

GENERATIVE ARTIFICIAL INTELLIGENCE AND CRITICAL THINKING: WHAT ARE THE CONDITIONS FOR RESPONSIBLE APPROPRIATION BY STUDENTS?

**Dr. Ghaouti ZIANI¹, Pr. Malika DJABER², Pr. Yacine MAHDJAR³,
Pr. Mohamed Salim KHEMIS⁴, Pr. Amor HAMDAOUI⁵**

¹Department of Information and Communication Sciences, Faculty of Humanities and Social Sciences; University of Ouargla, Algeria

²Department of Sociology and Demography, Faculty of Humanities and Social Sciences; University of Ouargla, Algeria

³Department of Psychology and Speech Therapy, Faculty of Humanities and Social Sciences; University of Ouargla, Algeria

⁴Department of Psychology and Speech Therapy, Faculty of Humanities and Social Sciences; University of Ouargla, Algeria

⁵Department of Sociology and Demography, Faculty of Humanities and Social Sciences; University of Ouargla, Algeria

ziani.ghaouti@univ-ouargla.dz¹
djaber.malika@univ-ouargla.dz²
mahdjar.yacine@univ-ouargla.dz³
khemis.mohammedsalim@univ-ouargla.dz⁴
hamdaoui.amor@univ-ouargla.dz⁵

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Abstract

This study investigates the relationship between students' appropriation of generative artificial intelligence technologies and the contribution of these tools to the development of their critical thinking skills. To examine this relationship, a questionnaire was administered to 200 students at the University of Ouargla. The analysis of the collected data revealed extensive use of these technologies, including the preparation of academic reports, idea generation, summarization of instructional materials, documentary research, and linguistic translation. Despite this diversity of uses, notable differences emerged regarding students' levels of proficiency with these tools. Most respondents reported being aware of the risks associated with potential errors and biases, which led them to verify the information produced and to adopt critical stances toward the generated content. Overall, the study suggests that generative AI can serve as an effective tool for enhancing critical thinking, provided it is used in a guided manner. Such use strengthens analytical capacity and reflective thinking, contributing to the development of self-directed learning skills and to the formation of a generation of students equipped with strong critical and analytical abilities. In conclusion, the findings highlight the importance of providing students with methodological and ethical training, increasing awareness of the limitations of these technologies, and establishing clear institutional policies defining their conditions of use.

Keywords: generative artificial intelligence, critical thinking, responsible appropriation.

1. Introduction

In recent years, Algerian universities have undergone a major and accelerated transformation, particularly after the Covid-19 pandemic. Just as they were facing the challenge of adapting to digital learning, artificial intelligence technologies emerged, raising new questions—especially with the rapid and growing rise of generative AI systems such as ChatGPT and Gemini. On the one hand, AI, through its capacity to generate text, has become a valuable tool for learning, documentary research, and completing academic projects. On the other hand, the increasing use of these technologies by students often attracted by the ease and speed of content production exposes them to new risks related to receiving inaccurate, biased, or scientifically unfounded responses (Floridi et al., 2023). At the same time, these systems are developed by industrial and commercial companies that exploit information through algorithmic processes operating in contexts influenced by financial considerations, as highlighted by Alain Jeannel (2025). These dynamics tend to move away from values associated with “critical thinking.” Nevertheless, generative AI remains a fallible technology, which fuels concerns among teachers regarding potential overdependence of students on these tools. In this context, and with the rapid spread of generative artificial intelligence as a central pedagogical

tool, the question of its contribution to the development of critical thinking among students becomes increasingly pressing. This reality calls for reflection on the establishment of appropriate frameworks that ensure conscious and responsible use of this technology within educational settings. Therefore, this study seeks to analyze the impact of generative AI usage by students on the development of critical thinking, highlighting the cognitive and pedagogical mechanisms involved, as well as the necessary conditions for achieving conscious and responsible adoption of these tools in higher education. Our study also aims to answer the following central question: What is the contribution of generative AI use by university students to the development of their critical thinking? And how can responsible adoption of these technologies be promoted?

We will first review the scientific literature related to generative AI and critical thinking, then explain the methodology adopted in our research to collect the necessary data. Next, we will present and discuss the results, and conclude with a general conclusion.

2. Literature Review

While classical computing aims to automate repetitive tasks in order to optimize certain processes, generative artificial intelligence technologies (GAI) pursue a more ambitious objective: simulating human intelligence by automating the production of knowledge (Bourgois, 2023: 72). Generative AI is considered a major technological advancement, as it enables machines to produce new content such as texts, images, and sounds from vast pre-existing datasets, often derived from Big Data. The effectiveness of these systems relies on their training using an immense textual corpus (Saporta, 2023: 42). Their functioning is based on principles derived from linguistic analysis, particularly what is known as “distributional semantics,” which suggests that the meaning of a word can be inferred from the complex statistical patterns of the surrounding words within a linguistic corpus (Gefen, 2023: 18). Through this approach, AI becomes capable of identifying lexical correlations and constructing semantic representations that are subsequently used to generate original content that respects the linguistic and grammatical structures it has learned.

The social issues accompanying AI, according to Floridi et al. (2023), are characterized by increasing complexity. Despite the extensive technical possibilities it offers, AI raises major ethical and security concerns. Hesitation to adopt it may stem from a lack of trust, legitimate fears, or the protection of certain interests. Furthermore, the deployment of these technologies without proper safeguards may lead to unforeseen or significant consequences. In this context, Edgar Morin (2020: 40) emphasizes that we are entering an era in which new scientific and technological horizons are emerging, but which also make societies vulnerable to new forms of fragility, leading to what is known as the “risk society.” This framework requires strict application of the precautionary principle.

One of the major risks learners face when using generative AI is the production of potentially misleading content. Although this content may appear coherent and convincing, it can mislead users, create confusion, and weaken students’ trust in the credibility of available information. As a result, learners face an unprecedented challenge: navigating a digital environment in which the norms of truth become increasingly blurred (Romainville, 2024).

Given this reality, it becomes necessary to equip students with skills that allow them to exercise conscious critical judgment, which implies developing strong critical thinking that enables them to assess the reliability of sources, question AI-generated content, and distinguish truth from falsehood. According to the definition proposed by Thomas C. Durand (2023: 273), critical thinking can be understood as a relational and reflective intellectual process aimed at making decisions about what should be believed or what should be done. This process is based on two complementary purposes: an epistemic purpose, which aims to determine what can be considered true or false, and a pragmatic purpose, which takes on concrete dimensions—particularly when orienting a therapeutic decision (which therapeutic choice to adopt) or adopting an appropriate behavior in the face of a problematic situation.

3. Methodology

This study seeks to investigate students' perceptions and experiences regarding the use of generative artificial intelligence tools (such as ChatGPT or Gemini) and their impact on the development of critical thinking within the context of university learning. It also aims to analyze the factors influencing the formation of students' representations and practices related to these technologies. The primary objective is to understand the meanings students attribute to the use of these tools in their learning process, in order to identify the conditions conducive to a critical and responsible appropriation of generative AI.

To achieve this objective, a structured questionnaire was designed using Google Forms and distributed to a sample of 200 students, divided as follows: 40 students from the French Language section of the Higher School of Teachers, and 160 students from the Department of Information and Communication Sciences at the University of Ouargla.

The participant selection method was adopted to ensure a balanced representation of the sample and to reduce selection bias. This method allowed the inclusion of diverse student categories, including those with prior experience using generative AI technologies, as well as others with no previous knowledge or experience. In total, 146 students responded freely and voluntarily, in compliance with the ethical principles of scientific research.

4. Results and Discussion

4.1. Description of the Study Population

The final sample of the study consists of 146 students who fully completed the questionnaire. These participants are distributed across two academic specialties: the French language section (24 students) and the Information and Communication Sciences section (122 students).

Regarding demographic variables, the age range of respondents was mainly concentrated between 20 and 25 years old (79 students), followed by the category under 20 years old (34 students), then those aged between 26 and 30 (16 students), and finally those over 30 years old (17 students), reflecting notable generational diversity within the sample.

The results also showed a predominance of female participants in the study population, with women representing 72.60% of the total participants. Concerning the level of education, the sample was relatively evenly distributed between the two cycles, with 83 undergraduate students and 63 master's students.

4.2. Differentiated Uses of Generative AI: Between Mastery and Occasional Use

The analysis reveals that the majority of students report using generative artificial intelligence, particularly tools such as ChatGPT and Gemini, although usage patterns vary from one individual to another. Approximately 31.00% of respondents confirm using it regularly, while others resort to it occasionally. Students use these technologies in multiple academic contexts, including writing reports and university assignments, generating ideas, summarizing educational content, searching for information, and linguistic translation.

It should be noted that regular users (31%) have, for the most part, benefited from training or specific guidance regarding the academic use of these tools, which seems to support a more controlled and strategic use of prompts. Conversely, 69% of students report only partially understanding the functioning of these systems, which limits their ability to fully exploit them in an academic context. The analysis of the declared uses allows us to formulate the hypothesis that student training and support in the use of generative AI tools constitute a decisive mediating factor. These mechanisms of guidance appear to condition students' ability to interact in a regular, appropriate, and controlled manner with AI.

4.3. A Critical Approach of Students Toward Generative AI

Despite students' reliance on generative AI in various learning activities, the results show that 72% of them acknowledge that these tools may produce erroneous or biased information. This observation aligns with the findings of Lobet et al. (2023), indicating that most students adopt a cautious attitude

toward the responses generated by systems such as ChatGPT, reflecting an emerging culture of critical awareness in the use of these technologies. Conversely, 25% of respondents declared themselves “unable to give an opinion” on this risk, while 3% believe that these tools produce neither errors nor biases. These results indicate that a significant portion of students is already capable of identifying the limitations of generative AI, particularly regarding the reliability of the content produced and its impact on knowledge construction. However, results also reveal that this critical awareness is unevenly distributed.

In this context, the development of explicit training on critical thinking and source evaluation appears necessary, especially when facing tools capable of providing rapid and convincingly formulated answers, yet potentially unreliable.

4.4. Best Practices: The Need for Critical Thinking in the Use of Generative AI

The results indicate that the vast majority of students (93%) adopt practices considered appropriate in their use of generative AI. More specifically, some perform cross-checking of generated content by comparing it to reliable documentary sources, while others reread and revise the text to improve its coherence and accuracy. Conversely, 7% of students report reproducing the generated text without any modification, reflecting a lack of critical distance toward the tool.

This dynamic echoes what Durand (2023: 273) defines as “critical thinking,” understood as a reasoned and reflective intellectual process allowing individuals to distinguish truth from falsehood before making decisions or taking action. In other words, the ability to question, analyze, and modify content constitutes a key indicator of cognitive maturity in the use of generative AI technologies.

It is important to underline that these practices, even if they seem repetitive or routine, play a crucial role in the learning process. In this perspective, several recent studies emphasize the need to strengthen so-called holistic skills, such as creativity, critical thinking, ethical responsibility, and discernment, in order to maintain a balance between technological innovation and the human values of learning (Ghotbi et al., 2022).

4.5. Generative AI as a Catalyst for Critical Thinking

The use of methodological practices by some students to verify the responses produced by generative AI tools shows that frequent use of these technologies encourages them to regularly adopt an analytical and critical approach. This is demonstrated by the statements of most participants:

« I read it and correct it. » (E59, Master’s student in Information and Communication Sciences)

« I check it using other sources. » (E62, Bachelor’s student in Information and Communication Sciences)

These same students (E59 and E62) answered “yes” to the question: “In your opinion, can these tools produce erroneous or biased information?”

Although they are aware that such tools may produce errors or biases, they do not see this as an obstacle to using them; rather, they perceive this limitation as an opportunity and a catalyst for developing and strengthening critical thinking skills. In other words, interactions with generative AI become a reflective exercise in which the student learns to evaluate, compare, and adjust information before incorporating it into academic work.

These findings are consistent with Michael Gerlich’s (2025) assertion in his study on the impact of integrating generative AI on the development of critical thinking among higher education students, where he argues that the phenomena of “hallucinations” and inherent biases in these systems should not be viewed merely as technical limitations but can serve as educational opportunities that stimulate analytical thinking and deepen students’ reflective abilities.

4.6. Delegating Work to Generative AI: Ethical Tensions and the Need for Literacy

The data reveal a tension between pragmatic use and ethical concern. The fact that a majority of students (83%), including 70% who declared having actually used generative AI, consider their use acceptable provided that content is verified and mainly used for reformulation tasks, expresses a desire to reconcile academic efficiency with respect for integrity standards. This trend shows that

students treat AI tools as complements to traditional teaching rather than substitutes, using the words of Sophie Agulhon and Patrice Schoch (2023: 121).

However, the 10% who perceive this use as an ethical issue reflect persistent concerns regarding academic integrity. It appears that these students prefer to complete their assignments independently, considering that personal writing ensures greater authenticity and leads to better results. This stems from the belief that learning occurs through cognitive effort rather than delegation to a technological tool.

This perception aligns with the findings of Hill (2023), who showed that university students tasked with producing their own answers and correcting answers generated by ChatGPT performed better when they wrote their responses themselves.

Finally, 7% declared they saw no ethical issue related to using these tools. It appears that these students lack sufficient knowledge of the principles behind generative AI and of its limitations, particularly regarding the production of potentially inaccurate or partial content. Thus, it becomes necessary for students to acquire digital AI literacy enabling them to interact effectively with these technologies while adopting a critical and ethical approach. This direction agrees with the recommendations of Long and Magerko (2020) regarding effective interaction with AI and the evaluation of produced content reliability.

4.7. Toward Responsible Use of Generative Artificial Intelligence in Higher Education

In response to the question: “In your opinion, what should be done to ensure responsible use of generative artificial intelligence in higher education?”, respondents affirm that despite the limitations displayed by generative AI tools, they contribute to improving learning efficiency and offer valuable educational opportunities to students, particularly by facilitating access to information and supporting the development of knowledge-building skills. Therefore, the use of ChatGPT may be considered a promising alternative, provided that a critical approach is adopted and generated information is verified:

«To ensure responsible use of generative artificial intelligence in higher education, it is necessary to first raise awareness among students and teachers about its advantages and limitations... It would also be advisable to integrate into university programs modules or training workshops explaining how to use these technologies ethically, in a way that supports the development of critical thinking rather than replacing it. » (E1, Bachelor’s student in French)

Several studies consider that this technology offers an opportunity for enhanced learning by providing students with new means to improve their learning processes (Many, Shvetsova & Forestier, 2024). However, excessive dependence on these tools could weaken learners’ critical capacities and reduce their ability to evaluate the validity and accuracy of produced content, especially since these systems may sometimes generate inaccurate or biased information. In this context, it becomes essential to support students in integrating generative AI tools into their practices, helping them develop a reflective, ethical, responsible, and critical attitude toward their use.

This includes verifying the sources of information produced by these tools and avoiding total dependence on the provided answers. What is required is not merely receiving answers, but questioning their sources, modes of construction, and the degree of reliability of the references on which they rely. Systematic comparison between generative AI content and reliable references such as scientific books, academic journal articles, and specialized databases helps students formulate their own ideas instead of reproducing pre-established ones.

Students should also be encouraged to use generative AI as an assistant rather than a complete substitute for human thinking. This may include offering student training sessions and establishing institutional rules ensuring respect for academic integrity and the ethical and responsible use of these tools:

« Verify the answers and the sources when selecting information. » (E20, Master’s student in Information and Communication Sciences)

« ..., first, it is essential to train and raise awareness among students and teachers regarding the ethical and effective use of these tools while highlighting their limitations and the risks associated with excessive dependence. It is also necessary for higher education institutions to define clear policies governing AI use: its use may be authorized for tasks such as data analysis or information synthesis... Moreover, the development of critical and analytical reasoning among students must be encouraged so that AI does not replace human cognitive capacities.».

The perceptions expressed by respondents align with recommendations highlighted in the scientific literature on integrating generative AI in higher education. These studies emphasize that the use of such technologies raises major challenges related to misinformation, academic integrity, and the development of critical thinking. They insist on the need to establish clear, responsible, and regulated frameworks to avoid misuse and ensure an ethical, safe, and pedagogically relevant integration of generative AI tools in learning practices (Mballo, 2023).

Conclusion

Over the past three years, higher education has witnessed a remarkable expansion in the use of artificial intelligence technologies, opening new perspectives for learning and supporting academic activities. Within the framework of our study on generative artificial intelligence and its role in the development of critical thinking, it became clear that students use these tools in various contexts, including writing reports and academic assignments, generating ideas, summarizing educational content, searching for information, and performing linguistic translation.

Although the majority of students included in the study are aware that the outputs produced by these tools may contain errors or biases, they do not abandon their use; instead, they seek to adopt a critical stance based on verifying the validity of the responses and comparing them with reliable sources, thereby strengthening their ability to discern and evaluate.

In this regard, it appears that the use of generative AI can serve as a potential lever for enhancing the development of critical thinking among students. However, the successful integration of such tools in higher education requires clear pedagogical and ethical guidance, in addition to adopting responsible use that ensures respect for academic integrity principles.

Thus, the objective is not to replace human learning with artificial intelligence, but to integrate it rationally in order to enrich educational practices, support the development of fundamental cognitive skills, and preserve learners' intellectual autonomy.

Finally, it should be noted that this study suffers from a significant limitation, namely its exclusive reliance on students' perspectives, while the adoption of AI in higher education also requires considering the role of teachers. Therefore, future research would benefit from examining teachers' viewpoints in order to achieve a more comprehensive and in-depth understanding of the dynamics of this integration.

References

1. Agulhon, S., & Schoch, P. (2023). "ChatGPT and education: Digital revolution or excessive dependence on AI?" In Guénot, F., & de Lagarde, O., *Educational AI: Artificial intelligence in higher education*, Bréal, pp. 117–123.
2. Bourgois, L. (2023). "Applications of AI in higher education." In Guénot, F., & de Lagarde, O., *Educational AI: Artificial intelligence in higher education*, Bréal, pp. 71–76.
3. Durand, T. C. (2023). *Critical Thinking for Dummies*. Paris: Editions First.
4. Floridi, L., Cows, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., ... & Vayena, E. (2018). AI4People—An ethical framework for a good AI society: Opportunities, risks, principles, and recommendations. *Minds and Machines*, 28, 689–707. <https://link.springer.com/article/10.1007/S11023-018-9482-5>

5. Gefen, A. (2023). Living with ChatGPT: Seducing, thinking, creating, cultivating oneself, enriching oneself... Will artificial intelligence have an answer to everything? Observatory Publishing House
6. Gerlich, M. (2025). AI tools in society: Impacts on cognitive offloading and the future of critical thinking. *Societies*, 15(1), 6. <https://www.mdpi.com/2075-4698/15/1/6?ref=newcanaanunplugged.org>
7. Ghotbi, N., Ho, M. T., & Mantello, P. (2022). Attitude of college students towards ethical issues of artificial intelligence in an international university in Japan. *AI & Society*, 1–8. <https://link.springer.com/article/10.1007/s00146-021-01168-2>
8. Hill, B. (2023). “Taking the help or going alone: ChatGPT and class assignments.” <https://hal.science/hal-04381138/>
9. Jeannel, A. (2025). “Artificial intelligences and critical thinking: A reflection in direct contact with field actors.” [Online] <https://educavox.fr/les-reportages/content/439-les-ia-et-l-esprit-critique/>
10. Lobet, M., Honet, A., & Wathélet, V. (2023). “ChatGPT: Use by first-year university students.” <https://shs.hal.science/halshs-04190226/>
11. Long, D., & Magerko, B. (2020, April). What is AI literacy? Competencies and design considerations. In *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems* (pp. 1–16). <https://dl.acm.org/doi/abs/10.1145/3313831.3376727>
12. Many, H., Shvetsova, M., & Forestier, G. (2024). Digital transformation: How to teach (with) generative AI in higher education? *Études & Pédagogies*. <https://etudesetpedagogies.fr/article/view/8100>
13. Mballo, M. H. W. (2023). Responsible generative AI serving higher education. *Applied and Engineering Sciences*, 5(1), 96–100. <http://publication.lecames.org/index.php/ing/article/view/29874>
14. Romainville, M. (2024). “Artificial intelligence and critical thinking.” *Résonances: Monthly journal of the Valais school*, (7), 4–5. [Online] <https://researchportal.unamur.be/en/publications/intelligence-artificielle-et-esprit-critique>
15. Saporta, G. (2023). “History and enjeux of AI.” In Guénot, F., & de Lagarde, O., *Educational AI: Artificial intelligence in higher education*, Bréal, pp. 41–50.