

# CHATGPT AND THE DECLINE OF CRITICAL THINKING AMID MISUSE OF AI SYSTEMS: A COMPREHENSIVE REVIEW

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## Abstract

Artificial intelligence (AI) technologies — including generative language models such as ChatGPT — are increasingly becoming an integral part of education, scientific research, and daily activities. At the same time, concerns are growing that their improper or excessive use may lead to a decline in critical thinking ability. High-quality, independent thinking is a core human competence in analyzing, evaluating, and making decisions based on theoretical and practical knowledge, serving as an essential component of educational and social efficiency. This article examines the effects of incorrect use of AI systems on critical thinking, related empirical research and statistical findings, as well as potential solutions.

**Keywords.** Artificial intelligence, ChatGPT, critical thinking, generative AI, cognitive offloading, education, cognitive abilities, misuse.

## Introduction

In recent years, artificial intelligence (AI) technologies — particularly generative language models such as ChatGPT — have been increasingly integrated into various spheres of education, research, and daily life. While their vast capabilities enhance human productivity, serious academic concerns have emerged regarding their potential negative impact on cognitive processes, particularly critical thinking. Critical thinking is a fundamental cognitive skill that enables individuals to analyze complex information, evaluate it, draw independent conclusions, and make logically grounded decisions in academic and social communication (Melisa et al., 2025).

Although the integration of generative AI tools into education may stimulate creativity, their improper or excessive use leads to the phenomenon of cognitive “offloading” — delegating complex reasoning tasks to AI systems, which decreases human intellectual engagement. Multiple scientific studies indicate that overreliance on AI tools weakens critical thinking: for instance, as dependence on AI devices increases, critical thinking outcomes significantly decrease (correlation coefficient  $r = -0.68$ ). An experimental study by MIT Media Lab researchers identified a decline in cognitive activity associated with the use of ChatGPT. Among 54 young adult participants, the group that used AI tools demonstrated notably reduced brain activity related to attention, planning, and memory, and even experienced difficulty recalling their own written texts (newly measured neurophysiological indicators decreased).

Credible sources also provide evidence that improper AI use affects educational efficiency. For example, some studies show that there are differences in critical thinking outcomes between groups



taught using ChatGPT-based instruction and those trained using traditional methods — suggesting that obtaining answers through AI tools reduces the learner’s independent reasoning process.

Furthermore, delegating cognitive work to external tools may weaken not only critical thinking but also memory retention and the ability to form independent logical conclusions, as noted in academic literature. Research in other domains has shown that groups with higher levels of AI reliance experience increased cognitive fatigue, which in turn leads to decreased critical thinking performance. It must be emphasized that the academic community does not hold a unified stance on the role of ChatGPT and other generative AI tools in education. Some studies claim that AI can support critical thinking, but methodological limitations hinder generalization of these findings. Thus, the complex interplay between critical thinking and generative AI remains one of today’s active scientific research questions.

In this introduction section, the term critical thinking, its role in education and cognitive development, and the negative impact of improper use of generative AI tools on critical thinking were discussed based on scientific-empirical evidence. Cognitive psychology, educational technology, and artificial intelligence research form the foundational disciplines in addressing these issues.

### Research Aim

The primary aim of this article is to scientifically analyze the decline of critical thinking resulting from improper use of ChatGPT and similar AI systems, compare available empirical research, and propose practical solutions.

### Materials and Methods

Published articles and systematic reviews, empirical studies in the fields of education and psychology, statistical analyses, and meta-analyses were used as research material. Specifically, scientific articles and meta-analyses exploring the relationship between AI tools and critical thinking were examined, analyzing both positive and negative statistical correlations between extensive AI use and critical thinking.

### Results

Analysis of empirical studies and statistical data for the scientific-analytical article on the topic “Decline of Critical Thinking amid Misuse of ChatGPT and Similar Artificial Intelligence Systems.” ***Correlation between the use of AI tools and critical thinking indicators.*** A recent large-scale study identified a significant negative association between the degree of artificial intelligence use and critical thinking ability. The study examined 666 participants across various age groups, noting that individuals who frequently used AI tools scored lower on critical thinking tests. This outcome is explained by the cognitive offloading phenomenon — transferring cognitive load to external tools — whereby high AI usage leads to a reduction in critical thinking scores. Statistical analysis showed that heavy AI users had noticeably lower critical thinking indicators ( $R^2 = 0.37$ ), and this correlation was found to be statistically significant.



**Table 1. Correlation between AI usage and critical thinking scores**(666 participants, ANOVA,  $R^2 = 0.37$ )

Level of AI Use	Average Critical Thinking Score	Interpretation
Low (< 2 hours/day)	78.2	High independent thinking
Moderate (2–4 hours/day)	71.5	Intermediate
High (> 4 hours/day)	63.9	Low result, high offloading

This finding indicates that excessive reliance on AI tools may reduce critical thinking performance, particularly in the domains of independent analysis and decision-making.

*Comparison of research findings on the positive and negative effects of ChatGPT on critical thinking.* Scientific conclusions regarding whether AI tools support or weaken critical thinking in the educational process are not unilateral. For example, some studies report that integrating generative AI — specifically ChatGPT — has enhanced learners' critical thinking skills: in one experiment, students exposed to ChatGPT-integrated instruction achieved significantly higher critical thinking scores in theoretical tasks — the experimental group scored an average of 78.6, compared to 69.3 in the control group ( $t(58)=5.85$ ,  $p < 0.001$ ). This suggests that using ChatGPT as a “thinking assistant” in the knowledge and analysis process may help support critical thinking.

**Table 2. Effectiveness of ChatGPT integration (quasi-experimental design)**

Group	Mean Score	Standard Deviation	Comparison
Experimental (with ChatGPT)	78.6	5.9	+9.3
Control (traditional)	69.3	6.5	—

However, strong arguments also exist in the literature indicating that AI tools can potentially weaken critical thinking. Systematic reviews of learning environments have shown that in many student populations, reliance on AI-generated content limits independent analysis and evaluation, thereby diminishing critical thinking.

*Effects of excessive AI dependence on cognitive and behavioral functioning.* An MIT Media Lab study examined the neurophysiological impact of using ChatGPT. According to the study, brain activity in areas associated with attention, planning, and memory declined during task performance using ChatGPT. Moreover, a decrease in recall ability was identified when shifting from AI-assisted work to independent essay tasks. These results suggest that excessive AI reliance may negatively affect brain activity, ultimately contributing to a decline in critical thinking performance.

*Meta-analysis results.* Meta-analytic findings indicate that the effect of ChatGPT and similar tools on student learning outcomes is context-dependent and not uniform. A meta-analysis covering 51 different studies found contradictory results regarding ChatGPT's impact on learning effectiveness and higher-order thinking. While some studies emphasized improvements in critical and higher-level thinking through ChatGPT use, others suggested no significant improvement — or even instances where AI use hindered such skills. This demonstrates that learning conditions, user characteristics, and pedagogical context significantly influence the outcomes of AI-based tools.



## Discussion

These research findings clearly demonstrate the complexity of the interaction between critical thinking and the use of artificial intelligence. Analysis shows that the decline in critical thinking is not solely determined by exposure to AI itself, but is directly linked to *how, how long, and under what pedagogical supervision* the technology is used. Large-scale research (N = 666) showing a high correlation ( $R^2 = 0.37$ ) indicates that strong reliance on generative AI reduces independent analytical activity and cognitive engagement. Mechanisms underlying this effect include cognitive offloading — shifting cognitive tasks externally — automation of reasoning processes, and habituation to receiving “ready-made answers.”

Nevertheless, not all empirical data point in a negative direction. In educational settings where ChatGPT was used purposefully, in a structured and reflective format, critical thinking scores increased — the experimental group achieved 78.6 points versus 69.3 in the control group. This demonstrates that AI tools produce positive outcomes when used as *cognitive stimulators* — not replacements — encouraging questioning and supporting complex reasoning.

Another important aspect highlighted in the discussion is the true origin of contradictory research outcomes. AI technology itself is neutral; it neither inherently destroys nor develops critical thinking. The core issue lies in user behavior. Delegating the entire intellectual task to AI resembles doing physical training without engaging your muscles: it offers short-term comfort but causes long-term weakening. In contrast, using AI while simultaneously independently processing information, questioning it, and deepening analysis acts as a form of intellectual training.

The decline in brain activity noted by MIT Media Lab — specifically reduced neuro-activity linked to attention and planning — is not accidental; it is a biological reflection of passive technological dependence. When cognitive effort is externalized, neural networks are deprived of stimulation.

Synthesizing these arguments, the main threat is not the existence of AI tools, but their mispositioning — when they are used to *replace* thinking rather than *challenge* it. Critical thinking is a skill that strengthens through practice. Technology, however, offers the temptation to skip this practice — which is its most dangerous downside.

At the same time, the discussion makes clear that banning AI in education and science is neither rational nor useful. Instead, educational policies must foster *conscious and regulated use* of AI. Every institution — whether a nation, university, or research organization — must design policies ensuring that AI does not replace human thought, but rather serves as its competitor, awakener, and intellectual sparring partner.

Protecting critical thinking today is no longer simply an individual competency — it is a cultural and cognitive foundation necessary for humanity's knowledge-driven future. Generative AI tools — when properly governed — have the potential not to erode this foundation, but to reinforce it.

## Conclusion

The reviewed scientific evidence and discussion demonstrate that the use of ChatGPT and similar artificial intelligence systems may have both positive and negative effects on critical thinking. The essence of the issue does not lie in the technology itself, but in the *manner, purpose, and degree* of its use. Excessive dependence on AI tools may weaken cognitive processes, while structured and pedagogically controlled use can stimulate deeper thinking and analytical activity.



1. The decline of critical thinking is directly linked to passive, automatic reliance on AI; when reasoning is outsourced, independent logical functioning decreases.
2. Empirical evidence shows that under structured methodological guidance, ChatGPT can support deeper analysis, question formulation, and theoretical reasoning.
3. When AI technologies are integrated into education without pedagogical supervision and methodological frameworks, the risk of critical thinking decline increases.
4. Critical thinking is a cognitive competence strengthened through exercise; AI must not replace this exercise — rather, it should serve as an intellectual rival and stimulant.

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