AI Dependency and Its Impact on Critical Thinking Skills Among College-Going Students

Mayukha Anumula[1], Dr. Sahaja Akuthota[2], Kavya Narayana[3], Srihari Subudhi[4]

[1,2,3,4] Ph.D. Scholar, Lingayas Vidyapeeth, Faridabad

Abstract—The rapid integration of Artificial Intelligence (AI) tools in higher education has transformed academic learning processes. While AI offers efficiency, accessibility, and personalized learning support, increasing concerns have emerged regarding students' dependency on these tools and its potential impact on critical thinking skills. This study investigates the relationship between AI dependency and critical thinking skills among college-going students using primary data collected through a structured questionnaire (N = 200). A quantitative, cross-sectional research design was adopted, with data analyzed using descriptive statistical techniques in Microsoft Excel.

Findings reveal a high level of AI usage among students, particularly for academic tasks such as assignment completion, exam preparation, and conceptual understanding. Results indicate that while AI enhances academic convenience, excessive dependency correlates with reduced independent problem-solving, limited verification of AI-generated information, and diminished confidence in completing tasks without AI assistance. The findings support the alternative hypothesis that AI dependency negatively impacts critical thinking skills when overused without reflective engagement.

The study concludes that AI is not inherently detrimental but must be used responsibly. Educational institutions should promote AI literacy, reflective learning practices, and self-regulated learning to ensure that AI strengthens rather than weakens cognitive development.

Keywords—Artificial Intelligence, Critical Thinking, AI Dependency, Higher Education, Self-Regulated Learning

I. INTRODUCTION

Artificial Intelligence (AI) has become an integral part of modern education, reshaping how students learn, access information, and complete academic tasks. Tools such as ChatGPT, Grammarly, and AI-powered search engines have transformed traditional learning environments by offering instant explanations, content generation, and personalized assistance. While these tools enhance efficiency and accessibility, they also raise concerns about excessive dependency and its impact on students' cognitive development—particularly critical thinking skills.

Critical thinking is a foundational competency in higher education, enabling learners to analyze information, evaluate arguments, and apply knowledge independently. However, growing reliance on AI may reduce students' engagement in deeper cognitive processes, encouraging surface learning rather than meaningful understanding. This concern is especially relevant among college-going students, who increasingly depend on AI tools for assignments, exam preparation, and problem-solving.

This study examines the relationship between AI dependency and critical thinking skills among college students. By analyzing primary data collected through a structured questionnaire, this research explores patterns of AI usage, dependency behaviors, and perceived effects on critical thinking.

II. LITERATURE REVIEW

2.1 AI Dependency in Higher Education

AI dependency refers to excessive reliance on artificial intelligence tools to perform academic tasks that typically require independent cognitive effort. Studies suggest that such dependency is influenced by academic self-efficacy, stress levels, and performance expectations rather than mere accessibility to technology. Students who rely heavily on AI may experience reduced engagement in analytical thinking and problem-solving processes.

2.2 Critical Thinking in the Age of AI

Critical thinking involves reflective judgment, logical reasoning, and evaluation of information. Research indicates that AI can both enhance and inhibit critical thinking depending on how it is used. When students engage with AI reflectively—questioning outputs and verifying sources—it can

support deeper understanding. However, passive consumption of AI-generated content may weaken analytical skills.

2.3 Academic Self-Efficacy, Stress, and Performance Expectations

Academic self-efficacy plays a central role in shaping AI usage patterns. Studies show that students with high self-efficacy use AI as a supplementary tool, whereas students with high academic stress tend to over-rely on AI for task completion. Academic stress and performance pressure significantly mediate AI dependency, often overshadowing critical thinking development.

2.4 Self-Regulated Learning and Motivation

Self-regulated learning enables students to monitor, evaluate, and control their learning processes. Learners with strong self-regulation are more likely to use AI responsibly, engaging in reflection and critical evaluation rather than passive reliance. This reinforces the idea that AI's impact depends largely on learners' motivation and cognitive discipline.

III. RESEARCH METHODOLOGY

3.1 Research Design

This study employed a quantitative, cross-sectional research design to examine AI dependency and its impact on critical thinking among college students. The design was suitable for analyzing structured numerical data collected at a single point in time

3.2 Data Source

Primary data were collected using an online questionnaire distributed among college students. Responses were exported to Microsoft Excel for data cleaning, analysis, and visualization.

3.3 Population and Sample

The target population consisted of college-going students from various academic disciplines and levels of study. A convenience sampling method was used. The final dataset included 200 valid responses, all of which were considered for analysis.

3.4 Research Instrument

The questionnaire consisted of two sections:

Section A – Demographic Variables
- Age group
- Gender
- Level of study
- Academic discipline

Section B – AI Dependency and Critical Thinking Variables
- Frequency of AI usage
- Dependency on AI for academic tasks
- Confidence in completing tasks without AI
- Verification of AI-generated information
- Independent problem-solving behaviour
- Perceived impact of AI on critical thinking

Most items used a 5-point Likert scale, while others used frequency-based responses.

3.5 Data Analysis Procedure

Data analysis was conducted using Microsoft Excel and included:
- Frequency distribution
- Percentage analysis
- Bar chart visualization

These techniques were selected to identify trends and behavioral patterns related to AI dependency and critical thinking.

3.6 Hypotheses

H_0 (Null Hypothesis):
There is no relationship between AI dependency and critical thinking skills among college students.
H_1 (Alternative Hypothesis):
AI dependency negatively impacts critical thinking skills among college students.

IV. RESULTS AND FINDINGS

4.1 AI Usage Patterns
- A significant proportion of students reported frequent or daily use of AI tools.
- The most common uses included:
  - Assignment completion
  - Exam preparation
  - Concept clarification
- ChatGPT and multi-tool usage were the most reported platforms.

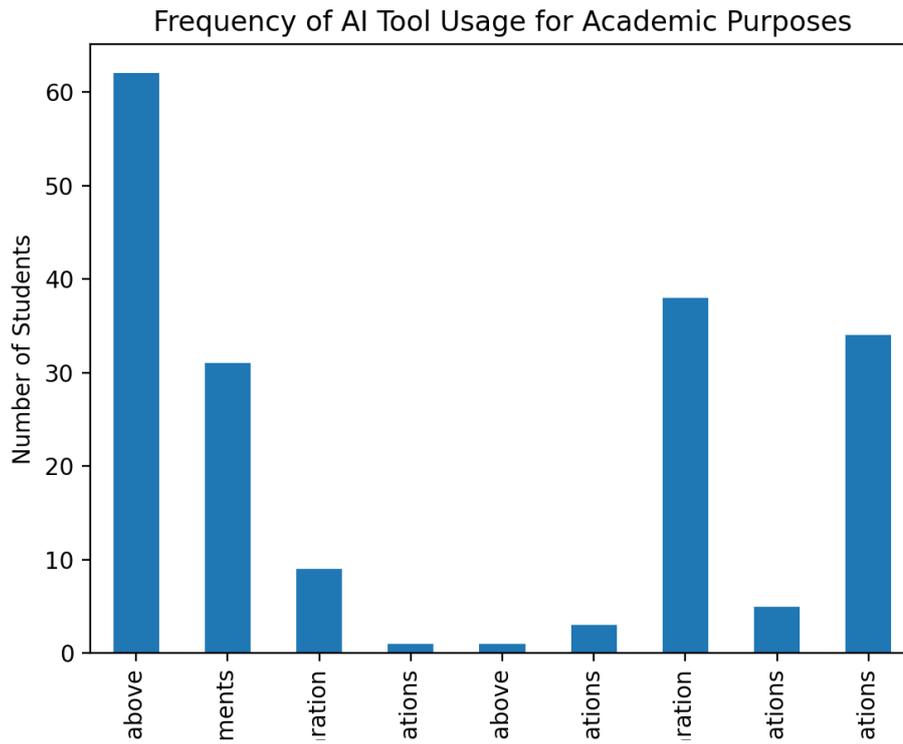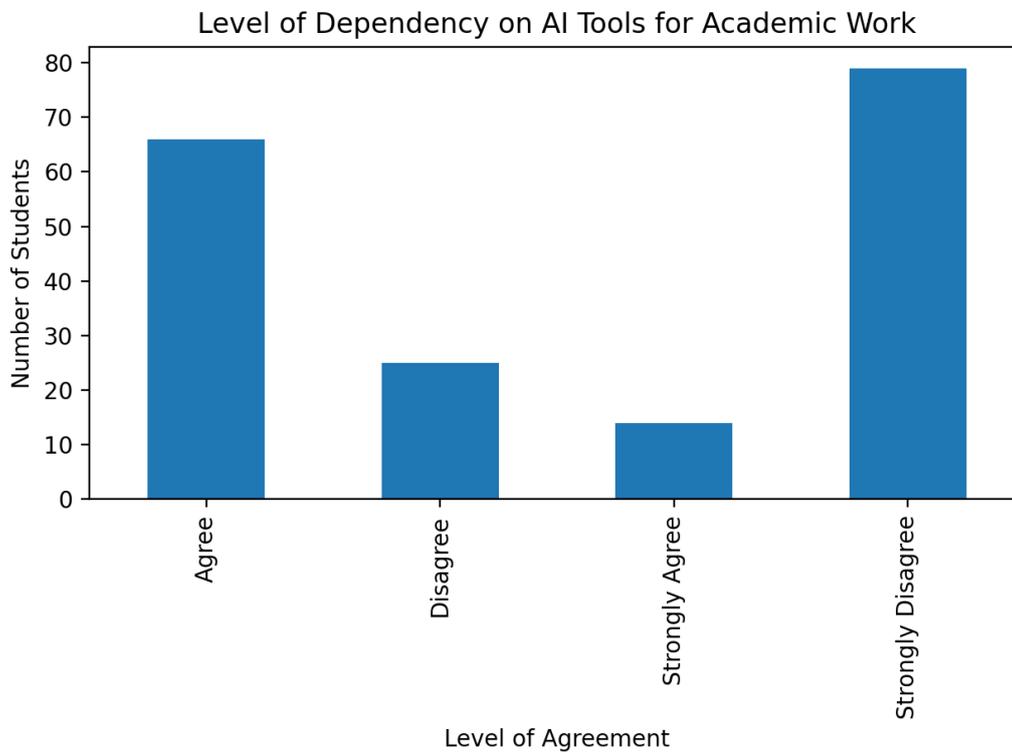Figure 1: Frequency of AI Tool Usage for Academic Purposes

Figure 2: Level of Dependency on AI Tools for Academic Work

4.2 Dependency on AI Tools
- A majority of respondents acknowledged moderate to high dependency on AI for academic tasks.
- Many students indicated discomfort or reduced confidence when completing tasks without AI assistance.

Figure 3: Confidence in Completing Academic Tasks Without AI Tools
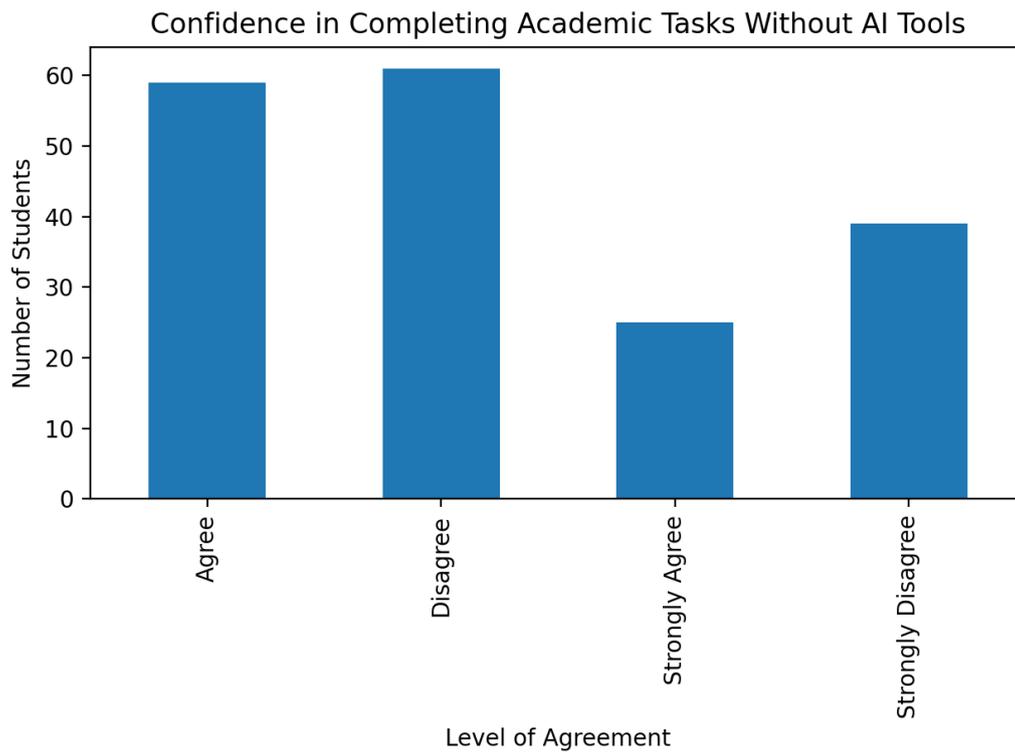
4.3 Critical Thinking and Verification Behaviour
- A noticeable proportion of students admitted they rarely verify AI-generated information.
- Reduced independent problem-solving behaviour was observed prior to consulting AI tools.

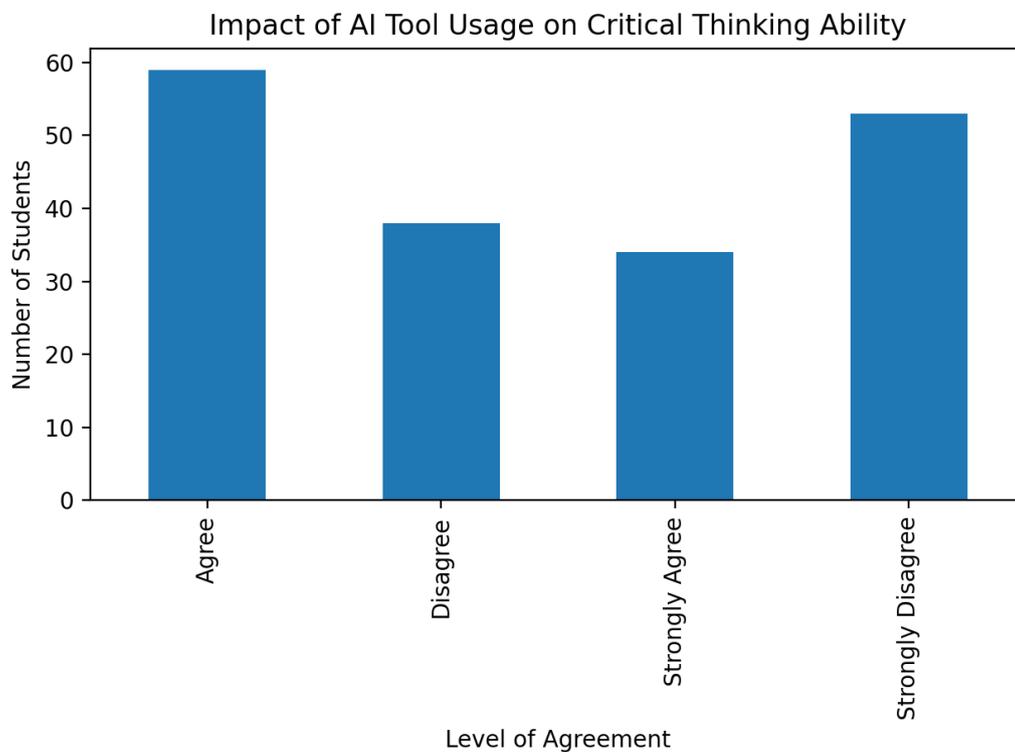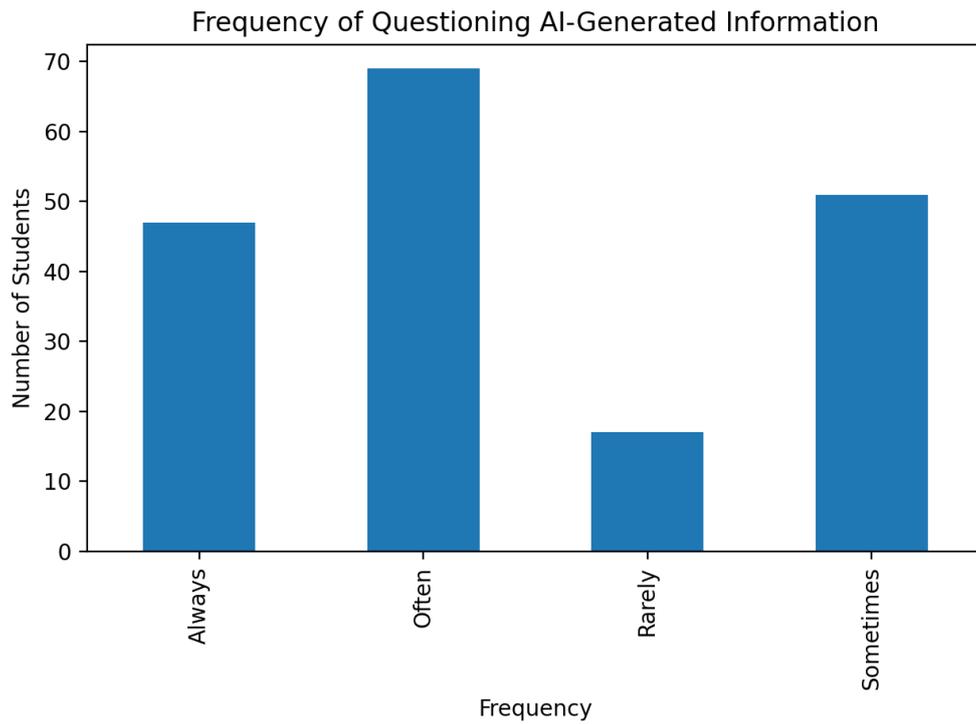Figure 4: Impact of AI Tool Usage on Critical Thinking Ability

Figure 5: Frequency of Questioning AI-Generated Information

Frequency of Questioning AI-Generated Information

What this figure proves: This graph shows reduced verification behavior, indicating cognitive offloading.

4.4 Perceived Impact on Critical Thinking
- A majority agreed that excessive AI use negatively affects critical thinking abilities.
- Fewer students strongly believed that AI enhances critical thinking without limitations.

Figure 6: Attempt to Solve Academic Problems Independently Before AI

Attempt to Solve Academic Problems Independently Before AI
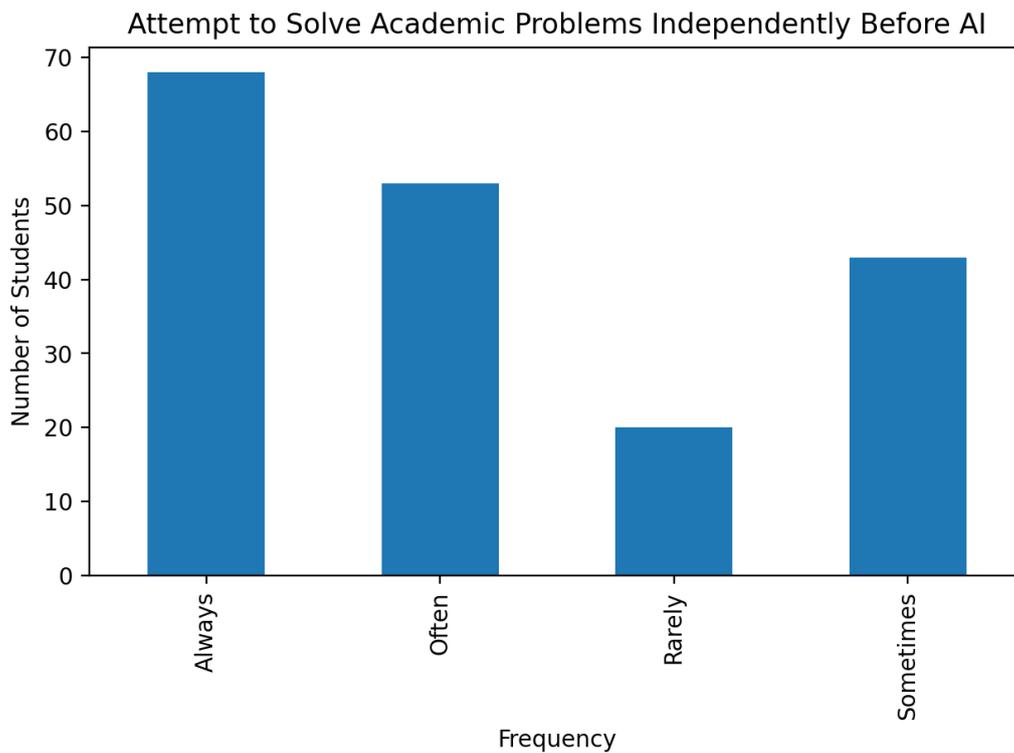
These findings support the alternative hypothesis (H_1) that AI dependency negatively influences critical thinking skills when used excessively and unreflectively.

V. DISCUSSION

The findings suggest that AI dependency among college students is a growing concern. While AI provides efficiency and academic support, excessive reliance weakens independent reasoning and analytical engagement. Students often prioritize convenience over cognitive effort, leading to superficial learning outcomes.

However, the findings also indicate that AI is not inherently harmful. When used reflectively—through verification, questioning, and contextual application—AI can enhance learning experiences. The challenge lies in promoting responsible AI usage rather than restricting access.

Academic stress, performance pressure, and lack of self-regulation emerge as key drivers of AI dependency. Addressing these factors is essential for preserving critical thinking skills in AI-driven educational environments.

VI. IMPLICATIONS

6.1 For Educators
- Integrate AI as a supportive learning tool rather than a substitute for thinking.
- Design assessments that require reflection, justification, and reasoning.
- Encourage verification of AI-generated content.

6.2 For Institutions
- Develop structured AI literacy programs.
- Promote ethical and reflective AI usage policies.
- Train faculty in responsible AI integration.

6.3 For Students
- Use AI as a learning companion, not a shortcut.
- Practice self-questioning and critical evaluation.
- Strengthen self-regulated learning habits.

VII. CONCLUSION

The rapid integration of Artificial Intelligence (AI) into higher education has undeniably transformed the academic landscape, offering unprecedented opportunities for learning efficiency, accessibility, and personalized support. However, this study highlights that alongside these benefits, AI dependency presents significant challenges—particularly in relation to the development and sustainability of critical thinking skills among college-going students.

The findings of this research indicate that a substantial proportion of students rely heavily on AI tools for academic tasks such as assignment completion, exam preparation, and conceptual understanding. While such reliance enhances convenience and productivity, it also correlates with reduced independent problem-solving, lower confidence in completing tasks without AI assistance, and diminished verification of AI-generated information. These patterns suggest a gradual cognitive shift where students may prioritize efficiency over deep intellectual engagement, thereby weakening essential critical thinking abilities.

Importantly, the study reinforces that AI itself is not inherently detrimental to learning. Rather, the negative impact arises from *how* AI is used. When employed passively or excessively, AI can foster dependency and cognitive offloading. Conversely, when used reflectively—as a supportive learning aid rather than a substitute for thinking—AI has the potential to enhance analytical reasoning, conceptual clarity, and metacognitive awareness. This dual nature underscores the importance of responsible and intentional AI integration within educational settings.

The findings further emphasize the role of psychological and behavioural factors such as academic self-efficacy, self-regulated learning, and performance pressure. Students with stronger self-regulation and intrinsic motivation are more likely to use AI constructively, whereas those experiencing academic stress are more prone to dependency. This suggests that strengthening students' confidence, autonomy, and reflective learning habits is essential for mitigating the negative effects of AI reliance.

From an educational perspective, the study highlights the urgent need for institutions to move beyond

restrictive approaches to AI usage and instead focus on fostering AI literacy. Educators must design learning environments that encourage critical questioning, justification of reasoning, and verification of AI-generated information. Assessment strategies should emphasize analytical thinking, reflection, and originality rather than outcome-based performance alone. Additionally, institutional policies should promote ethical AI use and empower both students and educators to engage with AI responsibly.

In conclusion, AI dependency among college-going students is a complex and evolving phenomenon shaped by technological, psychological, and educational factors. While excessive reliance can hinder critical thinking, purposeful and reflective AI use has the potential to enhance cognitive development. The future of education lies not in resisting AI, but in cultivating thoughtful, self-regulated learners who can engage with intelligent technologies critically and ethically. By fostering balanced AI integration, higher education can ensure that technological advancement strengthens—not substitutes—human intellect and reasoning.

REFERENCES

[1] Acosta-Enriquez, B. G., Arbulú Ballesteros, M. A., Guzman Valle, M. de los A., Morales Angaspilco, J. E., Aquino Lalupú, J. R., Bravo Jaico, J. L., Germán Reyes, N. C., Alarcón García, R. E., & Janampa Castillo, W. E. (2025).

[2] The mediating role of academic stress, critical thinking and performance expectations in the influence of academic self-efficacy on AI dependency: Case study in college students. *Computers and Education: Artificial Intelligence, 8*, 100381. https://doi.org/10.1016/j.caeai.2025.100381

[3] Bandura, A. (1986).
Social foundations of thought and action: A social cognitive theory. Prentice Hall.

[4] Sweller, J. (1988).
Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/s15516709cog1202_4

[5] Tian, J., & Zhang, R. (2025).
Learners' AI dependence and critical thinking: The psychological mechanism of fatigue and the social buffering role of AI literacy. *Acta Psychologica, 260*, 105725.

https://doi.org/10.1016/j.actpsy.2025.105725

[6] Zhai, C., Wibowo, S., & Li, L. D. (2024).
The effects of over-reliance on AI dialogue systems on students' cognitive abilities: A systematic review. *Smart Learning Environments, 11*(28). https://doi.org/10.1186/s40561-024-00316-7

[7] Zhang, W., & Liu, X. (2025).
Artificial intelligence-generated content empowers college students' critical thinking skills: What, how, and why. *Education Sciences, 15*(8), 977. https://doi.org/10.3390/educsci15080977