 2023).

In India, for example, critical thinking is understood as the capacity to examine, analyze, and objectively evaluate an idea or problem to reach well-founded conclusions. The absence of this skill can lead students to accept information without questioning it, thereby limiting their intellectual autonomy and their ability to make decisions based on reasoning and evidence. For this reason, fostering critical thinking is essential to strengthening cognitive independence and analytical capacity in various fields (Raj et al., 2022). In this regard, the 21st Century Skills framework focuses on preparing students to anticipate and respond to ever-changing challenges, such as migration, market transformation, technological advancement, and global environmental and political issues. The lack of development of these competencies can hinder adaptation and the ability to effectively address complex situations (Golden, 2023).

On the other hand, in Latin America, the exponential growth in the creation and dissemination of online content has posed a significant challenge in validating information. The ease with which information is shared and replicated online has led to a proliferation of misinformation, making it difficult to distinguish between truthful data and misleading content. This phenomenon underscores the urgency of developing critical thinking skills in users

so they can analyze, contrast, and evaluate the reliability of the information they access (Rodríguez-Tovar et al., 2024). Similarly, educational systems and society face the challenge of strengthening critical thinking, as today's world demands citizens capable of analyzing situations, making informed decisions, and creatively solving problems. The lack of these skills can limit adaptation and conflict resolution in an increasingly dynamic and complex environment (Vergara-Guerra et al., 2023).

In Peru, within this context, various proposals have emerged to integrate critical thinking into the educational process, recognizing its importance in problem-solving, decision-making, and research. However, this process has generated multiple definitions of critical thinking, highlighting it as a higher-order skill that requires a high level of reflection, control, and self-regulation. This variety of approaches presents a challenge in establishing effective strategies that promote its development among students (Cangalaya-Sevillano, 2020).

Consequently, the general objective of this study is to identify the implications of critical thinking in university students.

Methodology

For the development of this study, a systematic review methodology was employed, following the guidelines established by the PRISMA statement. In the analysis process, inclusion criteria were applied, considering articles published between 2021 and 2025, sourced from recognized databases such as Scopus, Web of Science (WoS), and SciELO, using the keywords “critical thinking” AND “students.”

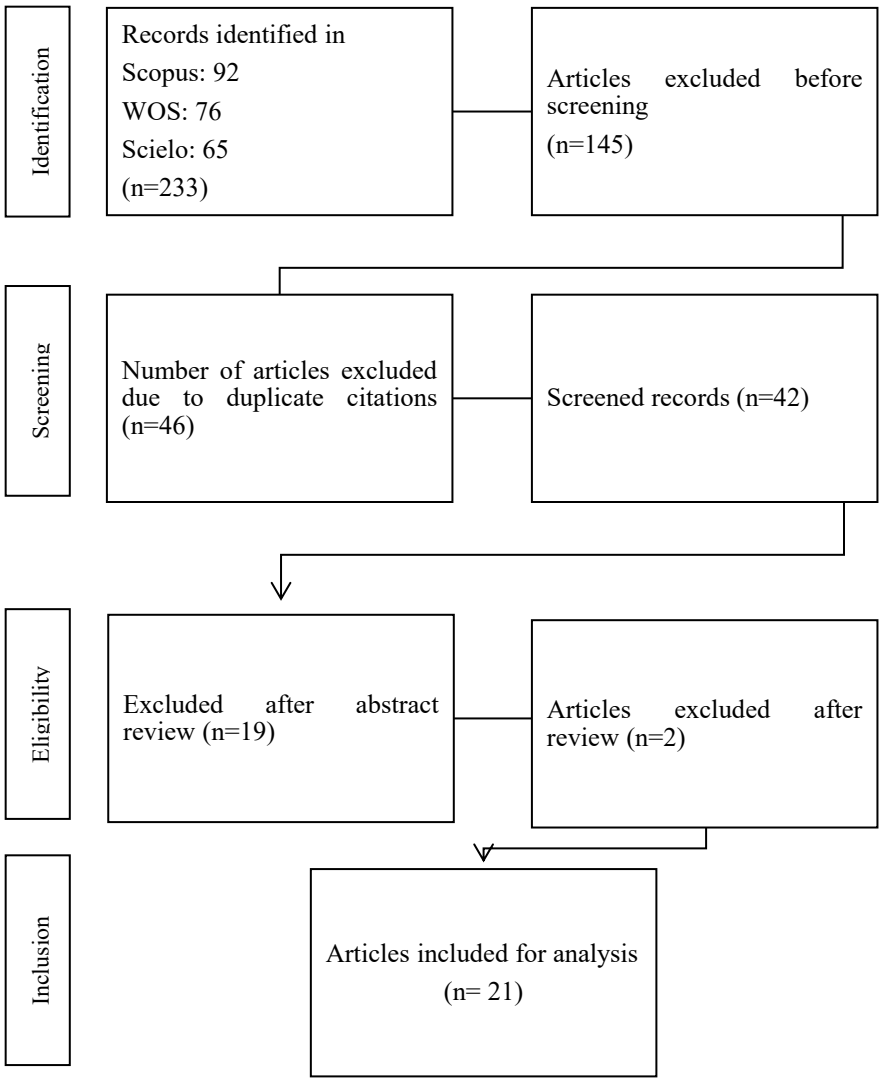
On the other hand, the exclusion criteria included articles published before 2021, those with restricted access, as well as book chapters, conference proceedings, and theses. After applying these filters, a total of 21 articles were selected for the results: 2 from Scopus, 12 from WoS, and 7 from SciELO.

The following Table 1 presents the search terms used in high-impact databases, which helped to narrow and guide the selection of studies included in this review.

Table 1
Search terms used in high-impact database searches

Database	Search term	Result	Selection
Scopus	"critical thinking" AND "students"	92	2
WoS	"critical thinking" AND "students"	76	12
Scielo	"critical thinking" AND "students"	65	7
		Total	**21**

Figure 2
Flowchart for the selection of articles according to the PRISMA method



Note. This table was prepared following the PRISMA format with original data.

Results and discussion

Table 2
Analysis of the results on critical thinking in students

No.	Author	Implications of critical thinking in students
1	Fan et al. (2022)	Findings indicate that critical thinking among Chinese students is a poorly explored topic, and existing studies present methodological limitations. This scenario opens the opportunity to design more effective educational strategies that promote critical thinking in various academic and cultural contexts.

2	Yan (2021)	Results highlight the importance of fostering critical thinking among teachers as an effective strategy to increase student participation in the classroom. However, further research is needed to better understand its impact and develop methodologies that effectively integrate critical thinking into foreign language teaching.
3	Zarzycka & Gesek (2022)	Critical thinking is an essential competence for future health professionals, as it enables them to collect and analyze information accurately, formulate correct diagnoses, solve problems, and optimize decision-making. Identifying and applying strategies to strengthen this skill during academic training is key to their professional performance.
4	Barta et al. (2022)	Concept mapping is presented as an effective pedagogical strategy to enhance critical thinking in students, surpassing traditional teaching methods. However, it is crucial to continue researching under what conditions this strategy is most effective, considering both its implementation and the characteristics of the educational environment.
5	Linina & Vevere (2021)	The development of critical thinking is a fundamental pillar in business education, as it enables students to better understand the market and strengthen their decision-making competencies.
6	Haftador et al. (2023)	Blended learning emerges as an effective strategy to strengthen critical thinking in the university context, as it integrates the benefits of traditional teaching with the advantages of digital learning. By incorporating methodologies such as flipped classrooms, station rotation, and self-directed learning, reflection, analysis, and informed decision-making—essential skills in modern education—are promoted.
7	Galindo-Domínguez et al. (2023)	The creation of specific assessment tools not only allows for measuring the development of critical thinking but also guides more effective pedagogical strategies. Universities and other educational institutions should consider these findings when designing curricula and methodologies that promote reflection-based learning, argumentation, and evidence-based decision-making.
8	Marín et al. (2025)	Critical thinking is a fundamental capability in the contemporary educational and professional environment, and its development requires the implementation of effective didactic strategies. In particular, its connection to communication skills enables students to not only analyze and structure their ideas better but also express them clearly and substantively. The systematic review highlights the importance of employing updated methodologies that foster these skills, thereby ensuring a comprehensive education adapted to current challenges.
9	Grobler (2025)	The use of innovative teaching strategies, such as educational games, can enhance critical thinking in students by providing them with more dynamic and participatory learning experiences. The implementation of these tools not only improves the retention of complex concepts but also stimulates reflective analysis. In the context of education for sustainability, these methods can be integrated into academic programs to train professionals with a deep and critical understanding of global challenges.

10	Izaguirre et al. (2025)	The integration of strategies such as socially relevant questions in teaching allows for the development of solid critical thinking by confronting real issues from a reflective and evidence-based perspective. Implementing these methodologies from early educational levels is essential to strengthen argumentative capacity and evidence-based decision-making, promoting an education that prepares future citizens.
11	Velázquez et al. (2024)	The development of critical thinking among university students represents a constant challenge that requires innovative didactic strategies and a pedagogical approach focused on analysis and complex argumentation. The findings of this study highlight the need to strengthen these competencies from academia by promoting methodologies that encourage deeper and more reflective learning.
12	Hernández et al. (2024)	Promoting reading as a tool to develop critical thinking is key in training more reflective and analytical students. The intervention demonstrated that, through appropriate methodologies, students can strengthen their reasoning skills without requiring significant resources, underscoring the importance of integrating these strategies into the educational sphere.
13	Gaitán et al. (2024)	The incorporation of technological resources, such as artificial intelligence, can complement traditional methods and offer new learning opportunities. However, further research is necessary to explore the appropriate balance between conventional teaching and technological innovation to optimize training in areas such as surgery.
14	Díaz et al. (2024)	Students do not exhibit a clearly defined disposition toward critical thinking, neither particularly strong nor weak. It is necessary to reinforce strategies that promote the development of these skills, as critical thinking can enhance analysis, interpretation, and argumentation capabilities. Integrating approaches that foster reflection and questioning will enhance these competencies in students.
15	Martínez et al. (2024)	To develop critical thinking, learning environments that favor both individual autonomy and group collaboration are required. While individualism may be perceived as a challenge within teamwork, it also represents an opportunity to strengthen skills such as argumentation, evidence-based decision-making, and analysis of diverse perspectives. Therefore, it is essential that pedagogical strategies balance both approaches, promoting spaces where students can reflect, question, and collectively construct knowledge, thereby strengthening their critical thinking.
16	Berg et al. (2023)	Training in critical thinking not only improves future professionals' ability to evaluate information objectively but also contributes to more ethical and evidence-based medical care.
17	Batdi et al. (2024)	To maximize the impact of critical thinking, it is necessary to integrate active methodologies and approaches that foster intellectual autonomy and deep reflection. The effective implementation of this competency requires not only well-designed didactic strategies but also overcoming barriers that hinder its application.
18	Ubaidillah et al. (2023)	The integration of inquiry-based and higher-order thinking approaches allows students to develop analytical and reflective skills. However, it is recommended to expand research on strategies such as self-regulated learning, which could provide additional benefits for autonomy and depth of critical reasoning.

19	Stenseth et al. (2022)	An overview of the effectiveness of technology-based simulation learning for the development of critical thinking can be provided. Additionally, these approaches help identify barriers and facilitating factors in the implementation of educational strategies, providing valuable information to improve teaching and design more effective methodologies for future professionals.
20	Lu & Xie (2024)	The use of information and communication technologies (ICT) in teaching has proven to be an effective strategy for strengthening critical thinking in students. However, it is crucial to balance their application across different areas of learning and explore methodologies that maximize their impact. A careful selection and utilization of these resources can enhance students' analytical capabilities and promote more autonomous and reflective learning.
21	Musharyanti et al. (2021)	The implementation of strategies such as problem-based learning or simulation allows students to not only acquire theoretical knowledge but also develop analytical, communicative, and problem-solving skills in practical contexts. These findings underscore the importance of redesigning educational methodologies to foster critical thinking and address the challenges of the profession.

Importance of critical thinking

Critical thinking is an essential skill in education, as it enables students to analyze, argue, and make informed decisions across various academic and professional contexts. Its development represents a constant challenge that demands the implementation of innovative teaching strategies and pedagogical approaches that promote deep analysis and complex argumentation. In higher education, it is crucial to adopt reflective methodologies that strengthen these competencies from the academic training (Velázquez et al., 2024).

In secondary education, students often do not exhibit a clear disposition toward critical thinking, highlighting the need to reinforce strategies that enhance these skills. Specifically, its application in learning a second language could significantly improve analytical, interpretative, and argumentative abilities. Therefore, integrating pedagogical approaches based on reflection and questioning would contribute to strengthening these competencies in students (Díaz-Larenaz et al., 2024).

At the university level, critical thinking is key to preparing students for the challenges of the contemporary world. The creation of specific assessment tools not only facilitates measurement but also allows for the design of more effective pedagogical strategies. Consequently, universities and educational institutions should structure curricula that promote reflection, argumentation, and informed decision-making (Galindo-Domínguez et al., 2023).

Similarly, critical thinking plays a fundamental role in enabling students to improve their understanding of the market and enhance their decision-making competencies (Linina et al., 2021). In the international academic context, the development of critical thinking has been identified as a relatively unexplored area, with existing studies presenting methodological limitations. This situation underscores the need to design more effective educational strategies that promote these skills across different cultural and academic environments (Fan et al., 2022).

Furthermore, the use of technological tools, such as artificial intelligence, can complement traditional teaching methods, providing new learning opportunities. However, it is essential to find an appropriate balance between conventional teaching and technological innovation to optimize training in various fields, including surgery (Gaitán-Buitrago et al., 2024). Additionally, the integration of inquiry-based and higher-order thinking approaches contributes to the development of analytical and reflective skills in students. In this regard, further research on strategies such as self-regulated learning is recommended, as it could provide additional benefits in autonomy and the depth of critical reasoning (Ubaidillah et al., 2023).

Effective strategies for fostering critical thinking in students

The development of critical thinking in students requires the application of effective teaching strategies that promote intellectual autonomy, deep reflection, and informed decision-making. In this context, it is crucial to employ updated methodologies that ensure a comprehensive education capable of responding to the challenges and demands of the contemporary world (Marin-Ube et al., 2025).

Critical thinking is an essential competency for future professionals, as it allows them to efficiently gather and analyze information, formulate accurate diagnoses, and optimize problem-solving. Therefore, identifying and applying strategies that strengthen this skill during academic training is fundamental to prepare students for the challenges inherent to their professional fields (Zarzycka et al., 2022).

In this sense, strategies such as blended learning are particularly effective for strengthening critical thinking, as they integrate the advantages of traditional teaching with those of digital learning. Methodologies such as flipped classrooms, station rotation, and self-directed learning foster reflection, deep analysis, and informed decision-making, thereby promoting a more active and autonomous learning experience (Haftador et al., 2023).

Likewise, concept mapping has proven to be an effective pedagogical tool for enhancing critical thinking, surpassing traditional methods. However, it is necessary to continue researching the conditions that optimize its effectiveness, taking into account both its implementation and the characteristics of the educational environment (Barta et al., 2022).

Moreover, the incorporation of strategies such as socially relevant questions in teaching allows students to develop solid critical thinking by addressing real issues from a reflective and evidence-based approach. Implementing these methodologies from basic educational levels is key to strengthening argumentative capacity and informed decision-making (Izaguirre et al., 2025).

On the other hand, applying strategies such as problem-based learning or simulation enables students to not only acquire theoretical knowledge but also develop analytical, communicative, and problem-solving skills in practical contexts. This underscores the importance of redesigning educational methodologies to foster critical thinking (Musharyanti et al., 2021). Furthermore, technology-based simulation learning has shown effectiveness in developing these competencies, although it is necessary to identify barriers and factors that facilitate its implementation (Stenseth et al., 2022).

The use of innovative strategies, such as educational games, also contributes to enhancing critical thinking by providing more dynamic and participatory learning experiences. In the field of sustainability education, these methods can be integrated into academic programs to train professionals with a deep understanding of global challenges (Grobler, 2025).

Additionally, promoting reading as a tool for developing critical thinking is fundamental in training reflective and analytical students. Through appropriate methodologies, students can strengthen their reasoning skills without the need for extensive resources, highlighting the importance of incorporating this strategy into the educational realm (Hernández et al., 2024).

Furthermore, the use of information and communication technologies (ICT) in teaching has proven to be an effective strategy for strengthening critical thinking. However, it is crucial to balance their application across different learning areas and explore methodologies that maximize their impact. The appropriate selection and utilization of these tools can enhance students' analytical capacity, promoting a more autonomous and reflective learning experience (Lu et al., 2024).

Finally, the development of critical thinking requires learning environments that foster both individual autonomy and group collaboration. Although individualism may be perceived as a challenge within teamwork, it also represents an opportunity to strengthen skills such as argumentation and analysis of diverse perspectives. For this reason, it is essential that pedagogical strategies balance both approaches, promoting spaces where students can reflect, question, and collaboratively construct knowledge (Martínez-García et al., 2024).

Considering all of the above, it is crucial to promote critical thinking among educators as an effective strategy to enhance active student participation in the classroom. Additionally, it is essential to delve deeper into research to better understand the impact of critical thinking on students and design methodologies that effectively integrate it into teaching processes. To maximize its benefits, it is essential to incorporate active methodologies and approaches that promote intellectual autonomy and deep reflection, overcoming barriers that hinder implementation (Yan, 2021; Batdi et al., 2024).

Conclusion

Critical thinking is an essential skill in education as it enables students to analyze, argue, and make informed decisions across various academic and professional contexts. Its development requires the implementation of innovative teaching strategies and pedagogical approaches that foster both deep analysis and complex argumentation. In this sense, the use of technological tools, such as artificial intelligence, can complement traditional teaching methods, opening new learning opportunities. Additionally, self-regulated learning, deep reflection, and informed decision-making provide significant benefits in autonomy and the depth of critical reasoning.

Moreover, pedagogical strategies such as concept mapping, problem-based learning, technology simulations, educational games, and promoting reading have proven effective in enhancing critical thinking and strengthening students' argumentative capacity. Finally, promoting critical thinking among educators emerges as a key strategy to increase active student participation in the classroom, contributing to a more dynamic and reflective educational environment.

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