



## Student-Reported Cognitive Effects of Artificial Intelligence (AI) Use in Philippine Classrooms: An Empirical Integrative Review

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### ABSTRACT

This non-systematic, empirical integrative review presents a synthesis of studies authored by Filipino scholars between 2020 and 2025 on the self-reported cognitive effects of Artificial Intelligence (AI) tools in Philippine classrooms. Key insights derived from the review highlight that AI tools can (a) foster critical thinking skills and boost self-efficacy, (b) adapt to create a personalized learning experience, and (c) enhance academic writing skills, primarily through large language models and adaptive learning systems. However, concerns arise regarding students' (a) over-dependence on AI, (b) altered fundamental cognitive processes, and (c) adverse effects on physical and mental health. These findings illustrate the paradox of AI-enhanced learning, where the advantages of technology in teaching and learning coexist with its limitations, potentially compromising deep and reflective engagement. To address this issue, it is recommended that AI tools be integrated into the curriculum with utmost caution while prioritizing ethics. Precautionary measures should include a critical assessment of AI-generated content, promoting mental health resources concerning AI use, and employing a context-aware implementation that considers local classroom environments. Further research is necessary to thoroughly examine its long-term cognitive and socio-emotional effects. This synthesis can guide educators, policymakers, and stakeholders in making informed, evidence-based decisions that harness the potential of AI while mitigating its risks.

### RESUMO

Esta revisão integrativa empírica não sistemática apresenta uma síntese de estudos realizados por acadêmicos filipinos entre 2020 e 2025 sobre os efeitos cognitivos autorrelatados de ferramentas de Inteligência Artificial (IA) em salas de aula filipinas. Os principais insights derivados da revisão destacam que as ferramentas de IA podem (a) promover habilidades de pensamento crítico e aumentar a autoeficácia, (b) adaptar-se para criar uma experiência de aprendizagem personalizada e (c) aprimorar as habilidades de escrita acadêmica, principalmente por meio de modelos de linguagem abrangentes e sistemas de aprendizagem adaptativos. No entanto, surgem preocupações quanto à (a) dependência excessiva dos alunos em relação à IA, (b) à alteração dos processos cognitivos fundamentais e (c) aos efeitos adversos na saúde física e mental. Essas descobertas ilustram o paradoxo da aprendizagem aprimorada por IA, em que as vantagens da tecnologia no ensino e na aprendizagem coexistem com suas limitações, potencialmente comprometendo o engajamento profundo e reflexivo. Para abordar essa questão, recomenda-se que as ferramentas de IA sejam integradas ao currículo com o máximo de cautela, priorizando a ética. Medidas de precaução devem incluir uma avaliação crítica do conteúdo gerado por IA, a promoção de recursos de saúde mental relacionados ao uso da IA e o emprego de uma implementação contextualizada que considere os ambientes de sala de aula locais. Mais pesquisas são necessárias para examinar minuciosamente seus efeitos cognitivos e socioemocionais de longo prazo. Essa síntese pode orientar educadores, formuladores de políticas e partes interessadas na tomada de decisões informadas e baseadas em evidências que aproveitem o potencial da IA e, ao mesmo tempo, mitiguem seus riscos.

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## Introduction

Artificial intelligence (AI) has become an increasingly visible presence in everyday life, shaping how people work, communicate, and learn. In educational contexts, AI is often described as a cognitive extension, offering tools that support thinking, memory, and learning by externalizing certain mental processes (Clark and Chalmers, 1998). Recent studies suggest that AI enabled systems can be aligned with learners' cognitive states, potentially reducing cognitive load while supporting attention, comprehension, and memory (Halkiopoulos and Gkintoni, 2024; Herm, 2023; Hudon et al., 2021; Han, Hwang, and Lee, 2024). In classrooms, AI tools are increasingly used to personalize learning experiences, automate routine academic tasks, and provide immediate feedback, all of which are viewed as promising contributions to teaching and learning (Ayeni et al., 2024; Demszky et al., 2024; Selwyn, 2022).

The growing presence of AI in education is rooted in its long and evolving history. Early discussions on machine intelligence began with Turing's (1950) proposal that machines could simulate human reasoning, followed by the formal establishment of AI as a field of study at the Dartmouth Conference in 1956 (McCarthy et al., 1956). Over the decades, AI development has progressed unevenly, shaped by alternating periods of optimism and decline. Early problem solving programs and natural language systems in the 1960s were followed by reduced funding and enthusiasm during periods known as AI winters. Renewed interest emerged alongside advances in computational power and data availability, with milestones such as IBM's Deep Blue in 1997 and the emergence of deep learning architectures in the 2010s (Jordan and Mitchell, 2015; Krizhevsky et al., 2012). Today, AI applications, particularly generative models and natural language processing tools, are widely accessible, intensifying discussions about their ethical, cognitive, and social implications (Binns, 2018).

Within educational settings, AI has been integrated through adaptive learning systems, intelligent tutoring, and data informed instructional support. These technologies aim to enhance efficiency, responsiveness, and personalization in classrooms (Holmes et al., 2019; Luckin and Cukurova, 2019). At the same time, scholars have raised concerns about the unintended consequences of AI use, particularly its influence on students' cognitive engagement. Issues such as over reliance on AI tools, reduced critical thinking, and weakened metacognitive control have been increasingly documented (Jose et al., 2025; Zhai et al., 2024). Other studies link problematic AI use to higher academic stress and lower self efficacy, suggesting that perceived gains in efficiency may come at the expense of confidence, curiosity, and sustained effort (Zhang et al., 2024). These contrasting outcomes have been described as a paradox of AI enhanced learning, where cognitive benefits and cognitive erosion coexist (Jose et al., 2025).

This paradox is especially relevant in the Philippine educational context. The Philippine education system has repeatedly adapted to disruptions brought about by natural disasters, socio political challenges, and public health crises. During the COVID 19 pandemic, the rapid shift to online learning accelerated the use of digital technologies, including AI, in instructional practices. As institutions gradually return to full on site instruction, AI use continues to expand across both physical and virtual classrooms. This expansion takes place within a system characterized by diverse learner needs, large class sizes, context specific pedagogical demands, and uneven technological infrastructure (Laguador, 2017; Manlongat et al., 2021; Raguindin et al., 2021). These conditions make it particularly important to examine how students themselves experience and interpret the cognitive effects of AI use.

Against this backdrop, the present integrative review focuses on students' self reported cognitive experiences with AI tools in Philippine classrooms. Rather than evaluating AI systems in isolation, this study synthesizes empirical research authored by Filipino scholars between 2020 and 2025 to capture how learners perceive AI's influence on their thinking, learning processes, and cognitive engagement. By narrowing attention to self reported cognitive effects, this review seeks to clarify how AI is shaping student learning experiences within local educational realities, providing a focused foundation for the methodological approach discussed in the succeeding section.

## **Methodological procedures**

This study adopted an empirical integrative review design to synthesize existing empirical research on the self reported cognitive effects of artificial intelligence use in Philippine classrooms. Integrative reviews allow for the inclusion and comparison of studies employing diverse research designs, making them particularly suitable for examining complex educational phenomena that cannot be captured through a single methodological lens (Whittemore and Knafl, 2005). This approach was appropriate given the varied quantitative, qualitative, and mixed methods studies conducted by Filipino scholars on AI use in education (Sukhera, 2022).

The review followed the five stages proposed by Sukhera (2022), namely problem identification, literature search, data evaluation, data analysis, and presentation of results. These stages guided the review process and ensured transparency and methodological rigor throughout the study.

1. **Problem Identification:** The central focus of this review was to synthesize empirical studies that examined students' self reported cognitive experiences with AI tools in Philippine classroom settings. The emphasis on self reported outcomes was intentional, as it captures how learners perceive the influence of AI on their thinking, learning processes, and

cognitive engagement. To reflect recent developments in educational technology, the review was limited to studies published between 2020 and 2025.

**2. Literature Search:** A structured literature search was conducted using open access academic sources, including ResearchGate, Google Scholar, and local printed academic journals. The search targeted peer reviewed studies authored by Filipino scholars that examined AI use in educational contexts within the Philippines. Keywords related to artificial intelligence, education, cognitive effects, student perceptions, and Philippine classrooms were used in various combinations to identify relevant studies.

**3. Inclusion and Exclusion Criteria:** Clear inclusion and exclusion criteria were applied to define the scope of the review and ensure consistency in study selection, following integrative review guidelines (Whittemore and Knafl, 2005; Sukhera, 2022).

Studies were included if they met the following criteria: they were authored or co authored by Filipino scholars, they employed an empirical research design, whether quantitative, qualitative, or mixed methods, they focused on AI use in Philippine classroom settings, they examined self reported cognitive effects on students, and they were published between 2020 and 2025.

Studies were excluded if they were purely conceptual or opinion based, lacked clear methodological descriptions, were conducted outside the Philippine context, or focused solely on teacher perceptions or technical system performance without addressing student cognitive outcomes. These criteria helped delimit the review and maintain alignment with the study's objectives.

**4. Data Evaluation:** Each study that met the initial inclusion criteria underwent a process of data evaluation to assess **relevance and methodological quality**. Relevance was determined by examining how closely the study addressed the review's central focus on students' self reported cognitive experiences with AI use. Methodological quality was assessed based on the clarity of the research design, transparency of data collection and analysis procedures, and coherence between research questions, findings, and conclusions.

Studies that did not provide sufficient methodological detail or whose findings could not be clearly linked to cognitive outcomes were excluded during this stage. This evaluation ensured that only studies with acceptable empirical rigor and relevance were included in the final synthesis.

**5. Data Analysis:** Data analysis was conducted in several stages. First, full text screening was performed to confirm each study's eligibility based on the established criteria. Second, relevant information was systematically extracted from each study, including research purpose, participant characteristics, AI tools examined, research design, and reported cognitive outcomes.

The extracted data were then coded through a comparative process to identify recurring patterns and shared concepts across studies. Coding focused on both positive and negative cognitive effects, such as critical thinking, self efficacy, personalized learning, cognitive dependency, and mental or physical well being. These codes were subsequently grouped into broader thematic categories.

Through this thematic synthesis, patterns and variations in students’ cognitive experiences with AI were identified and interpreted. A total of sixteen studies met all quality and relevance criteria and were included in the final analysis.

**6. Presentation of Results:** The results of the analysis are presented using a thematic structure supported by a summary table and narrative discussion. This format allows for a clear and organized presentation of findings while capturing the complexity of AI’s cognitive effects on students. The thematic approach also facilitates meaningful interpretation and supports evidence informed implications for educational practice and policy.

### Results and Discussions

The findings of this integrative review reveal a complex and often contradictory relationship between artificial intelligence use and students’ cognitive experiences in Philippine classrooms. Rather than producing uniformly positive or negative outcomes, AI use appears to reshape how students engage with learning in ways that depend on context, purpose, and patterns of use. This reinforces the view that AI in education functions not merely as a tool, but as an active influence on students’ thinking, decision making, and learning habits.

**Table 1.**  
Summary of Key Themes Culled

Key Theme	Description	Authors
Enhanced critical thinking and self-efficacy	AI tools, such as ChatGPT and virtual learning platforms, help students develop critical thinking and self-efficacy, although academic challenges persist.	Sadiasa et al. (2024), Fabro et al. (2024), Gonzales & Nabua (2025), Galindez et al. (2024)
Personalized and adaptive learning experiences	AI’s adaptive features enhance personalized learning, boosting student motivation and confidence. While demographic factors have minimal effect, cultural context plays a significant role.	Alejandro et al. (2024), Caloc et al. (2023), Agbong-Coates (2024), Hatmanto et al. (2024)
Benefits in academic writing and language skills	AI tools such as Grammarly and ChatGPT help students improve their writing skills, but they also raise concerns regarding bias, overreliance, and plagiarism.	Bantoto et al. (2024), Austria et al. (2023), Junio & Bandala (2023)
Altered fundamental cognitive processes	Students exhibit less fact-checking and greater reliance on AI-generated outputs, which can lead to misconceptions and a decline in critical thinking skills.	Bacallo et al. (2024), Villarino et al. (2024), Rosa et al. (2024)
Impact on mental and physical Health	The use of AI is linked to anxiety, social withdrawal, decreased communication skills, and lower emotional intelligence among students.	Rosa et al. (2024), Tenorio (2023), Klimova (2025)

The synthesis of sixteen empirical studies resulted in five major themes that capture students' self-reported cognitive experiences with AI tools. These themes, summarized in Table 1, reflect both enabling and constraining effects of AI use. While the table presents a structured overview, it is important to note that the themes are not independent of one another. Instead, they intersect in meaningful ways, illustrating how cognitive gains such as efficiency and confidence may coexist with emerging challenges related to dependency, diminished reflection, and well being.

### ***Enhanced Critical Thinking and Self-Efficacy***

Several studies indicate that AI tools, particularly large language models such as ChatGPT, are perceived by students as supportive of critical thinking and self efficacy (Sadiasa et al., 2024; Fabro et al., 2024; Gonzales and Nabua, 2025). Students consistently report that AI tools help them clarify complex concepts, generate ideas, and complete academic tasks more efficiently. These perceived benefits appear to strengthen students' confidence in their academic abilities, especially when AI is used as a supplementary learning aid rather than a replacement for independent thinking.

However, a closer examination of these findings suggests that the enhancement of critical thinking may be conditional rather than automatic. While Galindez et al. (2024) report measurable improvements in critical thinking skills following AI integration, the gains are closely tied to structured instructional use and guided engagement. This implies that AI alone does not cultivate higher order thinking, but instead amplifies existing pedagogical practices. Without intentional scaffolding, the perceived boost in critical thinking may reflect efficiency and task completion rather than deeper cognitive processing. This distinction is critical for educators seeking to integrate AI meaningfully into instruction.

### ***Personalized and Adaptive Learning Experiences***

Across multiple studies, students describe AI as enabling more personalized and adaptive learning experiences, particularly in addressing individual learning needs and pacing (Alejandro et al., 2024; Caloc et al., 2023; Agbong-Coates, 2024). These findings are especially significant within the Philippine context, where large class sizes and diverse learner profiles often limit opportunities for individualized instruction. AI's adaptive features appear to fill this gap by offering tailored feedback and learning pathways, which students associate with increased motivation and engagement.

At the same time, the findings suggest that personalization through AI is shaped by contextual and cultural factors. Hatmanto et al. (2024) emphasize that while AI supports learner independence and reflective thinking, its effectiveness depends on how well it aligns with instructional goals and classroom realities. The minimal influence of demographic

variables reported by Agbong-Coates (2024) further underscores that personalization is not simply a technical function, but a pedagogical one. These insights highlight the need for context sensitive AI integration that accounts for local educational conditions rather than assuming universal benefits.

### ***Benefits in Academic Writing and Language Skills***

The use of AI tools in academic writing emerges as one of the most visible and widely accepted applications among students (Austria et al., 2023; Junio and Bandala, 2023; Bantoto et al., 2024). Students report that tools such as Grammarly, Quillbot, and ChatGPT enhance their writing efficiency by assisting with idea generation, language accuracy, and structural organization. For second language learners in particular, AI is perceived as a confidence building support that reduces anxiety associated with academic writing.

Despite these advantages, the reviewed studies consistently raise concerns about over reliance and diminished cognitive engagement. Students' reliance on AI generated text may limit opportunities for original thought, critical revision, and deeper engagement with content (Junio and Bandala, 2023; Bantoto et al., 2024). These findings suggest that while AI supports surface level writing tasks effectively, its uncritical use may weaken essential academic skills over time. This tension reinforces the broader paradox identified in this review, where cognitive convenience may inadvertently undermine cognitive development.

### ***Altered Fundamental Cognitive Processes***

Bacallo et al. (2024) observed that senior high school students often present non factual information generated by AI tools, perpetuating misconceptions that can be misleading. In a mixed methods study, Villarino et al. (2024) made a similar observation, noting that students are no longer fact checking ideas produced by generative AI and tend to accept whatever it produces without question or reflection. The authors believe this impacts students' critical thinking and increase their potential for cheating. In another study involving college students, Rosa et al. (2024) also noted students' excessive reliance on AI, describing changes in their cognitive processes that include reduced critical thinking and problem solving skills. These same authors conclude that excessive AI use is already affecting students' mental and physical health. This theme is further explored in the next section.

### ***Impact on Mental and Physical Health***

As previously mentioned, Rosa et al. (2024) observe that students' mental and physical health decline due to excessive AI use, as evidenced by their impaired ability to learn independently and communicate verbally. One study even noted how AI had unrealistically altered the concept of beauty, affecting the mental health of Generation Z, those born between

1997 and 2012 (Tenorio, 2023). This observed effect of AI on mental health seems to align with the study by Klimova (2025), which specified that AI tools have heightened anxiety, social withdrawal, and lower emotional intelligence among students.

## **Conclusion**

This empirical integrative review examined the student-reported cognitive effects of artificial intelligence use in Philippine classrooms by synthesizing sixteen empirical studies authored by Filipino scholars between 2020 and 2025. Anchored in learners' self-reported experiences, the findings demonstrate that AI use in educational settings is associated with both perceived cognitive benefits and emerging concerns, reflecting its dual and complex role in learning.

Across the reviewed studies, students consistently reported that AI tools support cognitive processes related to critical thinking and self-efficacy, particularly when used to clarify concepts, generate ideas, and assist with academic tasks. AI-enabled personalization and adaptive learning were also identified as meaningful supports, especially in contexts marked by large class sizes and diverse learning needs. In addition, AI tools were widely perceived as beneficial in academic writing and language learning, particularly among second-language learners, where they were associated with increased confidence and efficiency.

At the same time, the findings highlight important cognitive and well-being concerns. Several studies reported altered cognitive processes linked to over-reliance on AI, including reduced fact-checking, diminished reflective engagement, and increased acceptance of AI-generated outputs without critical evaluation. Concerns related to mental and physical health, such as anxiety, social withdrawal, and reduced emotional engagement, were also evident in students' self-reports. Taken together, these themes illustrate the paradox of AI-enhanced learning, in which perceived gains in efficiency and support may coexist with risks to deeper cognitive engagement and well-being.

These conclusions are drawn from self-reported data and should be interpreted within the scope and limitations of this integrative review. The reviewed studies vary in design and context, and the findings do not establish causal relationships between AI use and cognitive outcomes. Instead, they reflect how students perceive and experience AI within specific educational environments in the Philippines.

Future research may build on these findings by examining the long-term cognitive and socio-emotional implications of AI use, as well as by exploring how instructional design, ethical guidance, and contextual factors shape students' cognitive engagement with AI tools. Continued empirical investigation is necessary to better understand how AI can be integrated into Philippine classrooms in ways that support learning while safeguarding critical thinking, well-being, and learner autonomy.

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