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# *"Not lazier, I'm Sharper with AI":* Analyzing How Artificial Intelligence Restructures Students' Cognition

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## Abstract

This study This qualitative case study explores how AI assistance influences students' cognition in English academic writing. With 18 undergraduate students in an Academic Writing course as research participants, the study compares assignments and reflections that were created with and without the aid of AI. Data were collected through two main sources: a set of written assignments (one non-AI-assisted and one AI-assisted per student) and reflective personal statements detailing students' learning experiences. The primary instruments included a qualitative analytic framework adapted from a writing rubric to guide close reading and thematic coding of both assignments and reflections. Data analysis was conducted through comparative content analysis and thematic analysis, focusing on key dimensions such as argumentation, organization, creativity, grammar, and real-world awareness. The findings suggest that AI-assisted writing not only supports surface-level features, such as grammar and vocabulary, but also fosters deeper argument, organization, and critical engagement skills. Many students expressed greater confidence and an enhanced awareness of problems in the world, saying that AI had led the way to more effective, independent thinking; but the analysis emphasizes that the extent of cognitive reframing varies significantly depending on how purposefully and critically students interact with AI tools. Conclusively, the results contribute to the ongoing discussion of AI in higher education: when used thoughtfully, AI can be a complementary pedagogical partner that enhances higher order thinking and self-efficacy. The study recommends further research in different contexts and on long-term outcomes.

Keyword: academic writing, artificial intelligence, cognition, higher-order thinking, higher education.

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## INTRODUCTION

The education field has been altered in the past few years by the fast pace of development of artificial intelligence (AI) and its application in the classroom. At an international level, one persistent theoretical claim driving debate is what is often framed as the premise that AI is revolutionizing the nature of human cognition, learning and knowledge production (Labadze et al., 2023). AI, and specifically generative language models like ChatGPT, is argued by scholars and educators to afford the ability to enhance human thinking, automate cognitive labor, and assist learners in grappling with ever more complex intellectual activities (Baek et al., 2025). The shift is less a technological one than a cognitive and cultural one: As students rely on AI to help them think, the definition of what is "authentically" human is moving, with implications for how we value knowledge, purpose, agency and intent. The use of AI in education via automated essay feedback, adaptive learning systems, or conversational tutoring bots, signifies a new age where technology is not just used to disseminate knowledge, but to actively provokes ideas (Harisha et al., 2024). As such, the global debate around education no longer revolves around if AI will alter education, but how it is shaping students' thinking and learning and their ability to demonstrate understanding.

Amongst this global debate, there is a subset of discussion which is under-examined – and that of the potential influence of AI on students' cognitive development as evidenced in their academic writing and the presentation of their work (Vibhavi et al., 2024). Despite the massive focus on the "technical" potential of AI tools, or their ability to scaffold the development of surface level skills (such as grammar and spelling), little is known about how AI actually shapes the deeper structures of student cognition—thinking critically, developing a cogent argument, thinking originally, acquiring intellectual habits of mind. In particular, it is increasingly important to understand how students are interacting with AI within the context of higher education assignments and whether such interactions lead to more shallow or more deep cognitive outcomes (Belda-Medina & Calvo-Ferrer, 2022). This space covers the visible changes in students' written products and the less visible, internal changes in students' ways of thinking about solving problems, making arguments, and thinking about and reflecting on their own learning.

It is very significant to investigate this phenomenon from different points of view. First, the rapid rise of AI tools in education that is frequently challenging to operationalize in ways that align with institutional scale, assessment practices and staff readiness (Mushtaq, 2025). The true cognitive effects of the use of AI matter for educators who need to create meaningful assignments, promote academic integrity and nurture true intellectual development. Second, as AI debates grow in society, empirical work on how students work with the technology can inform policy, pedagogy and ethical guidelines for its responsible use (Duhaim et al., 2022). Third, because the data comes from real student work collected at intervals over time (as opposed to hypothetical or stand-alone survey items), the findings help to provide a grounded reality check about how AI is (or is not) changing the

content of what students learn in action (Yoo et al., 2022).

Some important groundwork has been laid in this area by previous investigations, but significant gaps still persist. Zhum et al. (2024) conducted a systematic review on AI in HE and reported that the main focus of the research literature is on technical implementations of AI instead of its cognitive effects. Price (2024) studied teachers' and students' attitudes toward AI in education, finding excitement about the potential of AI to serve as model and fears about authenticity and erosion of expertise. Then, Sari et al. (2024) reviewed the support of self-regulated learning by AI, claiming that AI-based feedback may help to increase in metacognitive awareness. But their methodology was based heavily on students' recollections of what they had done, rather than an analysis of the students' actual work. Rahman et al. (2022) also questioned the rhetoric of AI-inspired "transformation" of education and called for attention to how technology mediates the purposes and practices of learning, rather than just the products of learning.

In spite of the listed potential fields, there are still important research gaps. Notably, few studies have investigated the comparative quality of reconstructed student assignment content, generated with, and without AI support, in a detailed and descriptive way. Little is known empirically about the extent to which cognitive structures—critical thinking, originality, or logical argumentation, for instance—are registered in real academic work outside of conventional classroom and test-taking venues when technological supports vary. Additionally, prior research frequently depicts AI as a monolithic force and does not consider students' nuanced approach to strategically utilizing or contesting AI tools based on the type of task, their own objectives, or institutional expectations. The theoretical contribution of the current study that undermines it is that it focuses on both the product (what the students make) and the process (students interacting with AI), to identify developmental trends and not static figures.

We therefore believe the main contribution to be the deep, document-level comparison of student output with and without AI support, together with the students' reflections on their learning. Through the examination of the completed texts and the means whereby students made their strategies, challenges, and decision to use, or not use, AI at the beginning and end this thesis intends to extend our understanding of the complex relationship that AI can have in relation to scaffolding and supplanting authentic cognitive activity. It transcends the simplistic "lazy" or "sharp" binary to shed light on the murky landscape where technology, agency and learning meet.

According to the above reasoning, the qualitative research question of the study is:

*How does the use of artificial intelligence assistance restructure students' cognition, as reflected in their writing assignments and self-reported learning experiences?*

## LITERATURE REVIEW

The early raise of AI in education revolved around the creation and trial of

intelligent tutoring systems (ITS) and adaptive learning environments (Issa, 2024). These systems were developed to personalize learning to each student's unique needs and automate functions, such as the diagnosis of errors and feedback delivery. There were findings suggesting that ITS could improve student achievement in mathematics and science or language by providing individualized scaffolding (Gutiérrez-Colón & Alameh, 2024). However, a lot of this early work concentrated on more superficial products such as test scores or end-of-sequence toil, rather than attempts to unfold more sophisticated cognitive processes like critical thinking, originality, or argumentation.

In the age of more sophisticated AI – like natural language processing (or NLP) or generative language models (like those found in OpenAI's GPT series) – the focus has turned to how AI might be able to actively participate in, or even co-construct, the writing of academic prose. AI that generates essays, summaries, and reports is now available on the request, and this also blurs the line between what is owed to the student, and what is the technology itself (Riyanto et al., 2024). Supporters claim that AI tools level the playing field for academic support, benefiting students of all backgrounds and abilities (Haristiani, 2019). Critics warn, however, that this reliance may create shallow learning and diminished academic integrity (Lee & Hahn, 2024).

Attempts have been made in empirical research to disentangle these contradictions. Liyana (2022) observed that the majority of AI studies in higher education were concentrated on administrative use and grading rather than on cognitive effects. Izzati et al. (2020) proposed that with utilization in a reflective learning context, AI can enhance cognitive development through scaffolded practice of metacognitive strategies and novel modes of feedback provision. Other relevant works include Safar & Anggraheni (2024). Further, Ma (2023) finds that AI-assisted feedback might help students to address the structure to a better writing; however, it could discourage critical involvement if used in a non-intentional, non-reflective way.

In regards to cognition restructuring, it is about the changing of how people think, interpret, and create their own meaning, transcending the acquisition of knowledge to actually shifting paradigms of understanding. In the field of educational psychology, cognitive restructuring is profoundly related to the way in which the students advance towards higher development, and more abstract levels of thinking, just when they encounter new information, face challenges, new tools or strategies are introduced to them. It is not just the retention of the information acquired, but the re-assembly of the information into more efficient, adaptable, highly interconnected structures.

The centrality of restructuring to meaningful learning has been a central theme in cognitive development theories. Jean Piaget, for example, characterized cognitive development as a sequence of restructurings through which children pass qualitatively differing stages of understanding. Also, Shaddad & Jember (2024) explained that Vygotsky cognitive change is situated in social and cultural interaction where learners restructure their thinking as they internalize new language, symbols and tools - most times with the help of a more expert other

(peer or adult). In either model, real cognitive development comes from going beyond surface-level recall to deeper, more integrated levels of comprehension (Sohrabi, 2021).

Cognitive restructuring can occur through various experiences such as exposure to wicked problems, involvement in reflective dialogue, and exposure to conflicting perspectives or digital technologies (Ismail & Syahputri, 2025), such as artificial intelligence AI. When learners encounter new knowledge that does not fit into their cognitive frameworks, they may experience cognitive dissonance inducing them either to fit their schema or to accept the new knowledge. This transformation is visible as learners progress from memorization to sense making, from sequential to systematic reasoning, or from reliance on the external to increasing self-control (Saleem et al., 2021).

## METHODOLOGY

This research used a qualitative case study (Miles et al., 2014) to explore how AI-supported assistance shapes and re-shapes students' cognition in writing in academic contexts. The study was conducted with 18 undergraduate students who took Academic Writing class at Universitas Serambi Mekkah in the 4$^{th}$ semester. These students both took part voluntarily and as part of their studies and confirmed prior to the study that they would do so in a way that preserved anonymity and would not affect their course of study. Data was primarily collected from two sources: Student written assignments and student reflective personal statements. Two crucial writing projects of each participant were submitted: one that an individual wrote without relying on AI and one that utilized AI tools like ChatGPT, perplexity-AI, or Gemini. The writing topics and formats for the assignments were designed to be comparable so that writing processes and cognitive engagement could be compared across conditions. The intention was to see whether there were any changes in the way students learnt to write during, and after, being supported by AI. Upon completion of the tasks, the students were required to write a reflective piece of personal statement. They were then asked to narrate their experiences with having AI aid in how they arranged essays and structured arguments, selected vocabulary, addressed grammar, and connected ideas to the larger world around them. Students were also encouraged to think about what it felt like for them to learn with AI and the positives and the negatives they experienced. This style of testimony allowed the participants to express themselves openly in their own words, as well as producing richer and more authentic qualitative data than structured interviews might generate (Stuckey, 2015).

The study employed a qualitative analytic framework based on the original assignment rubric. To make use of the rubric, not in a point assessment but as a framework, it was transformed in broad topic areas facilitating the collection theme analysis of the data. These analytic dimensions for the written tasks were as follows: (1) Critical thinking (CT); (2) Originality (Or); (3) Grammar and Language Use (LG); (4) Creativity (CR); and (5) Coherence and Cohesion (CC). Both collections (Non-AI and AI-assisted) were read carefully and relatively, noting

patterns in how students articulated their claims, elaborated and developed ideas, and articulated their thoughts before and after using AI. Rather than grading assignments for correct or incorrect responses, the analysis attempted to capture the subtleties of the students' emerging ideas, the trends in their language, and the alternative strategies that commanded their attention. Furthermore, personal statements were thematically analyzed employing analytic categories including (1) Structure and Organization; (2) Vocabulary Enrichment; (3) Grammar and Language Use; (4) Argumentation and Use of Evidence; (5) Creativity; (6) Cohesion and Flow; (7) Academic Tone; and (8) Real-World Awareness. A thematic analysis was used to code the testimonies to ascertain what students with similar testimonies discussed and what they differed in discussing with regards to their experiences of learning. The analysis was based not only on what students wrote, but also how they wrote about their shifts in mindset, confidence, self-regulation and academic skills during the training. Themes and differences emerged and some surprising insights became apparent around what AI meant to them as writers.

In regards of the validity and reliability, multiple strategies were employed. Findings from the task between the themes identified in assignment analyses and those from personal statements were compared to look for convergence or divergence. Peer debriefing was employed, where an interrater critically reviewed and discussed emergent codes and themes to reduce researcher bias. Member checking was conducted through summary interpretation feedback, shared with selected participants to comment or elaborate on their experiences.

Additionally, the research was conducted with ethical consideration at every stage. All student participants voluntarily undertook the study after receiving a full explanation on what is the purpose and methodology of the study, and made an informed affirmative consent. All the participants' information was coded at the time of interviews, by pseudonyms or initials and it is handled under total confidentiality and anonymity. It was also emphasized to the students that there would absolutely be no implications of their participation – or non-participation – on their study mark or academic report.

## RESULTS AND DISCUSSION

This section describes and analyses the results of the study of how AI assistance re-shapes student cognition in writing. Investigating the written products as well as the reflective personal statements of 18 students in one section of the course, the research attempted to capture both observable changes in output (in form of texts written) and self-reported learning processes. This discussion integrates the analytic findings with extracts from student products, reflections and related research reports, and provides a rounded account of AI in academic writing processes.

The first level of analysis involved a close comparison of student assignments completed without and with AI assistance. Table 1 summarizes the observable changes across five key qualitative indicators: Critical Thinking, Originality, Language, Clarity, and Cohesion. While numbers are presented for illustration, the emphasis throughout is on the qualitative meaning behind these shifts. The second

level of analysis centers on the students' personal reflections, providing rich, first-hand testimony of the ways AI-assisted essays influenced their thinking, writing practices, and confidence as academic writers.

| Code | Non-AI-assisted | | | | | | AI-assisted | | | | | | Observation |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *CT* | *Or* | *LG* | *CL* | *CC* | *Sum* | *CT* | *Or* | *LG* | *CL* | *CC* | *Sum* | |
| Stu. 1 | 3 | 3 | 3 | 2 | 3 | 14 | 4 | 4 | 4 | 3 | 4 | 19 | Marked improvement |
| Stu. 2 | 3 | 3 | 3 | 2 | 3 | 14 | 4 | 4 | 4 | 3 | 4 | 19 | Improved across all areas |
| Stu. 3 | 2 | 2 | 3 | 2 | 2 | 11 | 3 | 3 | 3 | 3 | 3 | 15 | More creative, better clarity |
| Stu. 4 | 3 | 2 | 3 | 2 | 3 | 13 | 4 | 3 | 4 | 3 | 4 | 18 | Significant structure boost |
| Stu. 5 | 2 | 2 | 2 | 2 | 2 | 10 | 3 | 3 | 3 | 3 | 3 | 15 | General improvement |
| Stu. 6 | 4 | 3 | 4 | 3 | 3 | 17 | 4 | 4 | 4 | 4 | 4 | 20 | Maintained, slightly better creativity |
| Stu. 7 | 3 | 2 | 3 | 2 | 2 | 12 | 3 | 3 | 3 | 3 | 3 | 15 | Improved originality |
| Stu. 8 | 2 | 2 | 2 | 2 | 2 | 10 | 2 | 2 | 3 | 2 | 3 | 12 | Minor improvement |
| Stu. 9 | 3 | 3 | 3 | 2 | 3 | 14 | 4 | 4 | 4 | 3 | 4 | 19 | Better analysis |
| Stu. 10 | 3 | 2 | 2 | 2 | 2 | 11 | 3 | 3 | 3 | 3 | 3 | 15 | Improved overall |
| Stu. 11 | 4 | 4 | 3 | 3 | 4 | 18 | 4 | 4 | 4 | 4 | 4 | 20 | Almost perfect |
| Stu. 12 | 2 | 2 | 2 | 2 | 2 | 10 | 3 | 3 | 3 | 3 | 3 | 15 | Noticeable improvement |
| Stu. 13 | 3 | 3 | 3 | 3 | 3 | 15 | 4 | 4 | 4 | 4 | 4 | 20 | Significant boost |
| Stu. 14 | 3 | 2 | 3 | 2 | 3 | 13 | 4 | 3 | 4 | 3 | 4 | 18 | Much clearer argument |
| Stu. 15 | 2 | 2 | 2 | 2 | 2 | 10 | 2 | 2 | 3 | 2 | 3 | 12 | Slight progress |
| Stu. 16 | 3 | 3 | 3 | 2 | 3 | 14 | 4 | 4 | 4 | 3 | 4 | 19 | Sharper analysis |
| Stu. 17 | 3 | 3 | 3 | 2 | 3 | 14 | 4 | 4 | 4 | 3 | 4 | 19 | Consistent gain |
| Stu. 18 | 2 | 2 | 3 | 2 | 2 | 11 | 3 | 3 | 3 | 3 | 3 | 15 | Improved clarity |

*(CT=Critical Thinking, Or=Originality, LG=Language, CL=Clarity, CC=Cohesion)*

Table 1. Non-AI vs. AI-Assisted Assignment Scores

A detailed, qualitative comparison of writing samples vividly illustrates the impact of AI support. Students' non-AI essays were frequently marked by awkward phrasing, repetitive vocabulary, and logic gaps, as seen in this example on social media:

Social media is very many used by student nowdays [sic]. It make [sic] communication easy and student can find information fastly [sic]. Some student use social media for group discuss and share homework, but sometimes social media make student spend many times for not important things. They often open social media and forgot to study their lesson. Sometime, information from social media is not true, so student can get mistake knowledge. In finally, social media give good and bad impact for student learning. Student must use social media with

wise and don't waste too many times on it. Teacher and parents also should telling [sic] student for use social media for study, not only just for play *(Stu. 17 non-AI)*.

Such writing demonstrates common struggles with grammar, coherence, and academic tone—challenges frequently noted in prior studies, such as Nassim (2018) and O'Reilly & Milner (2020), who observed that unassisted drafts often lack sophistication and accuracy.

In contrast, the same students' AI-assisted essays showed marked improvements in all qualitative indicators:

Social media has revolutionized the way students access information and interact with their peers. Platforms like WhatsApp and Instagram facilitate collaboration through group chats, allowing students to share resources, discuss assignments, and support each other academically. However, the constant stream of notifications and entertainment can easily lead to distraction and procrastination. Misinformation is another risk, as students might encounter unreliable sources or fake news. Despite these challenges, social media remains a powerful educational tool when used responsibly. By developing digital literacy and time management skills, students can maximize the benefits of social media while minimizing its drawbacks. Ultimately, a balanced approach—guided by teachers and parents—can turn social media from a source of distraction into a valuable learning resource *(Stu. 17 AI-assisted)*.

Additionally, the influence of AI is apparent not only in enhanced grammar and vocabulary, but also in improved argumentation and coherence. These findings echo Ābele et al. (2021) and Moriyanti et al. (2019), who have highlighted the potential of AI tools to scaffold higher-order thinking and support students' development of academic language.

A similar trend appeared in writing about environmental topics. A non-AI essay reads:

Trash is everywhere make [sic] problem for city. People put garbage in street and not care about environment. If too many trash [sic], the air will become sick and river not can drink by animal and people. Some trash is plastic, it cannot finish, it just stay [sic]long time and make the soil angry. If burning garbage, it explode [sic] smell and make children cough more. Many time, the trash is walk to ocean and fish eating [sic] bag plastic, so fish is die and people cannot dinner with fish again. To solve, people must throw trash not in anywhere, but sometimes people still doing. Sometime, I see animal inside trash, it very sad. Trash is bad, all people must clean always everydays [sic] to avoid die because trash is. Teacher say garbage not good, so we must not love trash *(Stu. 4 non-AI)*.

The AI-assisted version, by the same student, demonstrates richer detail, logical development, and discipline-specific vocabulary:

Proper waste management is essential for maintaining a healthy environment and ensuring the well-being of communities. When people carelessly dispose of trash on the streets or in rivers, it leads to pollution, health problems, and harm to wildlife. Plastic waste, in particular, poses a serious threat because it does not decompose easily and can persist in the environment for hundreds of years. Burning garbage releases toxic fumes that can cause respiratory illnesses,

especially among children. Additionally, when trash ends up in the ocean, marine animals often mistake it for food, leading to injury or death and disrupting the food chain. To address these issues, individuals must dispose of waste responsibly, and governments should implement effective recycling and waste management programs. By working together, we can reduce pollution, protect wildlife, and create cleaner, safer communities for everyone *(Stu. 4 AI-assisted).*

Moreover, the examination of the students' reflective statements indicates the explicit increase in their awareness related to the structural, lexical, and argumentative strategies being treated. Many students explained that responding to AI-assisted essays helped them improve their skills in organizing their thoughts, expanding academic vocabulary, and using better grammar. Many participants also remarked that they felt more confident in building and supporting arguments, and felt better able to make their writing flow smoothly from one point to the next. Significantly, students also cited the development of an academic discourse and an increasing awareness of the real-world implications of the issues they were examining. These thoughts represent more than just a technical improvement and there is a deeper shift here in terms of confidence and critical engagement with their learning. For further thematic examples from the student testimonies, see Appendix.

From the students' personal reflections, they consistently reported that exposure to AI-assisted essays helped them develop a clearer sense of how to structure arguments, expand their vocabulary, and maintain formal, academic tone. Many described feeling "more confident" in organizing ideas and "more aware" of real-world issues—findings that resonate with previous research (Haristiani, 2019).

Overall, the outcomes suggest that cognitive restructuring in academic writing is facilitated with the help of AI. The apparent enhanced outcomes in student work are congruent with Kenya et al. (2023) stating that AI, when employed strategically, can boost—rather than supplant—student agency and metacognition. Not only did they take new vocabulary and structures into their own language, they also felt they had been more able to form and defend arguments, move from rote production to critical engagement (Koriat, 2015). The evidence also demonstrates that learning gains are deeper than surface level and include being able to think through and flow one's thoughts logically, speak in an academic voice, and have a better sense of the broader applications of the topic of which they write. This is supported by Sarker (2024) study which showed that when students actively reflect on their process, AI can support self-regulated learning and metacognitive awareness. But it is also the case that some learners made only limited improvement, particularly those who were less-active learners or who passively relied on AI information. This finding also reflects the warning concerning the fact that this uncritical reliance on AI risks students not developing autonomous critical thinking skills as spotted by Khurma et al. (2024), Essien et al. (2024), Wang & Fan (2025), and Premkumar et al. (2024).

During the debriefing time, students were asked to reflect on how using AI had changed the way they approached their writing and assignments. Their

responses indicated that the practice changes. One student explained, "Not lazier, I'm sharper with AI *(Stu. 5)*" This demonstrates that AI was not merely a shortcut — it made them actually more confident and thoughtful working out the design and organization of their ideas. Another commented, "AI can browse is the internet coverage in no time, It [sic] useful for fast working method *(Stu. 11)*." This speed and efficiency made a difference for students who are juggling deadlines, allowing them to pay more attention to building arguments and engage more efficiently. These findings are reminiscent of previous research indicating that AI, when employed thoughtfully, can enhance not only writing accuracy, but also student independence and academic confidence. Students also added, however, that while AI is a great aid, it is still crucial for them to think for themselves. These insights add up to the possibility that AI might indeed be a real learning partner — not a compass to be used mindlessly — when used with intention.

## CONCLUSION

This study has demonstrated qualitative evidence that AI-assisted writing may be capable in restructuring student cognition in academic sectors. Close analysis of assignments and reflective statements of 18 students in an Academic Writing course revealed that AI support contributed to a development not only in surface features, such as grammar and vocabulary, but towards deeper argument and organization skills and critical thinking engagement. Students said they felt as if they were more capable of taking on challenging writing tasks as a result of using the AI system, consistent with the results of recent papers on how AI can be cognitively beneficial to education.

Nevertheless, there are several limitations that must be recognized. This was based on a relatively small and homogeneous sample studied across a single course at a single institution, which may raise some limitations to the generalizability of the results. In addition, the study is limited to short-term fluctuations during a semester, and long-term consequences and variations among different learning conditions are currently unknown.

The findings are important also despite these limitations. They argue that AI, when carefully incorporated, can act as an effective pedagogical tool that promotes not only language accuracy but higher-order thinking and academic self-efficacy. This underscores the need to develop writing practices that engage critically with AI technologies in education.

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