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EXPLORING THE INFLUENCE OF AI-GENERATED CONTENT ON CRITICAL THINKING SKILLS OF UNIVERSITY STUDENTS

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Abstract

This study investigates the impact of AI-generated content usage on the critical thinking skills and ethical-reflective academic behavior of university students. With the rapid adoption of generative AI tools such as ChatGPT, Bard, and Claude across academic disciplines, concerns have emerged regarding their influence on students' cognitive engagement and moral responsibility in educational settings. Employing a cross-sectional survey design, data were collected from a stratified random sample of 400 university students representing diverse fields including Humanities, Social Sciences, STEM, and Business, as well as both undergraduate and graduate levels. Participants' AI usage patterns were measured alongside validated scales assessing critical thinking competencies and ethical-reflective practices in academic work. Correlational analyses revealed a significant inverse relationship between the frequency of AI-generated content use and students' critical thinking skills, indicating that excessive reliance on AI tools may undermine students' ability to engage in analytical reasoning. Additionally, a notable negative association was found between AI use and ethical-reflective behavior, highlighting potential risks to academic integrity and responsible scholarship. Conversely, a positive relationship between critical thinking and ethical use suggests that students who maintain higher cognitive rigor are more likely to employ AI tools responsibly. These findings align with prior research underscoring the need for discipline-specific AI literacy and ethics education to mitigate overdependence on AI outputs and to foster critical and ethical engagement. The study emphasizes the vital role of higher education institutions in developing clear policies and instructional strategies that promote reflective, transparent, and ethical use of AI technologies. This will ensure that AI serves as a supportive aid to intellectual growth rather than a substitute for critical and ethical academic practices.

INTRODUCTION

The rise of artificial intelligence (AI) technologies, including systems that generate human-like content, has transformed education. As AI-powered tools (ranging from ChatGPT, Bard, and Claude) have been folded into the very work of schooling, students now have ready-to-hand access to advanced systems of summarizing texts, solving problems, generating essays, and even simulating academic discussion.

While offering a wealth of advantages of ease of use and access to information, these tools also introduced substantial challenges to developing students' analytical competence. Critical thinking is "thinking about thinking" or the ability to analyze, evaluate, and synthesize information for informed decision-making (Facione, 2015). It is a central outcome construct in higher education (Paul, Elder, & Bartell, 1997). The ubiquitous use of AI-based content generation may subtly dissuade students from thinking deeply and automatically to rely on pre-digested answers, needing little cognitive investment (Bender et al., 2021).

Many research works have proven the advantages and disadvantages of AI in education. First, AI means that learning can be scaffolded: giving examples, explanations, and immediate feedback means that learning can be supported at a pace that best enables understanding and motivation for each individual (Luckin et al. On the contrary, excessive dependence on these resources may do nothing but undermine the abilities that academia aims to promote, such as autonomous reasoning, reasoned judgment, and intellectual thoroughness (Florida, 2019). This is especially troubling when students rely on AI not to supplement research but to stand in for engaging directly with academic content. Educational technology research has long recognized cognitive engagement as the cornerstone of meaningful learning (Chi & Wylie, 2014), yet AI's role in automating knowledge production runs counter to this pedagogical tenet. There are also ethical and pedagogical issues associated with AI-generated content. Non-disclosure of AI-assisted work could lead to students masking deficiencies in their work that may prevent a teacher from accurately assessing their learning (Cotton et al., 2023). Moreover, AI's facile copying and pasting can result in a homogenization of thought while discouraging plural and dissenting thinking essential for robust academic debate and a critical academic culture (Khalil & Er, 2023). These considerations are especially acute in fields that value argument and creativity (such as the humanities and social sciences). In light of the increasing use of AI instruments at the university level, exploring what those technologies have to tell us about the development of students' CTS is imperative. This study aims to investigate the relationship between AI-generated content and the critical thinking of undergraduate students and to investigate its usage pattern, perceived usefulness, and levels of cognitive engagement. By exploring the dynamics at work here, educators and policymakers can devise interventions that harness AI's power while protecting the cognitive autonomy of higher education.

Significance of the Study

This study is important as it deals with reconciling the incorporation of AI technologies with the retention of fundamental academic skills, particularly critical thinking. It is a resource for educators interested in critically adapting curricular and instructional practices to include AI tools. Institutional guidelines on the use of AI are also informed by the results, advocating academic honesty, transparency, and proficiency in AI. The study speaks to the cognitive and ethical risks of myopic trust in AI, underscoring how students' trust and use of AI influence their intellectual and ethical development.

Research Objectives

To examine the relationship between the use of AI-generated content and critical thinking skills

To assess the impact of AI-generated content on students' ethical and reflective academic behavior.

To analyze differences in AI usage patterns across academic disciplines and study levels.

Methodology

This study used a quantitative, cross-sectional research design to explore the relationship between university students' use of AI-generated content and students' critical thinking and ethical-reflective academic behaviors.399 students were sampled using stratified random sampling to attain proportional specialization representations for the faculties, including Humanities, Social Sciences, STEM, and Business, and levels (undergraduate and postgraduate). Criteria for inclusion in the study were that the participants had previously used AI tools like ChatGPT, Bard, or Claude at least once for academic purposes. Data were obtained through standardized questionnaires of AI usage patterns cri, tical thinking skills, and ethical-reflective practices. Correlation and regression techniques were conducted to investigate the variables' relationships and test hypotheses. This approach enabled us to generate a valid and reliable

evaluation widely applicable to participation in students' cognitive and ethical engagement within their academic work.

Literature Review

AI and the Cognitive Landscape of Higher Education

The presence of artificial intelligence (AI) in higher education has changed the way students have access to, process, and interact with academic materials. While we are not attempting to teach people to use such systems, it is common to use generative AI tools like ChatGPT to help read, digest (and outline and draft), and think. However, its effects on students' cognitive development, particularly critical thinking, are complex and multilayered. Ashadi et al. (2025) reviewed the evidence for the influence of AI and higher-order cognitive fns in university students. Their results underscore a trend of increasing reliance on AI-generated content that, while practical, short-circuits the analytical and evaluative mechanisms necessary for deep learning. Students may uncritically embrace AI feedback as authoritative without further inquiry, undermining their capacity to think critically and synthesize ideas.

Qawqzeh (2024) also found that the students who had high contact with ChatGPT reduced the originality of their outputs. The AI-generated quick and well-organized feedback that limited the students from analyzing or making their argumentation. This brings into question the idea of "cognitive offloading," which occurs after users allow digital tools to do the mental labor for them that would otherwise demand mental effort on their part (Risko & Gilbert, 2016). In educational settings, this offloading can result in decreased metacognitive monitoring and shallow text processing.

Lijie et al. (2025) also studied this problem in Malaysian universities. They found that while AI tools made access to information easier, they usually motivated students to look for prepackaged answers rather than evolve answers through inquiry. The researchers underlined the need for AI literacy. They suggested that the promise of AI can be realized only when students are introduced to critically assessing AI systems' outputs. Absent structured interventions, students are apt to revert to receiving information instead of engaging intellectually with it.

Additionally, Oliveira et al. (2025) found that students' views of the "intelligence" of AI can deprecate descriptions of students' reasoning.

AI Self-Regulation and Its Mediating Role

While the fears about an overreliance on AI tools are not unfounded, new research finds that how students utilize AI may be the factor that determines whether these technologies serve as a barrier or a bridge to critical thinking. Zhou, Teng, and Al-Samarraie (2024) investigated this nuance concerning AI self-moderation—the capacity of learners to monitor, assess, and regulate their interactions with AI-created resources. They found that students who used metacognitive strategies (e.g., questioning AI outputs and comparing them with other sources) evidenced higher levels of critical thinking and problem-solving skills.

This is supported by Shanto and Ahmed (2024), who provide a teaching model in which students continually question and extend AI outputs rather than accept them at face value. Their intervention, featuring activities geared toward detecting bias, cross-referencing claims, and integrating perspectives, yielded gains in analytic reasoning. The framework defines AI as not a substitute for student thinking but a cognitive partner to elicit reflective judgment.

The mediating effect of self-regulation is crucial in an unhealthy educational system, which measures assessment in terms of a product, not a process. In such settings, students may employ AI to produce the desired answers without being involved in reasoning. Zhou et al. (2024) claimed that embedding reflective checkpoints in assignments (e.g., justification for leveraging AI, critique of AI's response) can stimulate self-regulation and cognitive engagement.

Moreover, Lijie et al. (2025) found a relationship between students' AI literacy and their capability to detect errors/biases in AI outputs. AI skeptics were likelier to see the tools as prompts guiding further exploration than as authorities. This suggests that self-regulation is not a static trait but a trained skill.

In the final analysis, these studies entail an important insight that the influence of AI on critical thinking is nonlinear but contingent upon individual- and context-related factors. Learning to learn SRL is a prerequisite to help students maximize their cognitive gain from AI tools; their absence may lead students

to be successful cognitively but with a possibility of generating cognitive passivity and skill erosion.

Models for Fostering AI-Era Critical Thinking

As generative AI is increasingly incorporated into academic practice, scholars and educators need pedagogical frames that help students use these tools thoughtfully and responsibly. Instead of prohibiting AI tools or saying they can be liberally used, a middle ground has emerged to encourage structured, reflective use. Shanto and Ahmed (2024) proposed a holistic framework to improve critical thinking using AI learning. Their model invited students to question AI-generated outputs through reflective prompts, comparing them with academic resources and explaining whether they agreed or disagreed with AI claims. When applied in university classes, the framework significantly increased students' skills in gap detection, bias detection, and multi-source integration, which are the backbone competencies of critical thinking.

A similar approach was suggested by Yusuf et al. (2024), presenting concepts of a "synthesis-oriented evaluation model." Students were thus asked to appraise the trustworthiness of AI-generated information and combine this data with peer-reviewed research. Their research found that when students are asked to engage in such directed activities, their analytical thinking is deeper, and they demonstrate a greater ability to articulate subtly written defenses. Crucially, the approach also taught students to identify some of the shortcomings of AI models, like lack of context, overgeneralization, and hallucination of facts.

Oliveira et al. (2025) on these prompt-based critical thinking frameworks. In their research, student designers were trained to write layered prompts. When taking the AI outputs, they caused more levels of inquiry – it built on more steps of inquiries involved compared to the level of cognitive engagement from them taking just regular interactivity. However, when situated within a scaffolded instruction system, the researchers suggested that AI could be "reframed as a Socratic tutor"—as a device that "stimulates," rather than replaces, thought.

Additionally, Sardi et al. (2023) emphasized the feedback in these frameworks. Their research identified that students who were provided teacher or peer feedback about how they interacted with the AI tools were likelier to self-analyze their use and transfer critical strategies for further interactions. These models stress that AI can improve education when deliberately embedded in reflective, iterative student' designs.

Drawbacks of Relying Too Much on AI Results

Even though the framework has the potential to solve this problem, it is just as important not to rely too much on AI in academia. One of the most common concerns is that AI-generated content will result in cognitive laziness and reduced student agency. Qawqzeh (2024) found that when students depended so much on ChatGPT to produce essays, they did not have the chance to generate their ideas. Many of their tasks appeared less original, coherent, and reflective of a thorough understanding. The danger, expressed by the author, is that AI might facilitate a "copy-paste teaching" by which students turn into purely receptive rather than reflective participants.

Cui and Zhang (2025) reported that students tend to trust AI-generated information uncritically, especially when the information is linguistically fluent and factually structured. This state of "blind trust" is ruining our ability to discern the truth, particularly when AI spits out false-in-fact or faulty content. Students, therefore, conceal these pitfalls if they are not exposed to an education in AI literacy, which results in mistakes in academic work and a false sense of adequacy.

Ashadi et al. (2025), in their systematic review , reiterated this concern, pointing out that the solace that learners can get in obtaining the answers from AI is in contrast to their actual learning effort. They added that there was a significant decrease in trial engagement when AI was easily accessible to students during formatives. With cognitive challenges removed, you can develop and practice critical thinking.

Darwin et al. (2024) also pointed out cross-disciplinary distinctions in using AI. For the humanities, where interpretation and depth of argumentation are key, too much reliance on AI eliminated diversity of thinking and inhibited creativity. Conversely, students in the technical domain applied AI more for information retrieval and verification, were less likely to show a decreased

reasoning depth, and tended to under-analyze AI-derived solutions.

Lastly, the ethical consequences of overdependence need to be taken into account. Lijie et al. (2025) note that submitting student work generated using AI systems without adequate attribution undermines the credibility and authenticity of the learning experience. They recommend that institutions set clear guidance and assessment rubrics that promote transparency and critical engagement instead of punishment for using AI.

Cross-Disciplinary Impact

The effect of AI-written text on students' critical thinking varies greatly between disciplines. This variability is due to how the various domains define and use critical thinking, the quality of the problem being addressed, and the nature of knowledge production. As stated by Yatigammana et al. (2024), students who study in STEM do not use AI tools the same way as those in the humanities. In fields like STEM, students are already harnessing AI for computing tasks, coding help, and brief write-ups of technical materials. These apps promote efficiency and free up time for understanding and doing things. There is less clear evidence concerning AI's impact on higher-order cognitive functions such as analytic reflection.

By contrast, in humanities and social sciences, students likely stand to lose something in the form of the development of argumentation, synthesis, and interpretive reasoning if they come to depend too much on generative AI to provide text-based responses. Darwin et al. (2024) observed that students in literature, philosophy, and social science studies were likely to consider uncritically AI-generated novels after reading them. As I have argued above, this resulted in the diminution of dialectical debate and the absence of ideas. Essays became formulaic, often reflecting the language style and construction of AI models with little nuance or originality.

Bukoye and co-workers reported a similar finding (2024) in their business school research work in the UK. This made students value AI outputs as they were "well-formed" and "sounded professional," wrongly believing fluency equated to legitimacy. This interdisciplinary review indicates that fields with a high tolerance of ambiguity and contestability risk being intellectually co-opted by AI unless safeguards and pedagogical interventions are deployed.

Ethics, Transparency, and Bias

The ethical considerations of AI-produced content in education reach beyond questions of plagiarism to concerns surrounding transparency, authorship, and bias. One of the key issues Sardi et al. (2025) raise is students' inadequate declaration of the source of AIDE materials in their assignments. This coverup about their competence is a false figure of their skill and sabotages instructors' efforts to give accurate feedback, thus destroying the entire academic evaluation process.

In addition, students tend not to understand the algorithmic biases in AI models. Cui and Zhang (2025) pointed out that many of our students were uncritically trusting AI outputs without knowing that these AI tools are trained on large datasets that reproduce the dominant culture, ignore the voices of minorities, and continue stereotypes. This is particularly problematic in sociology, gender studies, or ethics, where diverse viewpoints and analytical reflection on systemic-level phenomena are pivotal to learning. If students are not taught how to detect bias, they can fail to recognize the wrong or prejudices in their work.

Ethical utilization also requires an understanding of the constraints of AI reasoning. Even though AI can fake it with rationality and coherence, it cannot understand or appreciate context. Ashadi et al. (2025) indicate that users consistently overestimate the cognitive capabilities of AI tools; they ``endow machine-generated content with human judgment'' (p.11). The result of this anthropomorphization is a decrease in critical inspection and a mistakenly equalizing of human versus machine cognition. Oliveira et al. (2025) underscored the importance of organizations developing ethical AI policies that promote AI transparency and ethical sourcing and inculcate algorithmic accountability. They argue the case for incorporating modules on AI ethics into university courses to educate students about the origin of data, the failings of models, and the negative implications of unfettered automation in idea generation. Lijie et al. (2025) stressed that ethics is not a problem for students only but a systemic matter. Universities should provide clear guidance about what

appropriate AI use looks like and empower educators with the means to identify and counter any ethical abuse. They suggest that AI log, reflective justification, and peer-review processes be integrated within assessment systems as part of a dynamically evolving model that cultivates transparency and ethical reasoning.

Results and Analysis

Table 01

Demographic Profile of the Respondent

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	151	50.5
	Female	148	49.5
Age	18–20 years	31	10.4
	21–23 years	121	40.5
	24–26 years	118	39.5
	27 years and above	29	9.7
Academic Level	Graduate	119	39.8
	Undergraduate	180	60.2
Field of Study	Naturel Science	238	79.6
	Social Science	61	20.4

The demographic profile of the 299 university student respondents reveals a nearly balanced gender distribution, with 50.5% male and 49.5% female participants. In terms of age, the majority of students were between 21–23 years old (40.5%), followed closely by those aged 24–26 years (39.5%). A smaller proportion of respondents fell into the 18–20 years (10.4%) and 27 years and above (9.7%) categories. Regarding academic level, 60.2% of the participants were undergraduate students, while 39.8% were graduate students. The distribution across fields of study was notably skewed, with a large majority, 79.6%, belonging to Natural Sciences, and only 20.4% coming from the Social Sciences. This demographic spread provides a broad representation of university students' academic and age-related diversity, while also highlighting a predominant orientation toward the sciences.

Table 02

Pearson Correlation Between Use of AI-Generated Content, Critical Thinking, and Ethical and Reflective Use

		UAC	CT	ERU
Use of AI-Generated Content	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	299		
CT	Pearson Correlation	-.249**	1	
	Sig. (2-tailed)	.000		
	N	299	299	
ECD	Pearson Correlation	-.464**	.266**	1
	Sig. (2-tailed)	.000	.000	
	N	299	299	299

Table 1.2 The correlation analysis revealed significant relationships among the three key variables: Use of AI-Generated Content (UAC), Critical Thinking (CT), and Ethical and Reflective Use (ERU). A statistically significant negative correlation was found between the use of AI-generated content and critical thinking ($r = -.249$, $p < .01$), suggesting that increased reliance on AI tools may be associated with a decrease in students' critical thinking skills. Similarly, a moderate negative correlation was observed between the use of AI-

generated content and ethical and reflective content use ($r = -.464$, $p < .01$), indicating that greater use of AI-generated content tends to be linked with lower ethical awareness and reflective academic behavior. On the other hand, there was a positive correlation between critical thinking and ethical and reflective use ($r = .266$, $p < .01$), implying that students who exhibit stronger critical thinking tendencies are more likely to engage in ethical and reflective use of AI tools. These findings highlight the potential cognitive and ethical trade-offs in the increasing integration of AI-generated content in academic environments.

Discussion

The study's results demonstrate a differentiated relationship in the following areas: between students' engagement with AI-generated content and their critical thinking, as well as their ethical and reflective academic behavior. Consistent with concerns expressed in recent literature, our findings suggest that a greater reliance on AI tools is associated with a decline in students' ability to think critically and their ethical commitment to academic integrity.

Darwin et al. (2024) pointed out that students studying in interpretive fields, such as literature, philosophy, and the social sciences, were particularly susceptible to uncritically accepting AI-generated responses. This passive dependence led to more minimalist argumentation and a decline in dialectical thinking. The concomitant of this perspective, I wish to propose in the following, is that uncritical reliance on AI-produced content might even propound original thinking and obstruct the chance of intellectual advent.

The ethical considerations were also key features of this study. As noted by Sardi et al. (2025), one significant issue is that students do not declare AI as an aid, which essentially hides their ability; if it is not visible to the institution or the qualification authority, the assessment is not valid. The findings of the study at hand seem to confirm this claim, as they show that frequent users of AI tools are associated with less ethical and reflective academic and behavioral patterns.

Cui and Zhang (2025) acknowledged the dangers of students' indifference to algorithmic bias, especially in areas of study where critical perspectives and cultural competence are necessary. In fields like sociology and gender studies, this ignorance can mean that systemic biases in training data are regurgitated by models. These issues are particularly pertinent when students view themselves as neutral recipients of AI-generated texts without questioning their premises.

The link between critical thinking and the ethical use of AI discovered in this investigation is consistent with the work of Zhou et al. (2024), who noted that graduate-level students, particularly those in research-oriented programs, are more likely to view AI tools with a critical and ethical perspective. This distinction could be explained by their stronger disciplinary background and more experience in academic integrity policy.

Furthermore, the present investigation indirectly supports Oliveira et al. (2025), who called for the embedding of ethical AI practice across higher education. Their suggestions, such as creating explicit policies, implementing transparency requirements, and incorporating AI ethics modules, align with the findings of our study. If students are not guided, they will tend to anthropomorphize AI tools and attribute machine-generated content to human-like reasoning and moral judgment (Ashadi et al., 2025).

The heavy natural science demographic composition of the respondent sample prompts thoughts about disciplinary culture and its role in shaping dependency on AI. Bukoye et al. (2024) pointed out that in disciplines where there is a premium on technical fluency among students, equating well-crafted outputs with scholarly rigor may be given as much authority as written, mathematical, rigorous work.

Collectively, these results highlight the need for discipline-specific AI literacy programs that do more than teach students technical proficiency but also develop their critical and ethical discernment. As Lijie et al. (2025) noted, establishing an ethical culture for AI use is a collective institutional duty. They can do so not just by offering clear guidelines for use but by training and resourcing their faculty to adopt a responsible AI pedagogy. Practical approaches, including AI use statements, reflective commentaries, and peer feedback for role modeling, are among the strategies that can be used to bridge the gap between technical use and ethical academic practice.

Conclusion

This study examined how the use of AI-generated content affects university students' critical thinking skills and their ethical and reflective academic behavior. The results showed a significant negative relationship between frequent use of AI tools such as ChatGPT and Bing AI and students' ability to think critically and act ethically. This suggests that depending too much on AI may reduce students' engagement in thoughtful analysis and responsible academic decision-making. On the other hand, the study found a positive link between critical thinking and ethical-reflective use of AI, indicating that students with strong critical thinking skills are more likely to use AI tools responsibly. Although AI technologies provide many benefits such as saving time and supporting learning they can also negatively impact students' intellectual and moral development if used without care. Therefore, it is important for educational institutions to offer clear guidelines and training to help students use AI tools in a responsible, thoughtful, and ethical way.

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