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A Critical Thinking Research Trends: A Bibliometric Analysis (2020–2025)

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A B S T R A C T

This study aims to analyze publication trends related to critical thinking over the past five years (2020–2025) using a bibliometric approach. Data were collected from the Scopus database and processed using R Studio with the Bibliometrix package. The results reveal a significant increase in the number of publications each year, indicating growing scholarly attention to the topic of critical thinking. Leading publication sources include Thinking Skills and Creativity and Educational Sciences: Theory and Practice. Frequently appearing keywords such as "critical thinking," "education," and "higher education" highlight the strong connection between critical thinking and the educational domain. Citation network and keyword co-occurrence analyses demonstrate the existence of dominant research clusters, particularly within the context of 21st-century learning. These findings offer insight into the current development trajectory of critical thinking research and provide a foundation for future studies to explore underexamined areas in the field.

1. Introduction

Critical thinking has emerged as a core competency in 21st-century education, playing a pivotal role in preparing individuals to navigate an increasingly complex, dynamic, and information-saturated world (Bebasari et al., 2019). It enables learners to evaluate information objectively, make reasoned decisions, and solve problems in a systematic and reflective manner. Akbar et al. (2024) conceptualized critical thinking as a cognitive process that encompasses interpretation, analysis, evaluation, inference, explanation, and self-regulation—executed with logical rigor and intellectual discipline. This understanding is echoed by Wicaksono et al. (2024), who defined critical thinking as reasonable and reflective thinking focused on deciding what to believe or what to do. The demand for such cognitive ability is growing in response to the rapid technological, social, and economic

transformations that characterize the global landscape. As a result, educational systems around the world are increasingly positioning critical thinking as a foundational element in their curricula. Educational theorists such as Dong et al. (2023) argue that critical thinking not only fosters intellectual character but also acts as a safeguard against cognitive biases, flawed assumptions, and the spread of misinformation.

In alignment with this global shift, international frameworks such as the OECD Learning Compass 2030 and the P21 Framework have embedded critical thinking as a core dimension of future-ready education. In Indonesia, the national Kurikulum Merdeka incorporates critical thinking within the broader aim of developing the Profil Pelajar Pancasila, emphasizing its relevance not only in academic contexts but also in shaping socially and professionally competent individuals. Afriyuninda & Oktaviani (2021) further strengthens this position by identifying critical thinking as one of the top ten skills required in the workforce of the future. Consequently, cultivating critical thinking is no longer viewed as an optional enrichment activity but as an essential objective of formal education, particularly in fostering students' preparedness to meet real-world challenges (Farooq et al., 2025).

A substantial body of empirical research has demonstrated the positive impact of critical thinking on various educational and life outcomes, including academic performance, digital literacy, problem-solving ability, and informed decision-making (Aeni & Setiasih, 2024; Fatma Rabia et al., 2024; Ridho et al., 2021). Study of higher education graduates revealed that individuals with high levels of critical thinking exhibit superior capabilities in handling complex tasks and making autonomous decisions. These findings underline the urgency of embedding critical thinking in instructional design and pedagogical strategies (Lumban Gaol et al., 2022). In response, scholars have increasingly investigated the relationship between critical thinking and diverse teaching models—such as Problem-Based Learning (PBL), Inquiry-Based Learning (IBL), and Project-Based Learning (PjBL)—all of which emphasize active, student-centered approaches to learning (Ayyubi et al., 2024; Fajar et al., 2020; Pratiwi et al., 2018). Furthermore, researchers have explored how critical thinking is influenced by personal and psychological variables, such as self-efficacy, intrinsic motivation, and learning styles (Gifary, 2023; Puad & Ashton, 2023; Pursitasari et al., 2023). Although these studies provide valuable insights into the development and determinants of critical thinking, the current literature remains scattered and lacks a comprehensive synthesis that maps its evolution, scope, and research trends.

Despite the growing interest in critical thinking, relatively few studies have attempted to offer a holistic, bibliometric analysis of how research in this field has evolved over time. The absence of such mapping makes it difficult for researchers to identify major contributors, institutional and national trends, emerging themes, and unexplored research gaps (Ma et al., 2023). To address this gap, bibliometric analysis offers a powerful methodological approach. As outlined by Fatma Rabia et al. (2024), bibliometric techniques can provide structural, longitudinal, and visual representations of scientific knowledge, thereby enabling scholars to examine the intellectual architecture and developmental trajectory of a particular research

domain. In this context, the present study aims to conduct a bibliometric analysis of critical thinking-related publications over the past decade, utilizing data sourced from the Scopus database This article contains the description of experimental research that is aimed at finding out the influence of critical thinking ability on students' learning outcomes. The population in the study involved 30 students from the entire class V of SD Negeri 11 in Lubuk Cuik Lima Puluh in the academic year of 2020/2021.

The instruments used to collect data were multiple choice and questionnaires. The hypothesis was tested by using the \"t\" test. To find out the students' basic skills, the researcher conducted a pre-test with an average score of 58.2 and which could be said to be less. The results of the post-test have the improvement from the pre-test results imparted earlier. Post-test results that have been tested with an average score of 84.1 could be said to increase the success rate of students' learning outcomes. Based on the results of data obtained from the research at SD Negeri 11 in Lubuk Cuik, it could be said that critical thinking skills are very effective in learning to improve students' learning outcomes (Lumban Gaol et al., 2022). The analysis is conducted using the Bibliometrix R-package, with specific focus on publication trends, leading authors and journals, patterns of collaboration, and dominant keywords that characterize the field.

The results of this study are expected to contribute to a deeper understanding of the development and distribution of critical thinking literature worldwide, while also serving as a strategic reference for future research directions and educational policy formulation (Akbar et al., 2024). Critical thinking has emerged as a core competency in 21st-century education, playing a pivotal role in preparing individuals to navigate an increasingly complex, dynamic, and information-saturated world. It enables learners to evaluate information objectively, make reasoned decisions, and solve problems in a systematic and reflective manner. Walter (2024) conceptualized critical thinking as a cognitive process that encompasses interpretation, analysis, evaluation, inference, explanation, and self-regulation—executed with logical rigor and intellectual discipline.

This understanding is echoed by Siagian et al. (2021), who defined critical thinking as reasonable and reflective thinking focused on deciding what to believe or what to do. The demand for such cognitive ability is growing in response to the rapid technological, social, and economic transformations that characterize the global landscape. As a result, educational systems around the world are increasingly positioning critical thinking as a foundational element in their curricula. Educational theorists such as Gibson et al. (2023) argue that critical thinking not only fosters intellectual character but also acts as a safeguard against cognitive biases, flawed assumptions, and the spread of misinformation. In alignment with this global shift, international frameworks such as the OECD Learning Compass 2030 and the P21 Framework have embedded critical thinking as a core dimension of future-ready education. In Indonesia, the national Kurikulum Merdeka incorporates critical thinking within the broader aim of developing the Profil Pelajar Pancasila, emphasizing its relevance not only in academic contexts but also in shaping socially and professionally competent individuals (Umar Seno et al., 2022).

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Despite the growing interest in critical thinking, relatively few studies have attempted to offer a holistic, bibliometric analysis of how research in this field has evolved over time (Dong et al., 2023). The absence of such mapping makes it difficult for researchers to identify major contributors, institutional and national trends, emerging themes, and unexplored research gaps. To address this gap, bibliometric analysis offers a powerful methodological approach. As outlined by Sun & Xiao (2024), bibliometric techniques can provide structural, longitudinal, and visual representations of scientific knowledge, thereby enabling scholars to examine the intellectual architecture and developmental trajectory of a particular research domain. In this context, the present study aims to conduct a bibliometric analysis of critical thinking-related publications over the past decade, utilizing data sourced from the Scopus database (Donthu et al., 2021). The analysis is conducted using the Bibliometrix R-package, with specific focus on publication trends, leading authors and journals, patterns of collaboration, and dominant keywords that characterize the field. The results of this study are expected to contribute to a deeper understanding of the development and distribution of critical thinking literature worldwide, while also serving as a strategic reference for future research directions and educational policy formulation.

2. Methodology

This study employed a bibliometric approach to analyze the trends, patterns, and scientific structure of publications related to the theme of critical thinking. The bibliometric method was selected due to its capacity to reveal the intellectual structure and scholarly dynamics of a research field through publication data indexed in leading academic databases. The data were retrieved from the Scopus database in July 2025, using the keyword “critical thinking” applied to the title, abstract, or keyword sections (Royani & Rahayu, 2021). The inclusion criteria were

limited to peer-reviewed journal articles published between 2020 and 2025. Non-relevant documents, including editorials, reviews, and non-journal publications, were excluded from the analysis. After the initial screening process, a total of 1,000 articles were identified and included for further analysis. The data analysis was conducted using the RStudio software environment, specifically employing the Bibliometrix R-package and its web interface, Biblioshiny, to perform network visualizations and bibliographic mapping. The analytical procedures included:

(1) Analysis of annual publication trends
(2) Evaluation of author and institutional productivity
(3) Identification of source journals and citation metrics
(4) Keyword analysis and term mapping based on co-occurrence
(5) Examination of collaborative networks among authors and institutions.

To ensure data validity, only verified records from Scopus were used, and manual checks were conducted to eliminate duplicates and confirm thematic relevance. The interpretation of results followed a quantitative descriptive approach, emphasizing the relationships between frequency, connectivity, and academic impact of various entities within the critical thinking literature.

3. Results and Discussion

The results of this study are presented through several bibliometric visualizations that illustrate the thematic structure, citation patterns, disciplinary distribution, and publication trends of critical thinking-related research.

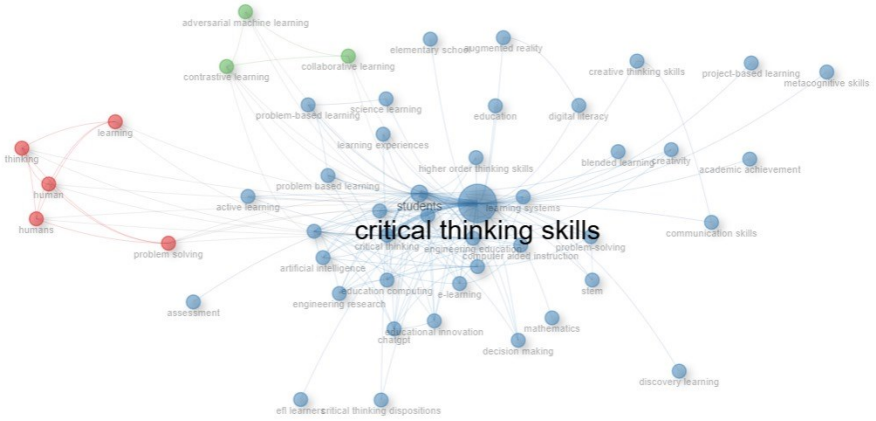

Figure 1. Keyword Co-occurrence Network

The first visualization (Figure 1) presents a keyword co-occurrence network, which maps the associative relationships among frequently appearing terms in critical thinking publications. The network highlights "critical thinking" as the central node, surrounded by closely linked terms such as *problem solving*, *creativity*, *decision making*, *collaborative learning*, and *higher-order thinking skills*. This configuration underscores the central role of critical thinking as a foundational

construct that supports the development of other cognitive competencies. The strong connection between critical thinking and problem solving, as emphasized by Gifary (2023), reflects their complementary roles in the broader domain of higher-order thinking. In the context of 21st-century learning, Siagian et al. (2021) argued that critical thinking should be cultivated alongside collaborative and reflective abilities to equip learners with the tools to manage complex, real-world situations. The appearance of terms such as *online learning* and *digital literacy* further illustrates a pedagogical shift toward digital platforms that require students to engage in autonomous and analytical thought processes (Luqmi et al., 2024).

In addition, the frequent emergence of terms like *metacognition*, *self-regulated learning*, and *creativity* indicates an expanding research focus on students' internal cognitive processes. These aspects are closely tied to learners' ability to monitor, control, and evaluate their own thinking strategies. This trend signifies a conceptual evolution of critical thinking—not merely as a learning outcome, but as an integral component of reflective and learner-centered educational processes.

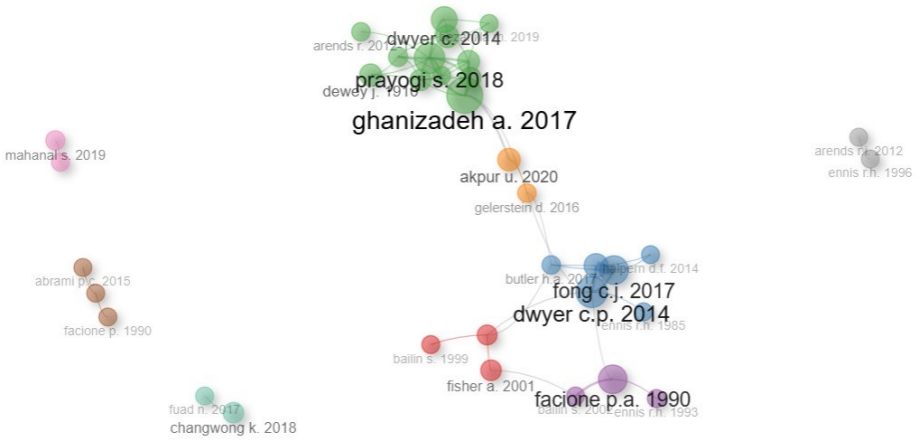

Figure 2. Citation Network

The second visualization (Figure 2) displays the citation network of articles in the critical thinking corpus. The network reveals several dominant nodal points, most notably the works of Yang et al. (2020), which serve as key theoretical foundations repeatedly cited in the literature. Puad & Ashton (2023) introduced six core dimensions of critical thinking—interpretation, analysis, evaluation, inference, explanation, and self-regulation—which have since become standard indicators in assessment and instructional design. Grecu (2023) expanded on this by proposing a model grounded in the *elements of thought* and *intellectual standards*, now widely used in curriculum development. Walter (2024), meanwhile, offered a definition of critical thinking that emphasized both skill and disposition, establishing it as more than a reasoning tool, but as a cultivated cognitive habit.

The continued relevance and frequent citation of these classical models suggest that foundational theories remain central to the field. Research by Baena-Morales et al. (2021) affirms that these models have been successfully adapted across different scientific and cultural contexts while maintaining their conceptual integrity. This

consistency in referencing older literature implies that the field is still largely focused on deepening and adapting established theoretical constructs, rather than generating entirely new frameworks.

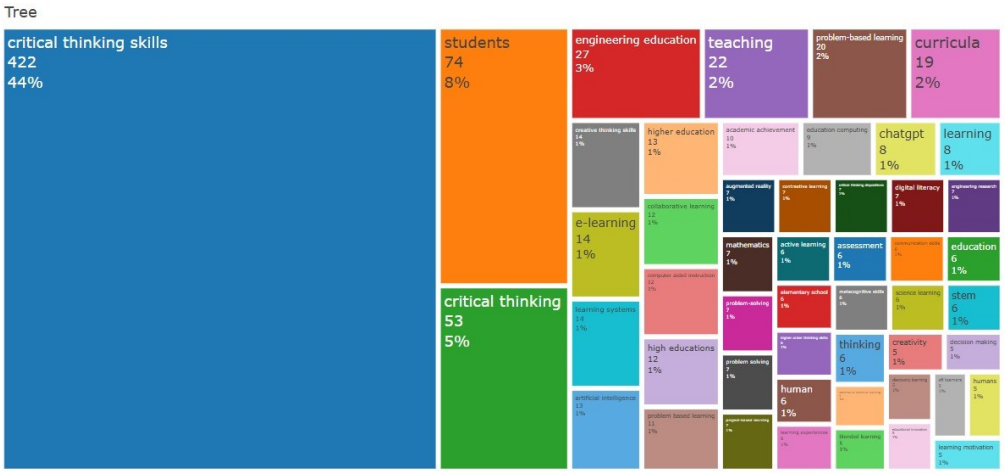

Figure 3. Subject Area Treemap

Figure 3. presents a treemap of the subject areas contributing to publications on critical thinking. The field of education dominates the landscape, followed by psychology, computer science, nursing, and the social sciences. The prominence of education is unsurprising, given that critical thinking remains a core pillar in curriculum design and instructional evaluation. Contributions from psychology underscore the recognition of critical thinking not only as a cognitive skill but also as a function of metacognitive awareness, learner disposition, and self-efficacy (Ma et al., 2023). In the nursing domain, studies such as Ridho et al. (2021) highlight critical thinking as an essential component in clinical decision-making and professional competence. The involvement of computer science and engineering disciplines suggests the growing relevance of critical thinking in problem-based computing and programming education (Ayyubi et al., 2024). This disciplinary diversity illustrates the high degree of applicability of critical thinking across sectors, particularly in addressing complex global problems that require reflective, analytical, and logical approaches.

Finally, the analysis of publication trends reveals a marked increase in research output beginning in 2018, with a significant peak between 2020 and 2023. This surge aligns with the global transition to online learning prompted by the COVID-19 pandemic, which heightened awareness of the need for students to develop critical thinking skills for independent learning. Pursitasari et al. (2023) pointed out, critical thinking became increasingly essential in virtual learning environments where information is abundant but not always reliable. Niancai et al. (2024) similarly emphasized that digital education demands learners to evaluate, filter, and make evidence-based decisions in an unstructured information landscape. The spike in publication during the pandemic years reflects the academic community's rapid and strategic response to this educational crisis.

Post-pandemic trends show a relative stabilization in the number of critical thinking publications, indicating sustained scholarly interest beyond the immediate emergency. This consistency suggests that critical thinking has transitioned from being a situational concern to a long-term priority, deeply embedded in educational discourse and likely to expand in relevance amid ongoing social, technological, and policy transformations.

Discussion

The bibliometric findings of this study reveal a marked and accelerating growth in critical thinking research over the past decade, with an especially sharp increase during the COVID-19 pandemic period. This exponential rise is not merely a numerical trend but reflects a heightened scholarly recognition of the urgency of cultivating critical thinking in response to increasingly complex global challenges. In a world facing waves of misinformation, sociopolitical turbulence, and rapid digitization of education, critical thinking has become indispensable—not just as an academic competence, but as a life skill with far-reaching implications. The observed surge in publications during 2020–2023 corroborates the argument presented by Claudia Wang et al. (2023), who assert that technological disruption has compelled education systems to adopt pedagogical approaches that prioritize higher-order thinking skills. In this context, the rising interest in critical thinking is not an isolated phenomenon, but rather a reflection of a paradigm shift wherein education is expected to produce adaptive, autonomous, and analytical learners.

The keyword co-occurrence analysis further emphasizes this shift. Terms such as problem solving, decision making, and collaborative learning frequently appear in close proximity to critical thinking, suggesting an epistemological integration of these skills within a broader cognitive framework. This interconnectedness indicates that critical thinking is no longer perceived as a standalone construct, but as the foundational bedrock upon which other essential 21st-century competencies are built. Rahayu et al. (2022) reinforces this notion by emphasizing the need for critical thinking to be embedded explicitly across disciplines, rather than being treated as an abstract or peripheral topic. The appearance of terms like metacognition and self-regulated learning within the same cluster further expands the discourse. It suggests a growing focus on introspective and self-directed learning processes, wherein learners are not only expected to engage in complex reasoning but also to be conscious of how they think, how they monitor their cognitive strategies, and how they adapt them in response to varying contexts. These findings point to an evolving research agenda that seeks to bridge cognitive psychology, educational theory, and pedagogical innovation.

The citation network visualization reveals a strong reliance on foundational works by Puad & Ashton (2023). These classic texts continue to serve as theoretical anchors within the literature, providing the definitional clarity and operational frameworks upon which subsequent studies are built. While their sustained relevance indicates a healthy conceptual consensus, it also signals a potential stagnation in theoretical innovation. The field appears to lean heavily on established paradigms, with relatively limited efforts to develop or test alternative models. This

observation aligns with Eprilia, et al. (2023) who noted that although numerous instructional strategies claim to promote critical thinking, most assessments and definitions continue to draw from the same foundational models due to their perceived validity and reliability. This reliance, while intellectually safe, could restrict the exploration of context-specific frameworks that better reflect the cultural and disciplinary diversity of learners today. It highlights an important gap in the literature—namely, the need to critically re-examine whether traditional models of critical thinking remain universally applicable in an era of globalization, digitization, and shifting epistemologies.

The disciplinary treemap reveals a clear dominance of the field of education in producing critical thinking-related scholarship. This is unsurprising, given the field's central role in shaping learning outcomes and designing pedagogical strategies. However, the increasing contributions from psychology, nursing, computer science, and the social sciences illustrate a multidimensional expansion of the concept beyond formal educational settings. In psychology, critical thinking is closely linked with dispositional factors, cognitive flexibility, and self-efficacy—indicating that it is not just a skill to be taught, but a mindset to be cultivated. In health-related disciplines such as nursing, it has become an essential criterion for clinical judgment and evidence-based practice, as emphasized by Triandi et al. (2020) The participation of fields such as computer science and engineering suggests an ongoing adaptation of critical thinking frameworks to suit problem-based learning in STEM contexts, particularly in areas such as programming, artificial intelligence, and cybersecurity. As Herwanto (2020) noted, critical thinking has evolved into a marker of professional competence across diverse domains, emphasizing its practical significance in decision-making processes that are often high-stakes and data-driven.

Publication trend analysis indicates not only the scholarly community's responsiveness to external crises but also its ability to pivot and produce knowledge that is contextually relevant. The sudden spike in critical thinking research beginning in 2020 is evidently a direct academic response to the global shift toward remote learning. As physical classrooms were replaced by digital platforms, students were required to navigate information-rich environments independently—often without the immediate scaffolding of a teacher. In this setting, the ability to think critically became not just beneficial, but necessary. Walter (2024) stressed the pivotal role of critical thinking in filtering, verifying, and synthesizing information in online learning environments. Likewise, Zhang & Zhu (2022) highlighted the need for learners to engage in evidence-based reasoning amidst an overwhelming influx of digital content. What makes this trend particularly significant is its continuity beyond the pandemic. Rather than declining in the aftermath of emergency remote learning, the number of publications has remained stable, suggesting that critical thinking has been re-established as a long-term educational priority, rather than a temporary solution to a crisis.

Overall, the findings of this study suggest that critical thinking remains a central concern in global education discourse—one that continues to evolve in both scope and depth. Its integration across disciplines, its relevance in real-world decision-

making, and its adaptability to digital learning environments all point to its enduring significance. However, the study also reveals areas in need of further exploration. Future research should go beyond reaffirming the value of critical thinking and begin to interrogate its conceptual boundaries, its cultural contingencies, and its measurement tools. There is a pressing need to develop new, contextually sensitive assessment instruments that are capable of capturing the nuanced manifestations of critical thinking in diverse educational and professional settings. Furthermore, interdisciplinary dialogue should be encouraged to enrich the theoretical landscape, ensuring that critical thinking is not only retained as a key outcome of education but also reimagined as a living, adaptive construct shaped by the demands of a rapidly changing world.

4. Conclusion

The bibliometric analysis reveals a growing scholarly interest in critical thinking, especially during the pandemic era, highlighting its relevance in navigating complexity and uncertainty. Citation and keyword network analyses indicate that while the field remains grounded in classical educational theories, it has evolved to incorporate interdisciplinary themes, notably in psychology, health sciences, and technology. The emergence of terms such as metacognition and self-regulated learning suggests a conceptual shift toward learner autonomy and cognitive strategy use. The findings emphasize the importance of rethinking critical thinking as a dynamic, context-sensitive construct. Practically, this study offers a roadmap for enhancing curriculum and assessment design aligned with 21st-century competencies. Further research should focus on developing culturally responsive, domain-specific measurement tools and fostering interdisciplinary collaboration to strengthen the theoretical and practical foundation of critical thinking.

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