

Critical Thinking Among University Students in The Digital and Artificial Intelligence Era: A Systematic Literature Review

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Abstract

Critical thinking has become an essential competency for university students in responding to the transformation of higher education in the digital and artificial intelligence (AI) era. This study aims to synthesize empirical findings on students' critical thinking skills using a systematic literature review (SLR) approach. The study employed PRISMA guidelines and collected data from Google Scholar publications between 2021 and 2026, resulting in 18 empirical articles that met the inclusion criteria. The findings indicate that research on students' critical thinking is dominated by quantitative approaches focusing on psychological and pedagogical factors. Psychological factors such as self-efficacy, cognitive flexibility, and reflective thinking significantly influence students' critical thinking skills. Meanwhile, pedagogical strategies such as Problem-Based Learning, collaborative learning, WebQuest, and digital learning effectively improve critical thinking skills. Furthermore, the development of AI has expanded the concept of critical thinking into the ability to evaluate digital information critically, reflectively, and adaptively.

INTRODUCTION

Critical thinking has become an essential competency for university students in responding to the transformation of higher education in the digital and artificial intelligence (AI) era. This study aims to synthesize empirical findings on students' critical thinking skills using a systematic literature review (SLR) approach. The study employed PRISMA guidelines and collected data from Google Scholar publications between 2021 and 2026, resulting in 18 empirical articles that met the inclusion criteria. The findings indicate that research on students' critical thinking is dominated by quantitative approaches focusing on psychological and pedagogical factors. Psychological factors such as self-efficacy, cognitive flexibility, and reflective thinking significantly influence students' critical thinking skills. Meanwhile, pedagogical strategies such as problem-based learning, collaborative learning, WebQuest, and digital learning effectively improve critical thinking skills. Furthermore, the development of AI has expanded the concept of critical thinking into the ability to evaluate digital information critically, reflectively, and adaptively.

The rapid development of digital technology and the widespread use of artificial intelligence (AI) have brought significant changes to higher education in the 21st century.

This transformation requires university students not only to access information quickly but also to possess the ability to analyze, evaluate, and validate information critically before making decisions. In this context, critical thinking has become one of the primary competencies needed to address global complexity, technological disruption, and increasingly dynamic social change. This ability is no longer viewed merely as an additional academic skill but rather as an intellectual foundation that determines the quality of decision-making, problem-solving, and individual adaptability in the digital era (Paul & Elder, 2020).

In higher education, critical thinking plays an essential role in encouraging students to think reflectively, analytically, and logically in understanding various academic and social issues. According to Facione (2011), critical thinking is a judgment process involving interpretation, analysis, evaluation, inference, and self-regulation in relation to information or problems. Meanwhile, Halpern (2014) explains that critical thinking is a higher-order thinking skill that enables individuals to use cognitive strategies effectively in achieving specific goals. Thus, critical thinking is not only related to cognitive aspects but also involves dispositional dimensions such as open-mindedness, curiosity, and the courage to evaluate information objectively (Ennis, 2011; Facione, 2000).

Despite the increasing urgency of critical thinking skills, various studies indicate that university students' critical thinking abilities remain at a relatively low level. This condition is caused by both internal and external factors. Internal factors include low self-efficacy, limited cognitive flexibility, and insufficient reflective ability in evaluating information. Meanwhile, external factors are associated with learning strategies that remain oriented toward memorization, limited implementation of problem-based learning, and inadequate integration of educational technologies that encourage higher-order thinking activities (Dwyer et al., 2014; Salea & Soetjiningsih, 2022).

On the other hand, the development of AI and digital technology has introduced new challenges in fostering students' critical thinking skills. Students acknowledge AI's utility in enriching various facets of critical thinking, such as academic research and theoretical scrutiny (Darwin et al., 2024). This is consistent with the findings of Ruiz-Rojas et al. (2024), which indicate that generative artificial intelligence (AI) tools enhance university students' critical thinking and collaborative skills. The presence of AI-based technologies enables students to obtain information instantly and automatically; however, this condition also has the potential to create cognitive dependency if not balanced with adequate evaluative abilities (Chan & Colloton, 2024). Students are required not only to utilize technology but also to verify, assess accuracy, and evaluate the relevance of information generated by AI systems (Crompton & Burke, 2024). Although AI tools may appear to hinder the development of writing skills, they can also improve writing fluency and foster self-directed learning when carefully integrated into the curriculum (Deep & Chen, 2025). Therefore, AI literacy is increasingly regarded as an important component in the development of critical thinking skills in higher education (H. P. (Hank) Lee et al., 2025).

Recent studies increasingly emphasize that critical thinking skills are closely associated with digital literacy, metacognitive awareness, and students' ability to evaluate information generated through artificial intelligence systems. In higher education contexts, students are expected not only to consume digital information but also to critically assess the credibility, bias, and ethical implications of AI-generated content (Zhao & Watterston, 2021; Hwang et

al., 2020). The integration of AI into academic learning environments has therefore shifted the orientation of critical thinking from conventional analytical reasoning toward reflective digital judgment and technologically mediated evaluation skills (Lee et al., 2023).

Furthermore, recent empirical studies demonstrate that active learning environments significantly contribute to the development of critical thinking skills among university students. Problem-based learning (PBL), collaborative inquiry, reflective learning, and digital-based instructional strategies have been found to improve students' analytical reasoning, argumentation, and decision-making abilities (Sulhan et al., 2023; Usiono et al., 2026). A study by Oliva-Córdova et al. (2025) demonstrates that the intentional integration of structured workshops based on generative artificial intelligence aligned with clear educational goals can produce a meaningful and positive impact on enhancing university students' higher-order thinking skills, particularly in the dimensions of applying, analyzing, and evaluating. Similarly, AI-supported learning environments encourage students to engage in deeper cognitive processing when accompanied by appropriate reflective and evaluative activities (Chen, 2021).

Several recent studies also highlight the importance of psychological dimensions in strengthening critical thinking skills. Self-efficacy, cognitive flexibility, reflective thinking, and learning motivation consistently emerge as important predictors of students' analytical and evaluative performance in higher education settings (Karakuş, 2024; Salea & Soetjningsih, 2022). Essentially, when students understand how to use digital tools wisely and believe in their own abilities, they become more effective in analyzing information and solving problems (Leuwol et al., 2023). These findings indicate that critical thinking should be understood as a multidimensional construct influenced simultaneously by cognitive, psychological, pedagogical, and technological factors.

Previous studies have examined university students' critical thinking skills from various perspectives, such as the influence of problem-based learning, collaborative learning, WebQuest, and psychological factors including self-efficacy and cognitive flexibility. However, these findings remain fragmented and generally focus on a single dimension. Some studies emphasize pedagogical strategies, while others focus more on psychological factors or the separate use of digital technologies. This condition indicates the limited availability of studies integrating psychological factors, pedagogical approaches, and AI literacy within a comprehensive framework for understanding university students' critical thinking skills.

In addition, systematic literature review studies specifically discussing the transformation of university students' critical thinking skills in the AI era remain relatively limited. In fact, changes in digital learning patterns and the increasing use of AI in academic activities have transformed the ways students obtain, process, and evaluate information (Chassignol et al., 2018). Therefore, a research synthesis is needed to provide a comprehensive overview of research trends, determining factors, and implications of university students' critical thinking skills within the context of modern technological development (Rothinam et al., 2025; Salido et al., 2025).

Although previous studies have explored critical thinking from pedagogical, psychological, and technological perspectives, the existing literature remains fragmented and lacks an integrative synthesis specifically addressing the transformation of critical thinking skills in the AI era. Most studies focus separately on instructional strategies, psychological

determinants, or digital literacy without comprehensively explaining the interaction among these dimensions. Therefore, this study offers novelty by integrating psychological factors, pedagogical approaches, and AI literacy into a unified analytical framework through a systematic literature review approach. This integrative perspective is expected to contribute theoretically to the development of critical thinking research and practically to the design of higher education learning in the digital era.

Based on these issues, this study aims to synthesize various empirical findings related to university students' critical thinking skills through a systematic literature review (SLR) approach. This study focuses on identifying research trends, psychological and pedagogical factors influencing critical thinking skills, as well as the implications of AI development for the transformation of university students' critical thinking skills in higher education.

The novelty of this study lies in its integrative perspective that combines psychological factors, pedagogical approaches, and AI literacy within a comprehensive analytical framework for understanding university students' critical thinking skills in the digital era. Unlike previous studies that tend to examine these aspects separately, this study provides a systematic synthesis of how technological transformation, particularly the increasing use of AI, reshapes the development of critical thinking skills in higher education. Furthermore, this study contributes to the literature by offering a conceptual framework that connects critical thinking, digital learning transformation, and AI-based educational practices within the context of 21st-century higher education.

This study is expected to provide theoretical contributions to the development of critical thinking research while also serving as a practical consideration in curriculum development and learning strategies in higher education institutions.

Critical thinking is one of the primary competencies required in 21st-century higher education. This ability plays an important role in helping university students understand information objectively, analyze various problems logically, and make rational decisions based on empirical evidence. In the context of higher education, critical thinking is not only understood as an intellectual ability but also as an adaptive skill that supports students in dealing with social change, technological advancement, and the complexity of digital information.

Paul and Elder (2020) define critical thinking as a disciplined intellectual process of conceptualizing, analyzing, synthesizing, and evaluating information obtained through observation, experience, reflection, and communication. This definition emphasizes that critical thinking is an evaluative activity carried out consciously and systematically to produce logical judgments. Meanwhile, Facione (2011) explains that critical thinking encompasses interpretation, analysis, evaluation, inference, explanation, and self-regulation abilities used by individuals in understanding a problem.

METHOD

This study used a systematic literature review (SLR) approach to synthesize empirical findings related to university students' critical thinking skills in the era of artificial intelligence (AI). The SLR approach was selected because it allowed a systematic and structured process for identifying, screening, and synthesizing relevant studies (Popay et al.,

2006). The review followed the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which covered the stages of identification, screening, eligibility, and inclusion of articles (Page et al., 2021).

The study was guided by three research questions (RQs): (1) how were the distribution and characteristics of research on university students' critical thinking represented in the existing academic literature; (2) which psychological and pedagogical factors influenced these critical thinking skills; and (3) what were the theoretical and practical implications of these studies for future research directions. These questions guided the selection, analysis, and synthesis of articles to ensure a focused and systematic review process (Turner et al., 2010).

The article search was conducted using the Google Scholar database with keywords related to university students' critical thinking skills, including "critical thinking," "critical thinking skills," "university students," "higher education," "artificial intelligence," and "digital learning." These keywords were combined using Boolean operators (AND, OR) to identify relevant studies (Snyder, 2019). Search strings included combinations such as "critical thinking" AND "university students," "critical thinking skills" AND "higher education," "critical thinking" AND "artificial intelligence," and "critical thinking" AND "digital learning." The search was limited to studies published between 2021 and 2026 to capture recent developments in the field.

Articles included in this review were selected based on predefined inclusion and exclusion criteria. The inclusion criteria were: (1) empirical studies on university students' critical thinking skills; (2) publications between 2021 and 2026; (3) studies involving university students as participants; (4) studies related to higher education, learning strategies, psychological factors, or AI and digital technology development; (5) full-text availability; and (6) publications in Indonesian or English. The exclusion criteria were: (1) studies not focused on university students or higher education; (2) non-empirical works such as opinion pieces, editorials, or review articles; (3) studies that did not directly address critical thinking skills; (4) irrelevant content to the research focus; (5) lack of full-text access; and (6) publications prior to 2021.

Table 2. Inclusion and Exclusion Criteria

Criteria	Inclusion	Exclusion
Document Type	Scientific Journal Articles (Peer-Reviewed)	Reviews, Books, Conference Proceedings, or Undergraduate/Thesis Dissertations
Time Range	Publications from 2021–2026	Publications before 2021 15m
Research Subjects	University Students	Other than University Students
Language	Indonesian and English	Languages other than Indonesian and English
Study Focus	Discusses factors, interventions, or impacts of critical thinking skills	Does not discuss critical thinking variables as the primary focus
Accessibility	Articles available in full text	Articles available only in abstract form

The article selection stages were conducted according to the PRISMA guidelines, consisting of identification, screening, eligibility, and inclusion stages (Page et al., 2021). During the identification stage, articles were collected based on the search results using the predetermined keywords. Subsequently, the screening stage was conducted by reviewing

article titles, abstracts, and the relevance of research topics. The eligibility stage involved evaluating the suitability of articles based on the established inclusion and exclusion criteria. Articles meeting all criteria were then selected as the final articles included in the study. Based on this selection process, a total of 18 empirical articles met the criteria and were used as the primary sources for analysis as shown in Figure 1.

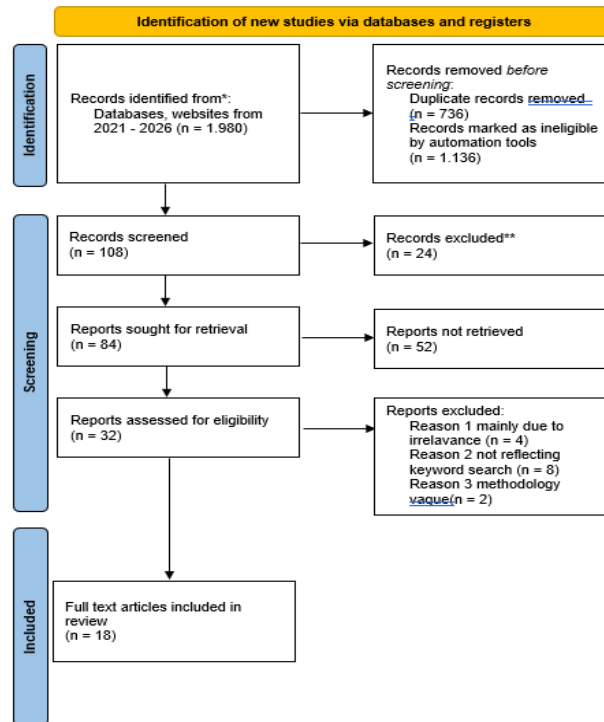


Figure 1. PRISMA Flow Chart

Data analysis was conducted using a thematic analysis approach to identify, classify, and synthesize research findings related to university students' critical thinking skills (Braun & Clarke, 2006). This technique was chosen because it enables a systematic understanding of patterns, themes, and interrelationships among variables emerging from the analyzed studies. The analysis process involved several stages, including reading and understanding all articles that met the inclusion criteria, identifying key concepts and findings related to university students' critical thinking skills, conducting coding processes based on thematic similarities, and synthesizing the research findings to identify general patterns and conceptual implications regarding university students' critical thinking skills in the AI era.

The data analysis was structured based on the predetermined research questions. The analysis for RQ1 focused on identifying the distribution of publications, research methods, and research themes related to university students' critical thinking skills. The analysis for RQ2 focused on examining psychological and pedagogical factors influencing university students' critical thinking skills. Meanwhile, the analysis for RQ3 focused on the theoretical and practical implications of research on university students' critical thinking skills, as well as recommendations for future research.

To ensure research validity, the article selection process was conducted systematically based on the established criteria. In addition, the analysis was carried out comprehensively by comparing various research findings to obtain an objective and consistent synthesis. The use

of PRISMA guidelines aimed to enhance the transparency of the review process so that the research findings could be academically accountable (Page et al., 2021). This study did not employ meta-analysis because the research focus was directed toward conceptual synthesis and the identification of major themes related to university students' critical thinking skills in the AI era.

RESULTS AND DISCUSSION

Based on the article selection process using the PRISMA guidelines, a total of 18 empirical articles met the inclusion criteria and were included in this study. These articles were published between 2021 and 2026 and discussed university students' critical thinking skills from various perspectives, including psychological factors, pedagogical strategies, digital-based learning, and the development of Artificial Intelligence (AI). The results of the analysis were organized according to the predetermined research questions (RQ) to ensure that the research synthesis remained systematic and focused.

RQ 1: How are the distribution and characteristics of research on university students' critical thinking represented in the current academic literature?

This study focuses on the distribution and characteristics of research concerning university students' critical thinking skills in the current academic literature. The analysis results are presented in three sections describing the distribution of studies based on publication year, research methods, and research themes. The following presents the distribution of studies related to university students' critical thinking skills.

Distribution of Research Based on Publication Year

Based on the collected articles related to research on university students' critical thinking skills, the data indicate that research trends concerning students' critical thinking skills between 2021 and 2026 tended to show increasing scholarly interest. A total of six articles were published in 2021, four articles in 2022, one article in 2023, one article in 2024, four articles in 2025, and two articles in 2026 as shown in Figure 2.

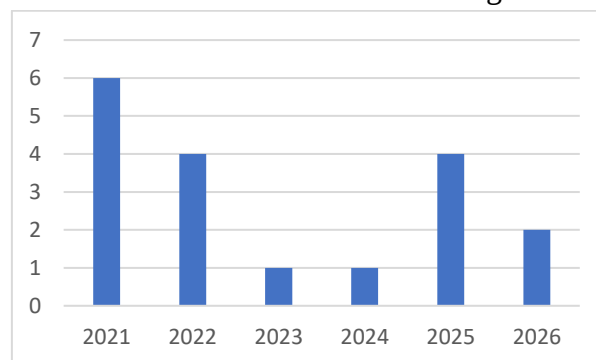


Figure 2. Distribution of Research Based on Publication Year

Based on Figure 2, it can be concluded that research related to university students' critical thinking skills has increased significantly, particularly following the expansion of digital learning and the use of AI technologies in higher education. This trend is reflected in the dominance of studies published in 2021, indicating substantial attention toward the transformation of learning following the digitalization of education during that period. Meanwhile, the increase observed again in 2025–2026 demonstrates a shift in research toward the integration of critical thinking skills with AI technology and digital literacy.

Distribution of Research Based on Research Methods

Based on the collected articles related to university students' critical thinking skills, the data show that research methods in this field are dominated by quantitative approaches, with 16 articles employing quantitative methods, while the remaining two studies used mixed-method and qualitative approaches as shown in Figure 3.

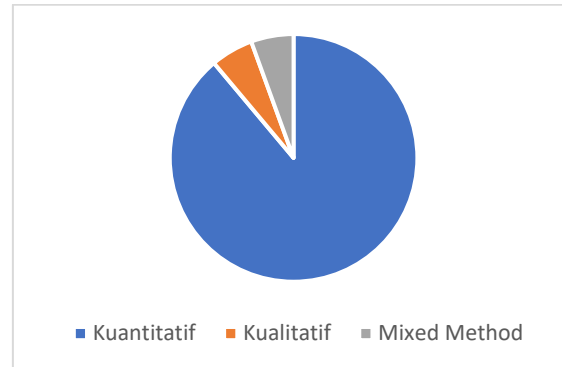


Figure 3. Distribution of Research Based on Research Method

Based on Figure 3, the data indicate that research on university students' critical thinking skills remains largely oriented toward measurement and the examination of relationships among variables. Most studies continue to focus on testing the effectiveness of learning strategies, the influence of psychological factors, and the relationship between critical thinking skills and other variables. Meanwhile, the findings also indicate that studies employing alternative methodological approaches remain highly limited, thereby requiring deeper exploration of students' experiences and the dynamics of critical thinking within real-world contexts.

Distribution of Research Based on Research Themes

Based on the collected articles related to university students' critical thinking skills, the findings indicate that the research focus can be categorized into several major themes, namely psychological factors, pedagogical strategies, digital learning, and AI integration. Pedagogical strategies emerged as the most dominant theme, particularly studies related to Problem-Based Learning (PBL), collaborative learning, WebQuest, and Six Thinking Hats. In addition, research concerning psychological factors such as self-efficacy, cognitive flexibility, and reflective thinking was also frequently identified. In more recent periods, studies examining the relationship between critical thinking skills, AI literacy, and Human–AI Interaction Capability have begun to emerge.

RQ 2: What psychological and pedagogical factors significantly influence these critical thinking skills?

The results of the thematic analysis indicate that university students' critical thinking skills are not influenced by a single factor, but rather represent the outcome of interactions between internal and external dimensions.

Psychological Factors

The findings demonstrate that psychological factors exert a strong influence on university students' critical thinking skills. One of the most dominant factors is self-efficacy. The study conducted by Salea and Soetjiningsih (2022) showed that students with higher levels of self-efficacy tended to possess better critical thinking skills because they had greater confidence in presenting arguments, evaluating information, and solving academic problems.

These findings are supported by Dwyer et al (2014), who explained that confidence in one's abilities plays a significant role in encouraging students' analytical and evaluative activities throughout the learning process.

In addition to self-efficacy, cognitive flexibility also emerged as an important factor in the development of university students' critical thinking skills. The study by Karakuş (2024) revealed that students with high cognitive flexibility were more capable of understanding diverse perspectives, adjusting thinking strategies, and evaluating information objectively. Furthermore, reflective thinking also contributed to the quality of students' critical thinking because it helps individuals evaluate their own thinking processes before making decisions.

Pedagogical Factors

The findings indicate that active and problem-based learning strategies have a significant influence on improving university students' critical thinking skills. One of the most widely implemented approaches is Problem-Based Learning (PBL). The study conducted by Salvira et al (2025) demonstrated that the implementation of PBL enhanced students' critical thinking skills through activities involving problem analysis, group discussions, and case-based decision-making. In addition, collaborative learning was also proven effective in helping students develop argumentation, evaluation, and reflection skills through social interaction during the learning process (Warsah et al., 2021).

These findings are consistent with recent studies emphasizing that student-centered and inquiry-oriented learning environments contribute significantly to the development of critical thinking skills in higher education (Lee et al., 2023; Sulhan et al., 2023). The dominance of Problem-Based Learning and collaborative learning approaches identified in this review indicates that critical thinking develops more effectively when students are actively involved in problem-solving, reflection, and argumentation processes rather than passive information reception.

Technological Digitalization Factors

The development of digital technology has also contributed to the enhancement of university students' critical thinking skills. Chen (2021) demonstrated that the use of WebQuest as a digital learning medium improved students' critical thinking skills through information exploration activities and inquiry-based learning using online resources. Furthermore, the Six Thinking Hats method was also found to be effective in helping students explore various perspectives for problem-solving in a systematic and creative manner (Elbilgahy & Alanazi, 2025). These findings indicate that university students' critical thinking skills develop more optimally when supported by active, collaborative, and exploratory learning environments.

The findings also demonstrate that the integration of AI and digital technologies has transformed the nature of critical thinking in higher education. Students are increasingly required to evaluate the credibility, relevance, and ethical dimensions of AI-generated information rather than merely searching for information online. This result supports the argument proposed by Hwang et al., (2020) that AI literacy should be integrated into higher education curricula to strengthen students' reflective judgment and evaluative reasoning abilities in digital learning environments.

RQ 3: What are the theoretical and practical implications of these studies for future research directions?

The synthesis of the existing literature generated several important implications.

Theoretical Implications

Theoretically, the findings indicate that critical thinking is no longer understood merely as a conventional evaluative ability, but has evolved into a multidimensional competency influenced by the interaction between psychological factors, pedagogical strategies, and the development of digital technology. These findings broaden the conceptual understanding of critical thinking, particularly within the context of higher education in the AI era.

In addition, the development of AI has introduced a new dimension to critical thinking skills, namely the ability to evaluate, validate, and utilize digital information reflectively and responsibly. Lee et al (2025) demonstrated that critical thinking skills are significantly associated with students' abilities to interact with AI technologies (Human–AI Interaction Capability). Meanwhile, Hanifatunnisa and Septiadi (2026) found that AI literacy and prompting skills influence students' critical thinking dispositions. These findings suggest that critical thinking skills in the AI era are closely related to digital literacy and technological evaluation abilities.

From a broader theoretical perspective, the findings of this review reinforce the view that critical thinking in the AI era should be conceptualized as a multidimensional competency integrating cognitive, metacognitive, psychological, and technological dimensions simultaneously (Zhao & Watterston, 2021). This indicates that the development of critical thinking can no longer rely solely on conventional instructional methods but requires adaptive pedagogical strategies capable of responding to technological transformation and digital learning cultures.

Practical Implications

Practically, the findings indicate that higher education institutions need to integrate active learning strategies, digital-based learning, and AI literacy into the learning process to support the development of university students' critical thinking skills. Conventional learning approaches oriented toward memorization are considered less effective in fostering higher-order thinking skills. Therefore, higher education institutions need to develop curricula and learning strategies that encourage analytical, reflective, collaborative, and problem-solving-based learning activities.

Implications for Future Research

The results of this study indicate the need for more in-depth research concerning the relationship between critical thinking skills and AI development within the context of higher education. Future studies are expected to focus on developing integrative models that connect psychological factors, pedagogical strategies, and AI literacy within a more comprehensive conceptual framework. Thus, the development of university students' critical thinking skills should not only focus on cognitive aspects, but also on adaptive abilities in responding to digital transformation and future technological advancements.

CONCLUSION

Based on the analysis of 18 empirical articles, the findings indicated that studies on university students' critical thinking skills had experienced significant development in recent years, particularly alongside digital transformation and the advancement of artificial intelligence (AI) in higher education. Research on university students' critical thinking remained dominated by quantitative approaches, with primary emphasis on pedagogical strategies and psychological factors. The findings demonstrated that psychological factors such as self-efficacy, cognitive flexibility, reflective thinking, and learning-to-learn abilities significantly influenced university students' critical thinking skills. In addition, pedagogical strategies such as Problem-Based Learning (PBL), collaborative learning, WebQuest, Six Thinking Hats, and the use of digital learning media had proven effective in enhancing students' critical thinking skills through more active, reflective, and problem-solving-oriented learning activities.

On the other hand, the development of AI had expanded the concept of critical thinking into a multidimensional competency closely associated with digital literacy and technological evaluation abilities. University students were required not only to understand and analyze information logically but also to critically and reflectively evaluate the validity, relevance, and accuracy of information generated by AI technologies. Theoretically, this study reinforced the understanding that critical thinking skills result from the interaction among psychological factors, pedagogical strategies, and the development of digital technology. Practically, the findings highlighted the importance of developing active, collaborative, and digitally integrated learning strategies in higher education. Future research was recommended to develop integrative models concerning the relationship between critical thinking skills, AI literacy, and digital learning transformation in order to generate a more comprehensive understanding of the development of university students' critical thinking skills in the technological era.

REFERENCES

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Chan, C. K. Y., & Colloton, T. (2024). Generative AI in Higher Education: The ChatGPT Effect. In *Generative AI in Higher Education: The ChatGPT Effect*. <https://doi.org/10.4324/9781003459026>
- Chassignol, M., Khoroshavin, A., Klimova, A., & Bilyatdinova, A. (2018). Artificial Intelligence trends in education: A narrative overview. *Procedia Computer Science*, 136, 16–24. <https://doi.org/10.1016/j.procs.2018.08.233>
- Chen, C. (2021). Effects of the application of webquest to technology education on business management students' critical thinking psychology and operation capability. *Contemporary Educational Technology*, 13(1), 1–8. <https://doi.org/10.30935/cedtech/9320>
- Crompton, H., & Burke, D. (2024). Artificial Intelligence Applications in Higher Education. In *Artificial Intelligence Applications in Higher Education*. <https://doi.org/10.4324/9781003440178>
- Darwin, Rusdin, D., Mukminatien, N., Suryati, N., Laksmi, E. D., & Marzuki. (2024). Critical thinking in the AI era: An exploration of EFL students' perceptions, benefits,

- and limitations. *Cogent Education*, 11(1).
<https://doi.org/10.1080/2331186X.2023.2290342>
- Deep, P. Das, & Chen, Y. (2025). The Role of AI in Academic Writing: Impacts on Writing Skills, Critical Thinking, and Integrity in Higher Education. *Societies*, 15(9), 1–19.
<https://doi.org/10.3390/soc15090247>
- Dwyer, C. P., Hogan, M. J., & Stewart, I. (2014). An integrated critical thinking framework for the 21st century. *Thinking Skills and Creativity*, 12, 43–52.
<https://doi.org/10.1016/j.tsc.2013.12.004>
- Elbilgahy, A. A., & Alanazi, F. J. (2025). Effect of applying six thinking hats teaching method for development through life span course on students opinion and critical thinking skills. *BMC Medical Education*, 25(1), 884. <https://doi.org/10.1186/s12909-025-07362-w>
- Ennis, R. (2011). Critical Thinking : Reflection and Perspective Part II. Inquiry: Critical Thinking Across the Disciplines, 26(2), 5–18.
- Facione, P. a. (2011). Critical Thinking : What It Is and Why It Counts. Insight Assessment, ISBN 13: 978-1-891557-07-1., 1–28. <https://www.insightassessment.com/CT-Resources/Teaching-For-and-About-Critical-Thinking/Critical-Thinking-What-It-Is-and-Why-It-Counts/Critical-Thinking-What-It-Is-and-Why-It-Counts-PDF>
- Facione, P. A. (2000). The Disposition Toward Critical Thinking: Its Character, Measurement, and Relationship to Critical Thinking Skill. *Informal Logic*, 20(1), 61–84. <https://doi.org/10.22329/il.v20i1.2254>
- Halpern, D. F. (2014). *Thought and Knowledge An Introduction to Critical Thinking*. Psychology Press.
- Hanifatunnisa, F. A., & Septiadi, J. (2026). The Simultaneous Influence of AI Literacy and Prompting Skills on Students' Critical Thinking Disposition. *Journal of Educational Sciences*, 10(5), 112–125. <https://doi.org/https://doi.org/10.31258/jes.10.5.p.112-125>
- Hwang, G. J., Xie, H., Wah, B. W., & Gašević, D. (2020). Vision, challenges, roles and research issues of Artificial Intelligence in Education. *Computers and Education: Artificial Intelligence*, 1, 1–5. <https://doi.org/10.1016/j.caeai.2020.100001>
- Karakuş, İ. (2024). University students' cognitive flexibility and critical thinking dispositions. *Frontiers in Psychology*, 15(September), 1–12.
<https://doi.org/10.3389/fpsyg.2024.1420272>
- Lee, A. V. Y., Tan, S. C., & Teo, C. L. (2023). Designs and practices using generative AI for sustainable student discourse and knowledge creation. *Smart Learning Environments*, 10(1), 1–18. <https://doi.org/10.1186/s40561-023-00279-1>
- Lee, H. P. (Hank), Sarkar, A., Tankelevitch, L., Drosos, I., Rintel, S., Banks, R., & Wilson, N. (2025). The Impact of Generative AI on Critical Thinking: Self-Reported Reductions in Cognitive Effort and Confidence Effects From a Survey of Knowledge Workers. In *Conference on Human Factors in Computing Systems - Proceedings. CHI Conference on Human Factors in Computing Systems (CHI '25)*.
<https://doi.org/10.1145/3706598.3713778>
- Leuwol, F. S., Deswalantri, D., Lumingkewas, C. S., Pattiasina, P. J., & Mardikawati, B. (2023). The Role of Digital Literacy and Self Efficacy in Enhancing Students' Critical Thinking in Learning in the Digital Era. *Edumaspul: Jurnal Pendidikan*, 7(2), 2678–2685. <https://doi.org/10.33487/edumaspul.v7i2.6709>
- Oliva-Córdova, L. M., Álvarez-Icaza, I., & George-Reyes, C. E. (2025). Evaluation of Generative AI Use to Foster Critical Thinking in Higher Education. *IEEE Revista Iberoamericana de Tecnologías Del Aprendizaje*, 20, 237–243.
<https://doi.org/https://doi.org/10.1109/RITA.2025.3597848>
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D.,

- Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Bmj*, 372. <https://doi.org/10.1136/bmj.n71>
- Paul, R., & Elder, L. (2020). *Critical Thinking: Concepts and Tools*. Lanham, MD: Rowan and Littlefield.
- Popay, J., Roberts, H., & Sowden, A. (2006). Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESRC methods programme Version https://www.researchgate.net/publication/233866356_Guidance_on_the_conduct_of_narrative_synthesis_in_systematic_reviews_A_product_fro. Accessed 22nd May, April 2006, 1–92.
- Rothinam, N., Vengrasalam, R., Naidu, S., Nachiappan, S., & Jabamoney, S. (2025). Systematic literature review on critical thinking in higher education. *Edelweiss Applied Science and Technology*, 9(5), 2046–2063. <https://doi.org/10.55214/25768484.v9i5.7377>
- Ruiz-Rojas, L. I., Salvador-Ullauri, L., & Acosta-Vargas, P. (2024). Collaborative Working and Critical Thinking: Adoption of Generative Artificial Intelligence Tools in Higher Education. *Sustainability (Switzerland)*, 16(13). <https://doi.org/10.3390/su16135367>
- Salea, N., & Soetjningsih, C. H. (2022). Hubungan Self-efficacy dengan Critical Thinking pada Mahasiswa. *Jurnal Ilmiah Bimbingan Konseling Undiksha*, 13(2). <https://doi.org/10.23887/XXXXXX-XX-0000-00>
- Salido, A., Syarif, I., Sitepu, M. S., Suparjan, Wana, P. R., Taufika, R., & Melisa, R. (2025). Integrating critical thinking and artificial intelligence in higher education: A bibliometric and systematic review of skills and strategies. *Social Sciences and Humanities Open*, 12(May), 101924. <https://doi.org/10.1016/j.ssaho.2025.101924>
- Salvira, M., Azzahra, F., Muttaqin, A., & Azhar, A. (2025). The Effect of Problem- Based Learning on Students ' Learning Outcomes in the Topic of Matter and Its Changes. 8(1), 49–54. <https://doi.org/https://doi.org/10.24036/semesta/vol8-iss1/555>
- Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research*, 104(August), 333–339. <https://doi.org/10.1016/j.jbusres.2019.07.039>
- Sulhan, A. S., Wilujeng, I., & Prasetyo, Z. K. (2023). Improving Critical Thinking Skills Students Through Problem Based Learning E-Module. *Jurnal Penelitian Pendidikan IPA*, 9(11), 9481–9486. <https://doi.org/10.29303/jppipa.v9i11.5231>
- Turner, M., Kitchenham, B., Brereton, P., Charters, S., & Budgen, D. (2010). Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology*, 52(5), 463–479. <https://doi.org/10.1016/j.infsof.2009.11.005>
- Ulfa, M., Rambe, S. A., Anisa, E., & Dewi, W. R. (2025). e-ISSN: 3031-6960. 3(6), 119–126.
- Usiono, Sayekti, R., Arsyad, J., Yusnaldi, E., & Budiman. (2026). Toward a pedagogical model: insights from student perspectives in learning Islamic Education Philosophy. *Cogent Education*, 13(1). <https://doi.org/10.1080/2331186X.2026.2645287>
- Warsah, Idi., Morganna, Ruly., Uyun, Muhamad, Hamengkubuwono., Afandi, M. (2021). The Impact of Collaborative Learning on Learners' Critical Thinking Skills. *International Journal of Instruction*, 14(2), 443–460. <https://doi.org/10.29333/iji.2021.14225a>
- Zhao, Y., & Watterston, J. (2021). The changes we need: Education post COVID-19. *Journal of Educational Change*, 22(1), 3–12. <https://doi.org/10.1007/s10833-021-09417-3>