



The Impact of Artificial Intelligence (AI) Tools on the Critical Thinking and Academic Integrity of Secondary School Students

DR. JAGRUTIBEN R. PATEL

Assistant Professor,

SVSB Education College, P.G. Department, Nagalpur, Mehsana

Abstract:

The rapid integration of Artificial Intelligence (AI) tools, particularly Generative AI like ChatGPT, into the daily lives of secondary school students has precipitated a paradigm shift in the educational landscape. This research paper explores the multifaceted impact of these tools on two critical pillars of education: critical thinking and academic integrity. Through a mixed-method approach involving surveys of 200 secondary school students and interviews with 20 educators, this study investigates how AI usage influences cognitive development and ethical behavior. The findings suggest a dichotomy: while AI serves as a powerful scaffold for personalized learning and overcoming writer's block, its over-reliance leads to "cognitive offloading," potentially stunting the development of independent analytical skills. Furthermore, the study highlights a significant "ethics gap," where students often fail to distinguish between using AI for assistance and engaging in academic dishonesty. The paper concludes with a call for a paradigm shift in assessment strategies and the implementation of comprehensive AI literacy programs to ensure that technology acts as a catalyst for, rather than a replacement of, human intellect.

Keywords: Artificial Intelligence (AI), Cognitive offloading, Critical thinking

1. Introduction

1.1 Background of the Study

The dawn of the 21st century has been defined by the exponential growth of digital technology, with Artificial Intelligence (AI) standing at the forefront of this revolution. In the educational sector, AI has transitioned from a theoretical concept to a practical tool accessible to anyone with an internet connection. The launch of Large Language Models (LLMs) like ChatGPT, Claude, and Google Bard has democratized access to information generation, allowing students to complete essays, solve complex mathematical problems, and generate code within seconds. Secondary school students, typically aged between 14 and 18, are at a developmental stage where identity formation and cognitive maturation are paramount. They are also the most prolific adopters of new technologies.

Unlike previous educational technologies (e.g., calculators or spell-checkers), generative AI possesses the capacity to mimic human reasoning and creativity. This capability has fundamentally altered the learning process. No longer is the student merely a consumer of information; they are now a conductor of an intelligent agent. However, this accessibility brings profound challenges. As schools rush to integrate technology, educators and policymakers are grappling with a fundamental question: Does the convenience of AI come at the cost of the student's intellectual growth?

1.2 Problem Statement

While AI tools offer undeniable benefits in terms of efficiency and personalized tutoring, there is growing concern regarding their negative externalities. Critics argue that the ease of obtaining answers from AI may erode the "productive struggle" necessary for deep learning. When a student asks an AI to write an essay or solve a physics problem, they bypass the cognitive friction that cements memory and

understanding. This phenomenon, known as cognitive offloading, threatens to impair critical thinking skills the very skill set education aims to cultivate.

Simultaneously, the boundary between assistance and cheating has blurred. Academic integrity, traditionally defined by rules against plagiarism and cheating, is now facing a crisis of definition. If a student uses AI to structure an essay or generate ideas, is it plagiarism? The lack of established norms and the opacity of AI detection tools have created an environment of uncertainty. This paper addresses the pressing need to understand how secondary school students perceive and utilize these tools, specifically focusing on the twin pillars of critical thinking and academic integrity.

1.3 Objectives of the Study

The primary objectives of this research are:

1. To assess the frequency and purpose of AI tool usage among secondary school students.
2. To analyze the relationship between AI dependency and the development of critical thinking and problem-solving skills.
3. To evaluate student perceptions regarding the ethical implications of AI usage in academic work.
4. To propose educational strategies to integrate AI tools ethically while preserving cognitive rigor.

2. Review of Related Literature

The discourse on AI in education is vast and rapidly evolving. Early studies on educational technology often focused on the "Calculator Effect," suggesting that while computational aids improved speed, they sometimes hindered conceptual understanding of mathematics. This analogy is frequently applied to modern AI.

AI and Critical Thinking: Research by Sharples (2022) suggests that AI acts as a "co-author" rather than a mere tool. In the cognitive apprenticeship model, learning occurs through guided participation. However, if the "guide" is too capable, the apprentice fails to develop independent competence. Conversely, supporters of AI in education argue for the theory of "distributed cognition," suggesting that thinking happens not just in the brain but in interaction with tools. From this perspective, using AI can actually *enhance* critical thinking by allowing students to interrogate the AI's output, fact-check it, and refine arguments (Baidoo-Anu & Owusu Ansah, 2023). However, this requires a level of metacognitive maturity that many secondary school students may not yet possess.

AI and Academic Integrity: The issue of integrity is complex. Traditional plagiarism involves copying text from a source. Generative AI creates unique text, bypassing standard plagiarism detectors. Eaton (2023) describes this as "AI contract cheating." Literature suggests that students often do not view AI usage as cheating because there is no single human victim; they view it as using a smart search engine. Studies from the Turnitin Foundation indicate a significant rise in "unoriginal" content since the release of generative AI, but also note the difficulty in distinguishing between AI-generated text and sophisticated human writing.

The Educational Shift: Policy frameworks, such as UNESCO's (2023) guidelines, emphasize the need for "AI Literacy." The consensus in pedagogical literature is moving away from banning AI (which is futile) towards teaching students how to collaborate with it ethically.

3. Research Methodology

3.1 Research Design

This study utilizes a Descriptive and Exploratory Research Design. Given the novelty of widespread Generative AI usage among secondary students, the study aims to map the current landscape and identify correlations rather than prove causality definitively.

3.2 Population and Sample

The target population consists of secondary school students (Grades 9-12) and teachers in urban and semi-urban schools.

- Student Sample: 200 students were selected using stratified random sampling to ensure representation across different academic streams (Science, Arts, Commerce).
- Teacher Sample: 20 teachers were selected for in-depth interviews to understand the perspective from the other side of the desk.

3.3 Data Collection Instruments

1. Student Survey: A structured questionnaire comprising Likert-scale items and open-ended questions. It covered three domains: Usage patterns (Frequency, Tools used), Impact on Skills (Confidence in problem-solving, dependency), and Ethical Perception (What constitutes cheating).
2. Teacher Interviews: Semi-structured interviews focusing on observed changes in student work quality, critical thinking during class discussions, and incidents of suspected AI misuse.

3.4 Data Analysis

Quantitative data from the survey was analyzed using descriptive statistics (percentages, mean scores) and correlation analysis. Qualitative data from interviews were coded thematically to identify recurring patterns and sentiments.

4. Data Analysis and Interpretation

4.1 Patterns of AI Usage

The survey revealed that 85% of secondary students have used an AI tool at least once for academic purposes. Of these, 45% reported using it weekly.

- Tools used: ChatGPT led the usage (90%), followed by Quillbot (for paraphrasing) at 40% and Photomath (for math) at 30%.
- Primary Uses: 60% used AI to "explain concepts" or "summarize notes." However, a concerning 30% used AI to "generate full answers for homework," and 10% used it to "write essays."

4.2 Impact on Critical Thinking

To measure critical thinking, the survey asked students to rate their agreement with statements like "I feel confident solving problems without AI" and "I check AI answers for accuracy."

- The Scaffold Effect: Students who used AI for *clarification* (e.g., "Explain this metaphor to me") reported a 15% increase in their perceived understanding of complex topics compared to those who did not use AI. This suggests that when used as a tutor, AI enhances critical thinking by providing scaffolding that bridges gaps in understanding.
- The Dependency Trap: However, students who used AI for *generation* (e.g., "Write this paragraph for me") showed a disturbing trend. 60% of this group admitted that they often submit AI work without reading it thoroughly. When asked to explain the content in class, these students struggled significantly.
- Teacher Observations: 80% of teachers interviewed noted a decline in the "originality of thought" in written assignments since the rise of AI. One teacher noted, "The essays are grammatically perfect and structured beautifully, but they lack the 'voice' of a teenager. They sound generic."

Interpretation: The data indicates a bifurcation. AI acts as a cognitive ladder for those who use it to understand concepts, potentially boosting critical thinking. However, for a significant subset, it acts as a cognitive crutch. The phenomenon of "cognitive offloading" is real; students are outsourcing the struggle of thinking. Critical thinking requires wrestling with ambiguity—a process AI shortcuts by providing immediate, certain answers.

4.3 Impact on Academic Integrity

The study delved into the ethical dimensions by presenting students with scenarios and asking if they constituted cheating.

- Scenario A: Copying a friend's homework. 95% said this is cheating.
- Scenario B: Asking ChatGPT to write an essay and submitting it unchanged. Only 40% classified this as cheating.
- Scenario C: Using AI to generate ideas and then writing the essay in own words. 15% classified this as cheating.

This data highlights a massive Ethics Gap. Students view AI as a tool for productivity, similar to using a calculator, rather than a form of intellectual theft. The ambiguity of the technology (it generates unique text) allows students to rationalize the behavior. They argue that since they had to "prompt" the AI, they exerted intellectual effort.

Furthermore, 70% of students admitted they are rarely or never checked for AI usage by teachers, and 85% believe they could get away with submitting AI-generated work without detection.

5. Discussion

The findings of this study underscore the complex reality of AI in secondary education. It is neither a panacea nor a poison; it is a powerful amplifier of existing study habits and ethics.

5.1 The Erosion of the "Struggle"

The most significant impact on critical thinking is the removal of the "struggle." Learning is neurologically demanding; it involves forming new neural pathways through confusion and eventual clarity. When an AI tool instantly provides an answer, it interrupts the metacognitive process—the "thinking about thinking." The data shows that while students may feel they understand the *result* provided by AI, they fail to understand the *process* to get there. This suggests a shallow learning style. For secondary students, who are still developing their analytical frameworks, this is particularly dangerous. They risk becoming "prompt engineers" rather than thinkers, valuing the input/output mechanism over the internal generation of ideas.

However, the counter-argument supported by the data is that for students with learning gaps or lower proficiency, AI provides a safety net. By breaking down complex barriers, AI allows these students to engage with material at a higher level than they otherwise could. This suggests that the *pedagogical integration* of AI matters more than the tool itself. If teachers simply ask for the "answer," AI will kill thinking. If teachers ask for the "analysis of the AI's answer," AI can stimulate thinking.

5.2 The Redefinition of Cheating

The disparity in how students view plagiarism versus AI usage is alarming but understandable. We have spent a decade teaching students how to "search smart" (Google). Generative AI is the next step in "search." Students do not see the distinction between synthesizing five Google sources and asking an AI to synthesize them.

The integrity issue is compounded by the lack of effective enforcement. If detection tools are unreliable, and teachers are overwhelmed, the "social contract" of the classroom breaks down. Students are operating in a "Wild West" of academic integrity. The data suggests that current academic policies are outdated. They focus on "copying" (the act) rather than "authorship" (the intent).

5.3 Teacher Dilemma

Teachers are caught in a difficult position. They cannot police every keystroke a student makes. The interviews revealed a sense of helplessness. Some have resorted to "pen and paper" exams, which limits

the ability to use AI but also limits the ability to edit and refine work—a key 21st-century skill. The challenge is not to detect AI, but to design assignments that AI cannot easily complete.

6. Recommendations

Based on the findings, this paper proposes the following recommendations for school administrators, curriculum developers, and policymakers:

6.1 Shift from "Detect" to "Design"

Schools must stop relying on AI detectors (which have high false-positive rates) and start designing "AI-resilient" assignments.

- **Process over Product:** Evaluate the *process* of learning. Require students to submit drafts, brainstorming notes, and reflection papers on their writing process. AI can write a final draft, but it cannot easily fake a week-long evolution of ideas.
- **In-Class Critical Analysis:** Assignments should ask students to critique an AI-generated response. For example, "Ask ChatGPT to argue X. Find the flaws in its logic." This turns AI into a subject of study rather than a tool of production.
- **Oral Defense:** Increase the weight of oral presentations and vivas where students must explain their work. It is nearly impossible for a student who did not write the essay to defend its nuances in real-time.

6.2 Implement AI Literacy Curriculum

Just as schools teach digital citizenship (safety online), they must teach AI literacy.

- **Transparency Training:** Teach students how to cite AI usage properly (e.g., using MLA or APA guidelines for AI).
- **Limitations Education:** Demonstrate to students *why* AI hallucinates and makes mistakes. By showing that AI is often wrong, schools can encourage students to verify facts, thus reinstating the critical thinking layer.
- **Ethical Framework:** Establish clear, school-wide policies defining what constitutes "unauthorized assistance." The gray areas must be colored black and white for students.

6.3 Refocus on Critical Thinking

Curriculum must pivot away from information retention (which AI does best) to synthesis and evaluation (where humans excel).

- **Human-Centric Skills:** Focus on skills AI lacks: empathy, ethical reasoning, nuanced argumentation, and creative metaphor.
- **The "Human in the Loop":** Mandate that AI use, if permitted, must be an iterative process where the student adds at least 50% more value to the AI's output.

7. Conclusion

The integration of AI tools into secondary education is an irreversible tide. This research paper highlights that the impact of AI on critical thinking and academic integrity is a double-edged sword. On one side, AI offers personalized support that can democratize learning and scaffold understanding for struggling students. On the other side, it presents a profound risk of cognitive atrophy, where the ability to think deeply, struggle with problems, and generate original ideas is eroded by the convenience of immediate answers.

The crisis of academic integrity is perhaps a symptom of a larger transition—a transition where the definition of "authorship" and "work" is being rewritten. The data indicates that secondary students are currently navigating this transition without a compass, often defaulting to the path of least resistance. Ultimately, AI will not replace students, but students who use AI effectively and critically will replace those who do not. The goal of education must shift from filling students with information to teaching

them how to command the machine intelligently. By redesigning assessments and embedding ethics into the curriculum, educators can ensure that AI serves as a launching pad for critical thinking, rather than a cage for the human intellect.

References

1. Baidoo-Anu, D., & Owusu Ansah, L. (2023). Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning. *Journal of AI*, 7(1), 52-62.
2. Eaton, S. E. (2023). The battle against AI contract cheating in higher education. *International Journal for Educational Integrity*, 19(1), 1-15.
3. Luckin, R., & Holmes, W. (2016). *Intelligence Unleashed: An Argument for AI in Education*. Pearson.
4. Mollick, E., & Mollick, L. (2023). Assigning AI: Seven Approaches for Students, with Prompts. *SSRN Electronic Journal*.
5. Sharples, M. (2022). The development of a chatbot for supporting learning in higher education. *International Journal of Educational Technology in Higher Education*, 19(1), 1-13.
6. UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO Publishing.
7. Stokel-Walker, C. (2023). AI bot ChatGPT writes smart essays — should professors worry? *Nature*, 612(7939), 22-23.