

*Review Article*

# Critical thinking and artificial intelligence in tandem: A nursing perspective

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## Abstract

The human race is forced to engage in a very rapid adaptation process whenever it is confronted with technological change in any sphere of life. The unabated progress of artificial intelligence (AI) has also impacted the field of critical thinking. It is fascinating that critical thinking, an essential component of intellectual intelligence in nursing, seems to be disrupted by an artificial brain-like machine that can automatically analyze and synthesize a series of contexts. This has been an improvisation of ideas of intellectual intelligence for a very long time. Perspectives on both sides of the coin bring up interesting questions about the role that AI will play in the future, such as whether it will disrupt the critical thinking skills of nurses or whether it may be engaged as a tool to increase the critical thinking skills capability, especially in the fields of nursing care.

## Keywords

artificial intelligence; critical thinking; disruption; technology; nursing care

## Introduction

Critical thinking, one of the significant factors impacting a person's capacity for thought, is crucial for gathering, assessing, and applying knowledge. Critical thinking includes skills and tendencies toward critical thinking (Tajvidi &

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Moghimi Hanjani, 2019). While tendencies constitute the sympathetic-emotional component of critical thinking and one of the personality domains, skills include the cognitive portion of critical thinking (Toofany, 2008). Truth-seeking, open-mindedness, analyticalness, methodicalness, critical self-confidence, judgment maturity, and inquisitiveness make up the inclination toward critical thinking, which is a set of mental habits (Hassan et al., 2020).

In the field of nursing care, critical thinking is a vital ability required for every nurse to make well-informed decisions based on facts rather than speculation (Simpson & Courtney, 2002). It entails deliberate, goal-oriented thought that questions accepted nursing care theories and procedures (Duchscher, 1999). Previous research has demonstrated the importance of critical thinking skills for clinical decision-making in nursing care, especially for nursing students (Shin, 1998). Indeed, critical thinking skills development is essential for nurses, particularly nursing students, as it improves their emphatic disposition and self-esteem, which helps them overcome obstacles in their personal and professional lives (Gunaydin & Barlas, 2015; Hassan et al., 2020).

In the context of the learning process, critical thinking skills instruction is crucially emphasized in nursing education programs (Jones, 2010). Critical thinking is a crucial component of nursing education, which cannot be separated individually (Burns et al., 2013). A study has demonstrated the beneficial effects of work-based critical reflection programs on nurses' clinical critical thinking skills (Kim et al., 2018). Therefore, developing critical thinking skills is another vital point that needs more concern.

Despite its significant influence on clinical competence and decision-making, critical thinking development and promotion in nursing are notably neglected (Tajvidi & Moghimi Hanjani, 2019). Studies have compared the critical thinking abilities of various nurse groups, including registered nurses and nurse managers. The results have shown differences in critical thinking abilities among those groups (Zuriguél-Pérez et al., 2018). Furthermore, studies on nurses' critical thinking skills throughout generations have demonstrated critical thinking's ongoing significance in nursing (Uncu & Güneş, 2021). Research comparing the critical thinking abilities of first-year and senior nursing students has revealed variations in critical thinking capacities according to academic standing (Al-Mutawakel et al., 2019). In essence, the development of critical thinking abilities is growing slowly.

In dealing with these circumstances, the academic setting undoubtedly takes a crucial role. Cultivating critical thinking abilities in nursing students is vital, as research has indicated the necessity of implementing strategies to improve these abilities (Kantek & Yıldırım, 2019). Unfortunately, there are issues with nursing education programs, as evidenced by the fact that clinical judgment, clinical

reasoning, and critical thinking are all used interchangeably (Westerdahl et al., 2020). This interchangeable use may cause misunderstandings and impede the targeted improvement of critical thinking abilities.

Furthermore, there is continuous worry about how well instructional practices foster critical thinking in nursing students (Carter et al., 2016). Nurse educators continue to confront difficulties promoting critical thinking, particularly when switching from conventional teaching strategies to more creative ones like idea mapping (Latif et al., 2016). Another crucial point is a need for more context-specific assessment tools because the use of standardized tests to assess critical thinking in nursing students has been contested (Chau et al., 2001).

Challenges are also popping up not only in the academic setting but also in the nursing care setting. In the clinical setting, front-line nurses need to improve their critical thinking abilities because of the growing complexity of treatment. This presents a fresh urgency to address this topic (Berkow et al., 2011). A study comparing critical thinking abilities among clinical nurses has discovered that nurses with high critical thinking abilities are more suited to deliver high-quality patient care (Nopriyanto et al., 2020). This is the top of the mountain that needs to be achieved by the nursing profession, where all nurses can provide high-quality patient care with no exception. Therefore, overcoming obstacles to critical thinking in nursing calls for an all-encompassing strategy that includes honing instructional techniques, making clear the differences between critical thinking and related ideas, and encouraging the use of critical thinking abilities in various clinical contexts.

In light of these issues, the growth of artificial intelligence (AI) seems to hold the promise of providing a solution to one of the difficulties associated with developing critical thinking capabilities. In nursing, AI potentially includes effectiveness and efficiency in academic and clinical settings.

Our article aims to provide a foundation of knowledge on how AI holds a crucial role in nursing. A narrative review method was used. However, it notably lacks predefined research questions or a designated search approach. Furthermore, there is a deficiency of systematic criteria or guidelines to guide the review process (Demiris et al., 2019). This review article covers several essential aspects of AI, such as the history of AI development, potential benefits offered by AI, challenges in coupling AI into actual situations, and conclusion.

## The Era of Artificial Intelligence

Historically, the past of AI is filled with illusions, potential, demonstrations, and hope. Just in the last fifty years, the community concerned with AI has been able to construct computers that examine the mechanics of thought and intelligence



of human beings, demonstrating ideas that were previously merely theoretical possibilities (Hernández-Orallo et al., 2016; Xu et al., 2021). Although establishing full-fledged artificial intelligence is still in the distant future, discussing the ramifications of realizing the promise should be continued (Buchanan, 2005).

During the growth of AI, experts have proposed sentient devices that assist in defining what it is to be human (Akter et al., 2022). René Descartes, for instance, has been interested in the concept of the “mechanical man” as a metaphor than as a possibility (Gunderson, 1964). On the other hand, Gottfried Wilhelm Leibniz seems to envision the possibility of reasoning devices utilizing principles of logic to set disagreements (Buchanan, 2005). Leibniz and Pascal, furthermore, created calculating tools that automated arithmetic. It had previously been the domain of trained individuals known as “calculators” (Gross, 2020). Etienne Bonnot and Abbé de Condillac utilized the analogy of a statue into whose skull we displaced knowledge nuggets and questioned at what point the statue would appear intelligent (Falkenstein & Grandi, 2017). Therefore, AI in the last few decades remains one of the most perplexing topics in computer science. This is partly owing to the vastness and vagueness of the topic. AI varies from truly intelligent devices to search algorithms used in board games. It has applications in practically every aspect of computer usage in modern culture.

The concept of AI has been around for many years, but the term itself was coined in the 1950s by computer scientist John McCarthy (Teneo.ai, 2024). Creating algorithms and systems that could carry out particular tasks, like playing chess or solving mathematical puzzles, was the primary goal of early AI research (Nilsson, 2009). Over time, AI has become more sophisticated, and today’s AI systems can learn from data and make predictions and decisions based on that data. Some of the key milestones include some complex tasks, which show how the developments of AI lead to a tendency for the complexity of thinking, which is still dominated by creatures called human beings (Dong et al., 2020). Today, AI is an active area of research and development, with many organizations and companies working on various applications.

Initially, AI was a subfield of computer science that concentrated on creating algorithms and systems that could carry out operations like learning, problem-solving, and decision-making that normally required human intelligence (Copeland, 2024). AI systems use a combination of machine learning, natural language processing, and other advanced technologies to analyze data, make predictions, and take actions based on their findings. AI has many potential applications, including healthcare, finance, transportation, and education (Bohr & Memarzadeh, 2020).

## Potential Benefits of AI

AI has the potential to enhance productivity in many different ways. AI systems can automate many routine tasks, allowing human workers to focus on more complex and creative work. For example, it can process large amounts of data quickly and accurately, making it possible to identify patterns and trends that would be difficult or impossible for humans to detect (Laskowski & Tucci, 2024). This can help organizations make more informed decisions and improve their operations and processes.

Particularly in educational settings, AI is becoming recognized as a potent tool to support critical thinking abilities. AI and education have garnered much attention in recent years, especially regarding how AI might help students become more adept at critical thinking and problem-solving. AI in education has created new opportunities for improving students' cognitive abilities, including their ability to solve problems and think critically, as well as the learning process (Kamalov et al., 2023).

From another corner, teachers are looking more closely at how they might use AI in their lesson plans to improve their students' cognitive skills as technology advances quickly (Kim, 2023). Additionally, AI's ramifications and integration have impacted how students continue to hone their critical thinking and problem-solving skills.

Moreover, AI impacts critical thinking for critically examining accepted theories and paradigms. The ability of AI, in particular data analytics tools, to objectively evaluate preexisting frameworks is what gives them strength (Mathisen et al., 2020). This emphasizes the significance of questioning as a fundamental component of critical thinking. These views are supported by researchers who contend that AI can be used to question conventional wisdom and promote skepticism (Halpern & Dunn, 2021). As mentioned by Lamb et al. (2023), machine learning technology, for example, can help with experimental design, particularly in anticipating outcomes to refine research questions. AI's diverse role, which ranges from automation to hypothesis testing, expands the scope of critical thinking education and makes it possible to provide students with a deeper, more complex learning environment.

Another study has also pointed out the benefit of AI in creating a supportive learning environment. By connecting e-collaborating learning to integrated AI learning, Alharbi et al. (2022) delve deeply into the effects of e-collaborative learning on developing higher-order thinking skills and critical thinking. The study results suggest that the development of higher-order thinking and critical thinking is better served by employing an online collaborative learning environment instead of an online individual learning environment. Specifically,



it was shown that the group's E-collaborative learning environment positively impacted the three elements of critical thinking: reasoning, hypothesis testing, and defining and adjusting variables. All three components of critical thinking were also found to have a favorable effect on the development of higher-order thinking abilities and critical thinking, with the collaborative group performing significantly better than the individual group on a test of higher-order thinking skills.

Moreover, regarding a learning environment, virtual simulation is another advantage of AI that is not possible with conventional learning methods. AI can create artificial environments through simulations in academic settings. In both nursing education and practice, simulation is essential. It is widely used to address challenging topics like end-of-life difficulties, critical illness, and cultural sensitivity. It is also regularly used as an instructional tool to improve technical patient care abilities, decision-making, and interpersonal and communication skills (Sofer, 2018).

AI, furthermore, can enhance simulation by providing realistic scenarios customized to meet each student's specific learning demands. AI-enhanced robots that can interact with nursing students more realistically than the high-fidelity mannequins used today are one example of AI-enriched simulation (Clipper et al., 2018). Sitterding et al. (2019) confirmed that AI is also used to create immersive virtual simulation experiences in augmented and virtual reality. Simulating environments that are hard to access in the actual world is one possible use for this technology. In simulation scenarios, for example, medical emergencies could be used to practice skills that nursing students might find challenging to replicate in typical educational settings.

In clinical settings, AI shows promise as a tool to support the growth of critical thinking abilities in clinical judgment. With the help of AI-generated predictions and recommendations for clinical care, nurses can now give more prompt and suitable treatments in clinical settings. AI-enhanced clinical decision support tools, for instance, can quickly produce nurse diagnoses, estimate patient fall risk, and create decision trees to stop urinary tract infections related to catheter use (Stokes & Palmer, 2020). Even while nurses can perform these tasks without AI, emerging AI clinical tools provide the advantage of quickly analyzing vast amounts of data and automating the adjustment of risk assessments to produce more accurate forecasts. Teachers skilled in using these new AI-based patient care assistance tools will be able to advise students on how to use them effectively and efficiently.

## Challenges of AI Implementation

Beyond its ability to enhance critical thinking abilities, there are a few possible problems and difficulties that should be taken into account. The interaction between teachers and pupils is the primary problem. Teachers are constrained in their capacity to monitor and adjust as connectors by the extent to which they comprehend their students, the quantity of resources available to them, and the efficiency with which they can handle data (Coman et al., 2020). Though AI is versatile and adaptable and may be used in a multitude of ways for teaching and learning, there is no agreement on terminology to describe its role in role recognition. However, even though AI is increasingly being used in schools, it is ineffective for teaching difficult subjects like emotions or complex concepts. For this reason, educators ought to have faith in their ability to instruct.

In addition, face-to-face communication and face-to-face involvement still differ greatly from one another. The contribution that students can make to the creation of propositional knowledge greatly outweighs the influence of AI. AI can track and document students' progress and analyze their feelings, behaviors, and learning styles. Teachers can use this information to provide pupils with targeted guidance and assistance. Educators must be up to date on current events and adopt new technologies. They should also create a learning atmosphere that fosters each student's growth in creativity and critical thinking skills. AI cannot replace human creativity and learning, even though it can help with particular tasks (Coman et al., 2020).

Another issue is bias. AI algorithms are only as good as the data they are trained on, and if the data is biased, then the AI system may also be biased. This could lead to unfair or inaccurate results in any aspect. Another potential issue is related to how AI could possibly replace human expertise (Jarrahi, 2018; Knowledge at Wharton Staff, 2020; Kshetri, 2021). Current improvements in AI algorithms can assist with some aspects of the writing process, neither with the creativity, critical thinking, and insight from human researchers and writers. However, the possibility will always be there and should be a concern.

The last important issue is ethical concerns. There are also ethical concerns about using AI in academics (Stahl, 2021). For example, if AI algorithms are used to generate papers, who is responsible for the content of those papers? If AI is used to assist with the writing process, how can it ensure that the work produced is genuinely original and not simply a copy of existing work (Masic & Begic, 2016)?

## Conclusion

It is difficult to predict the exact future of AI in the field of critical thinking skills development, but AI will likely continue to play an increasingly important role

in this field. As AI algorithms and technologies continue to improve, AI will likely assist with a broader range of tasks, such as data analysis, writing and editing, and organizing and formatting tasks. This could help nurses, particularly nursing students, to be more efficient and productive and could allow them to focus on the more creative and challenging aspects of academic thinking. Therefore, nursing students must be prepared for AI-enhanced healthcare workplaces. To equip students with the AI-related abilities required in the workplace, nursing schools can incorporate AI. This might take many different forms: for example, teaching students how to create generative AI research prompts, having them conduct literature reviews, or giving them practice with AI clinical tools. It will be crucial to keep open lines of communication between educational institutions and prospective employers as artificial intelligence becomes more and more common in the workplace and classroom to prepare students for the demands of the workforce. Global research initiatives exploring the application of AI in education are underway, with the primary goal of equipping students for the future workforce.

In summary, the field of nursing, particularly nursing education, will undoubtedly come up against this issue at some point. It is expected that educational institutions will swiftly respond to the desire to generate nursing professionals with high critical thinking capabilities. Therefore, the educational institutions must act rapidly to meet this expectation. This concerns not just how inclinations can be improved upon human resources but also how technological sophistication, such as AI, can be enhanced positively. AI, which was developed on the basis of human needs to be able to process information more quickly, needs to be placed in the appropriate position where it can work in tandem with human activities to increase human productivity without the need to be concerned with humans being displaced from their jobs.

#### Declaration of Conflicting Interest

The author declared no conflict of interest in this study.

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All authors contributed equally to this article according to authorship criteria.

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## Data Availability Statement

Not applicable

## Declaration of the Use of AI in Scientific Writing

None.

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