The Use of Artificial Intelligence in Academic Writing: Between Scientific Misconduct and Cognitive Influence.

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RESUME

Les recherches soulignant la convergence des neurosciences cognitives et l'intelligence artificielle ont profondément influencé le domaine éducatif.

Ces deux disciplines sont vues comme complémentaires et capables de développer une intelligence artificielle adaptée aux fonctions cognitives humaines.

Néanmoins, nombreuses réflexions versent dans le sens d'étudier l'impact de l'usage perpétuel de cette avancée technologique par les étudiants sur les fonctions cognitives au moment de l'apprentissage. La présente recherche s'intéresse également à cette problématique et revêt le repérage des perceptions des étudiants universitaires inscrits dans des établissements à accès ouvert sur l'influence de l'usage de l'IA sur leurs fonctions cognitives à savoir la mémoire et le processus attentionnel. Afin de répondre à ladite question, nous avons adopté une approche quantitative reposant sur l'administration d'un questionnaire auprès des étudiants de l'Université Mohammed Premier au Maroc. L'objectif est d'identifier les différentes perceptions des étudiants universitaires auprès de l'usage de l'IA dans l'apprentissage. La suite du travail se consacre à la discussion des résultats tout en se focalisant sur des recommandations sur l'usage efficient de l'IA pour maintenir l'effort cognitif.

ABSTRACT

Research highlighting the convergence between cognitive neuroscience and artificial intelligence has had a significant impact on the field of education. These two disciplines are viewed as complementary and capable of contributing to the development of artificial intelligence that aligns with human cognitive functions.

However, many reflections tend to focus on the potential impact of the continuous use of this technological advancement by students on their cognitive functions during the learning process.

The present study also addresses this issue and aims to identify the perceptions of university students enrolled in open-access institutions regarding the influence of AI usage on their cognitive functions, particularly memory and attentional processes.

To address this question, we adopted a quantitative approach based on the administration of a questionnaire to students at Mohammed Premier University in Morocco. The objective is to identify the various perceptions that university students have concerning the use of AI in learning.

The results show that students believe the use of AI to improve the quality of academic writing is far from constituting scientific misconduct. Moreover, these same users are aware of the impact that AI has on their cognitive abilities, particularly cognitive effort. However, this awareness has not prevented them from using it.

KEYWORDS : Artificielle Intelligence, Cognitive Neuroscience, Cognitive Effort.

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1 Introduction

In recent decades, artificial intelligence and cognitive neuroscience have remained two highly complementary scientific fields, enabling a rethinking of educational practices. Scientific advances in neuroscience provide knowledge that helps adjust algorithmic systems based on the functioning of the human brain.

However, numerous studies have focused on the impact of AI use on learners' practices, as well as its effectiveness in the learning process.

Indeed, this technological revolution also raises questions, particularly regarding its effects on learners' practices and on the learning process itself.
In this regard, our work follows the same direction as previous studies, focusing on identifying university students' perceptions of the use of AI in academic writing, its impact on cognitive effort, and the practices students adopt to collect data.

Thus, the research question guiding our study is as follows:

To what extent does the use of AI influence students' cognitive effort and their learning practices? In order to address the central research question of our study, we formulated two main research questions : To what extent can artificial intelligence constitute a source of scientific misconduct for university students, and how do they perceive its impact in their cognitive effort?

To answer these two major questions, we proposed the following hypotheses:

1. The use of artificial intelligence improves the quality of academic writing for university students.

2. The use of artificial intelligence alters the cognitive load required from students.

2 What is the added value of artificial intelligence in the learning process?

In recent years, artificial intelligence (AI) has played a significant role in scientific research and has been explored across various fields, including neuroscience, education, robotics, agriculture, and medicine.

In computer science, Russell and Norvig (2020) define artificial intelligence as a field dedicated to the creation of systems capable of performing tasks that typically require human intelligence. These capabilities include visual perception, speech recognition, decision-making, and translation.

In the field of education, however, Luckin, Holmes, Griffiths, and Forcier (2016) describe AI as an applied domain that relies on technologies to adapt and optimize learning processes.

In the educational context, Roll and Wylie (2016) highlight that AI serves as a strategic tool that enables the transformation of teaching methods. This transformation is reflected in the development of personalized approaches that place the learner at the center of the learning process and aim to meet individual needs (Holmes et al., 2019).

These teaching methods may rely on digital platforms equipped with adaptive systems capable of analyzing user behavior and adjusting to students' proficiency levels (Karsenti & Collin, 2020).

The use of artificial intelligence in education does not only concern teachers; it also directly involves students, who increasingly perceive AI as an informational resource that facilitates the research process. Indeed, students' use of AI in learning varies according to their needs and objectives. Generally, studies in this area suggest that students use AI to write texts, summarize content, obtain answers, translate, and correct written work in order to produce syntactically and grammatically accurate writing.

However, the use of AI in academic studies remains a significant issue that has attracted the attention of

many researchers. More specifically, the integration of AI in academic writing raises important questions regarding learning and the development of university-level writing skills (Livian & Laurini, 2024).

In this regard, Bladier (2023) suggests that AI is a key factor in changing student behavior, arguing that this tool has made students of this generation increasingly lazy and intellectually disengaged.

Since the present study investigates the impact of AI usage by university students on both cognitive effort and academic writing, the following section is dedicated to a brief review of the literature on the effects of AI on cognitive effort.

3 Cognitive Effort in Academic Writing

Artificial intelligence is increasingly used today in academic writing, which, according to cognitive neuroscience specialists, represents a resource capable of influencing the brain functioning of its users. Moreover, the interaction between the user and AI can have varying effects, in other words, the effect varies from one situation to another.

In this context, Dahmani and Bohbot (2020) argue that AI is a tool capable of enhancing cognitive functions and contributes to making the brain increasingly adept at decision-making. Furthermore, language learning experts such as Godwin-Jones (2021) emphasize that applications dedicated to language acquisition can create neural connections that deepen the learning of linguistic structures related to a foreign language.

On the other hand, clinical studies in cognitive neuroscience have shown that AI has become a cognitive prosthesis that students tend to overuse (Domínguez, 2024).

In the university context, students are required to produce scientific and academic papers. However, in recent years, scientific misconduct has seen a notable increase in writing practices. Scientific misconduct was extensively addressed by Ioannidis (2005), who specifies that it can take various forms, including data fabrication, data falsification, plagiarism, ghostwriting, excessive self-citation, and redundant publication.

Regarding data fabrication, Ioannidis (2005) emphasizes the moment when a researcher chooses to create so-called fictitious data that do not actually exist. The researcher's objective in this situation is to manipulate the data to support their expectations; however, this manipulation leads to data falsification.
The same author highlights the issue of plagiarism, which he categorizes into three types: direct copying, excessive paraphrasing, and self-plagiarism.

Concerning ghostwriting, Ioannidis (2005) stresses the attribution of academic work or research to a so-called "ghost" author—specifically, a person who has not contributed in any way to the work. Furthermore, Ioannidis (2005) discusses the phenomenon of excessive self-citation, which in some cases is used to increase citation counts; however, this practice threatens the researcher's genuine impact.

Finally, Ioannidis (2005) refers to redundant publication as another form of scientific misconduct, which occurs when a researcher publishes the same data across multiple papers.

In contrast, a study by Jarrah, Wardat, and Fidalgo (2023) highlights that the use of AI in academic writing offers significant benefits to the writing process for students. More specifically, the researchers demonstrated AI's role in managing writing coherence and organizing citations. Moreover, Jarrah, Wardat, and Fidalgo (2023) emphasize AI's ability to provide students with opportunities to detect plagiarism and to properly paraphrase ideas.

In a different vein, neuropsychologists interested in studying the impact of digital technology on cognitive functions suggest that the immediate availability of digitally generated information leads to a deterioration of cognitive functions, especially in terms of memory retention (Eustache, 2022).

Indeed, the unavoidable presence of AI in the university context places the issue of scientific misconduct at the center of researchers' concerns. This study focuses on the perceptions of students at Mohammed Premier University regarding the use of AI and its implications in academic writing. To include a diverse sample of students from various faculties within UMP, we opted for a quantitative methodology, which we will outline in the following sections.

4 Methodology and Data Collection

This study primarily aims to discern the perceptions of students at Mohammed Premier University regarding the use of AI in academic writing, and subsequently to determine its effect on cognitive effort.

To collect data for this research, we opted to use a self-administered online questionnaire distributed to students of Mohammed Premier University. We also sought to ensure wide dissemination to target various departments and faculties within UMP. However, despite considerable efforts in distributing the questionnaire link, we received 157student reponses.

5 Data analyses and discussion :

This research is based on achieving two main objectives: identifying students' perceptions regarding the use of AI in academic writing and examining their perceptions of the effect of this usage on cognitive effort.
As previously mentioned, our study adopts a quantitative methodology relying on the administration of an online questionnaire to the target population in order to capture these perceptions (Fortin, Côté & Filion, 2006).

Indeed, addressing this issue necessarily involves an empirical study based on distributing a web-based questionnaire to students at Mohammed Premier University. The data analysis will be divided into two parts to answer the two major research questions outlined earlier.

Regarding the target population, it consists of students enrolled at Mohammed Premier University of Oujda, encompassing its various faculties and institutions.

A non-probabilistic convenience sampling method was employed, consisting of students who agreed to respond to the online questionnaire. To participate, students had to be enrolled at the university during the current academic year. In total, 157 responses were collected, despite numerous follow-ups needed to overcome some students' reluctance to participate.

Data were collected using a self-administered questionnaire distributed electronically via Google Forms. The questionnaire was shared through official student groups on social media platforms (WhatsApp, Facebook) as well as through institutional email.

The composition of the sample by faculty is as follows:

- 54.1% of students from the Faculty of Letters and Human Sciences.
- 12.1% from the National School of Applied Sciences.
- 8.9% from the Multidisciplinary Faculty of Nador.
- 8.9% from the Faculty of Medicine and Pharmacy of Oujda.
- 8.9% from the Faculty of Sciences of Oujda.
- 6.4% from the Faculty of Legal, Economic and Social Sciences.
- 1.3% from the Higher School of Technology.

Furthermore, our sample is diverse and categorized as follows: 33.1% Master's students, 27.4% doctoral candidates, 17.2% undergraduate students, 13.4% engineering students, and 8.9% medical students.

To capture students' perceptions, the study began by measuring the variation in AI usage among students. The responses are presented as percentages, varying across levels and fields of study. Undergraduate students reported a high usage of AI in learning, with 96.3% confirming its use, while engineering students followed closely with 95%. These results indicate that both groups demonstrate significant interest in AI and clear reliance on it. Moreover, Master's students also expressed considerable interest in AI usage in learning, with a percentage of 77.4%. Doctoral students also show interest in the use of AI in learning, with 73.3% confirming their usage. Conversely, medical students appear more reluctant, with only 30% reporting AI use. Indeed, the responses from the participants in this study merely confirm the growing rate of AI use in learning. Furthermore, there is a significant gap in usage rates between medical students and other students, which may be related to the nature of their respective training programs.

Furthermore, we deemed it necessary to identify students' practices in carrying out academic writing. The students' responses indicate that the majority use AI to summarize texts and structure ideas by relying on writing assistance tools. However, 21.9% of doctoral students reported that they also use AI to create images for their research presentations.

Indeed, the aforementioned responses confirm that the use of AI in academic writing has

become indispensable. Nevertheless, opinions on AI usage in learning and academic writing remain divided. Many researchers argue that using AI in academic writing constitutes scientific misconduct and diminishes the quality of scholarly work (Ioannidis, 2005). Conversely, Heddouche (2024) emphasizes that, based on research conducted with university students, AI is considered by students themselves as a relevant tool for improving the quality of scientific writing. For this reason, we sought to explore the opinions of users, specifically university students in the Moroccan context.

Similarly, the students' responses reveal a disparity of opinion reflected in varied statistics. Among the respondents, 47.1% consider the use of AI in academic writing to be scientific misconduct, while 52.9% assert that such use does not constitutes scientific misconduct. Indeed, the issue of AI use in academic writing divides students' opinions, with a slight difference that raises ethical, pedagogical, and disciplinary questions. Consequently, a differentiation of opinions across disciplines and academic levels emerges.

Engineering students are the least likely to view AI usage as scientific misconduct, with 61.9% rejecting this notion. Doctoral students also express a rejection at 51.1%. Master's and undergraduate students show rejection rates ranging between 49% and 41%. However, medical students emphasize that AI constitutes scientific misconduct, with a high percentage of 71%.

Undoubtedly, these statistics support the idea that the previously reported rate of AI usage in learning is likely linked to the perception of AI as a tool contributing to scientific misconduct among university students at UMP. The more student associate the use of AI with scientific misconduct, the greater their apprehension regarding its use.

To better understand the other factors contributing to the ongoing use of AI in learning, we found it important to measure the degree of trust students place in generative AI models such as ChatGPT regarding the accuracy of the information provided. Responses collected through the questionnaire reveal that 59.2% of students believe that certain generative AI models, like ChatGPT, often produce false statements. Meanwhile, 17.8% assert that such AI models do not generate false statements, and a minority of 22.9% indicate that they are unsure whether these AI systems produce false claims.

Among these general responses, master's and doctoral students are the most likely to acknowledge that generative AI can produce false statements. In contrast, medical students tend to reject the notion that AI produces false information, while a significant number of undergraduate students expressed uncertainty on this matter.

These findings lead to two potential hypotheses: either the continued, daily use of AI has made master's and doctoral students more aware of the possibility that AI generates inaccurate data, or students as a whole still hold nuanced views regarding AI usage. More specifically, although students recognize this drawback, they remain attached to using AI tools.

In connection with the issue of trust that students place in generative AI, the phenomenon of human judgment absenteeism caused by AI usage emerged as a significant aspect of this study. Overall, only a minority of students believe that the information collected by AI contributes to this phenomenon. When considering the students' academic levels and fields of study, master's and engineering students are the most likely to affirm that AI induces absenteeism of human judgment. As previously noted, student responses reveal nuances in their perceptions regarding the use of AI in learning and its impact on human cognitive imprint.

To provide more precise and detailed explanations about the phenomenon of human judgment absenteeism, respondents were asked to indicate how AI might cause this outcome. Student responses notably emphasize the phrase "dependence on AI-generated information," with 85% agreement. Additionally, 78% highlighted "passivity leading to the absence of human judgment," while 40% mentioned "inhibition of humain effort" We chose to highlight these particular expressions as they reflect a heightened awareness among students of the negative impact AI may have on the cognitive aspects of learning.

In response to the central research question of this study—To what extent does the use of AI influence students' cognitive effort and learning practices?—two hypotheses were formulated to examine students' perceptions regarding the use of AI in learning and academic

writing. The results of this study demonstrate that, overall, students at Mohammed Premier University do not consider the use of AI in scientific writing as a form of academic fraud. Thus, their views contradict those of Ioannidis (2005), who argued that practices such as direct copying and excessive paraphrasing constitute academic fraud.

Conversely, the findings align with those of Jarrah, Wardat, and Fidalgo (2023), who emphasized that AI use in academic writing facilitates the citation process and helps produce more coherent texts. Therefore, we can suggest that the answer to the question to what extent can AI be considered a source of academic fraud among university students? depends largely on how students employ AI tools. It is within this perspective that many students argue that relying on AI does not equate to committing academic fraud.

Consequently, our first hypothesis that the use of AI improves the quality of students' scientific writing has been confirmed, as students highlight that AI remains a tool that enhances the quality of their academic work.

Regarding the second research question, which addresses the impact of AI usage on cognitive effort, it is undeniable that having access to information within a limited time frame influences individuals' mental processes. Consequently, the use of AI is no exception to these effects. For instance, neuropsychologist Eustache (2022) demonstrated in his studies on the impact of digital technology on memory processes that when an individual is aware of the ease with which information can be accessed digitally, this awareness leads to a decline in the effort invested in information processing and storage. This inevitably results in a negative impact on cognitive effort, which tends to become increasingly passive with AI use.

Moreover, the students' responses in our study reinforced these observations. Interestingly, despite their awareness of the passivity and cognitive laziness induced by AI, students remain reliant on it. Therefore, our second hypothesis, which posits that the use of artificial intelligence transforms the cognitive load required from students, is also supported by their affirmations and recognition of this effect.

Through the present research, we have demonstrated that the use of AI is indispensable for students in preparing academic or scientific writings. However, our study was limited to identifying the perceptions of students at Mohammed Premier University. Therefore, it is difficult to generalize the results of this study to other contexts.

Furthermore, our research focused on comparisons based on study levels and academic disciplines; however, the variable of gender was not addressed. Additionally, it is important to emphasize that assessing cognitive effort during AI usage requires clinical methods capable of identifying brain activity through electroencephalography (EEG) or through neuropsychological tests.

6 Conclusion

Through the present research, we have demonstrated that the use of AI is indispensable for students in preparing academic or scientific writings. However, our study was limited to identifying the perceptions of students at Mohammed Premier University. It is important to note that the results of this study cannot be generalized to other contexts.

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7 Références bibliographiques

1. Bladier, (2023). L'intelligence artificielle, le fléau de la pensée critique. *Business-on-line*. https://business-on-line.fr/blog/uncategorized/lintelligence-artificielle-le-fleau-de-la-pensee-critique/
2. Eustache, F. (2022, novembre). Mémoire : La comprendre, l'exercer, la conserver : Les neurosciences face à l'énigme. *Hors-série : neurosciences*, 304, 02-122.
3. Fortin, M. F., Côté, J., & Filion, F. (2006). *Fondements et étapes du processus de recherche*. Canada : Chenelière Éducation.
4. Heddouche, O. (2024, septembre). L'intelligence artificielle dans le contexte universitaire : Un aperçu sur son usage dans la rédaction académique. *Atras*, 41, 644-659. https://doi.org/10.70091/atras/AI.41
5. Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLoS Medicine, 2*(8), e124. https://doi.org/10.1371/journal.pmed.0020124
6. Karsenti, T., & Collin, S. (2020). *Technologies de l'intelligence artificielle et pédagogie : Une révolution éducative en marche.* Montréal : Éditions Universitaires.
7. León-Domínguez, U. (2024). Potential cognitive risks of generative transformer-based AI chatbots on higher order executive functions. *Neuropsychology, 38*(4), 293–308. https://doi.org/10.1037/neu0000948
8. Livian, Y., & Laurini, R. (2024, juin). L'utilisation de l'IA générative pour la rédaction académique en français par les étudiants allophones : L'expérience de CPU Lyon [Communication orale]. *Défis et incertitudes de l'intelligence artificielle*, IRAFPA, Figueira da Foz, Portugal.
9. Livian, Y., & Laurini, R. (2024, juin). L'utilisation de l'IA générative pour la rédaction académique en français par les étudiants allophones : L'expérience de CPU Lyon. In *Défis et incertitudes de l'intelligence artificielle*. IRAFPA, Figueira da Foz, Portugal.
10. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.
11. Roll, I., & Wylie, R. (2016). Evolution and revolution in artificial intelligence in education. *International Journal of Artificial Intelligence in Education, 26*, 582–599. https://doi.org/10.1007/s40593-016-0110-3
12. Russell, S., & Norvig, P. (2020). *Artificial Intelligence: A Modern Approach* (4th ed.). Pearson.