PRAXIS
PEDAGÓGICA

Artículo de investigación

Cómo citar: Román-Acosta, D. D., Rodríguez Torres, E., Baquedano Montoya, M. B., López Zavala & L. C., Pérez Gamboa, A. J., (2024). ChatGPT and its use to improve academic writing in postgraduate students. *PRA*, 24(36), 53–75. https://doi.org/10.26620/uniminuto.praxis.24.36.2024.53–75

ISSN: 0124-1494

eISSN: 2590-8200

Editorial: Corporación Universitaria Minuto de Dios - UNIMINUTO

Recibido: 18 septiembre 2023
Aceptado: 16 enero 2024
Publicado: 12 febrero 2024

Conflicto de intereses: los autores han declarado que no existen intereses en competencia.

Daniel Roman Acosta
Universidad de Zulia
https://orcid.org/0000-0002-4300-9174
danieldavidromanacosta@gmail.com
Venezuela

Esteban Rodríguez Torres
Universidad de Ciego de Ávila
Máximo Gómez Báez
https://orcid.org/0000-0002-3571-6899
ert931025@gmail.com
Cuba

Martha Beatriz Baquedano Montoya
Instituto José Cecilio del Valle
Universidad Pedagógica Nacional
Francisco Morazán
https://orcid.org/0000-0002-5314-3641
martabaquedano3@gmail.com
Honduras

Lilibeth Carolina López Zavala
Centro Regional Universitario Danlí
https://orcid.org/0009-0003-2619-021X
lclopez@upnfm.edu.hn
Honduras

Alfredo Javier Pérez Gamboa
Universidad de Ciego de Ávila
Máximo Gómez Báez
https://orcid.org/0000-0003-4555-7518
frejavier92@gmail.com
Cuba

ChatGPT and its use to improve academic writing in postgraduate students

ChatGPT y su uso para perfeccionar la escritura académica en educandos de posgrado

ChatGPT e seu uso para melhorar a escrita acadêmica em alunos de pós-graduação

Abstract

At present, Artificial Intelligence has revolutionized various social spheres, and in this sense, contexts related to the field of science and knowledge are not exempt. However, it is necessary to continue studying and deepening its understanding because its transformation and progress are advancing at accelerated rates. Therefore, the objective of this study is to describe the results obtained through the research carried out by the Platform for Action, Management, and Social Research (PLAGCIS), which refer to the use of ChatGPT to enhance academic writing in postgraduate students. To this end, a quantitative approach was adopted, and descriptive and inferential statistical analysis was employed to obtain the results. Thus, the findings reveal that a minority percentage of students receive regular training on the ethical use of the tool. This highlights the need to implement training and awareness programs that address the ethical implications of using ChatGPT in academic writing.

Keywords: artificial intelligence, ethics, ChatGPT, academic writing.

Resumen

En la actualidad, la Inteligencia Artificial ha revolucionado diversas esferas sociales, en este sentido, los contextos vinculados al área de la ciencia y el conocimiento no quedan exentos. Sin embargo, es necesario continuar con su estudio y profundización, debido a que su transformación y progreso avanza a

ritmos acelerados. Por lo que, el objetivo del presente estudio está orientado a describir los resultados obtenidos a través del estudio llevado a cabo por la Plataforma de Acción, Gestión e Investigación Social (PLAGCIS), los cuales hacen referencia al empleo de ChatGPT para perfeccionar la escritura académica en educandos de posgrado. Para ello, se adoptó un enfoque cuantitativo y se empleó el análisis estadístico descriptivo e inferencial para la obtención de los resultados. De esta manera, los hallazgos revelan que un porcentaje minoritario de estudiantes recibe capacitación regular sobre el uso ético de la herramienta. Esto resalta la necesidad de implementar programas de capacitación y concientización que aborden las implicaciones éticas del uso de ChatGPT en la escritura académica.

Palabras clave: inteligencia artificial, ética, ChatGPT, escritura académica.

Resumo

Atualmente, a Inteligência Artificial tem revolucionado diversas esferas sociais; nesse sentido, os contextos ligados à área da ciência e do conhecimento não estão isentos. Contudo, é necessário continuar com o seu estudo e aprofundamento, porque a sua transformação e progresso avançam em ritmos acelerados. Portanto, o objetivo deste estudo visa descrever os resultados obtidos através do estudo realizado pela Plataforma de Ação Social, Gestão e Pesquisa (PLAGCIS), que se referem ao uso do ChatGPT para melhorar a escrita acadêmica em estudantes de pós-graduação. Para tanto, adotou-se uma abordagem quantitativa e utilizou-se análise estatística descritiva e inferencial para obtenção dos resultados. Desta forma, os resultados revelam que uma percentagem minoritária de estudantes recebe formação regular sobre o uso ético da ferramenta. Isto destaca a necessidade de implementar programas de treinamento e conscientização que abordem as implicações éticas do uso do ChatGPT na redação acadêmica.

Palavras-chave: inteligência artificial, ética, ChatGPT, redação acadêmica.

Introduction and background

Academic writing (AW) is a fundamental tool for expressing, showcasing, and internationalizing the results derived from studies and research in the field of science and knowledge. According to Escobar *et al*. (2019), Romero González & Álvarez Álvarez (2020), and Lopez & Bustos (2021), AW has posed significant challenges in undergraduate and postgraduate programs. In this regard, it is expected that students are prepared to engage with scientific texts and acquire the necessary concepts and vocabulary through their daily interaction with them.

Regarding teachers, Codina (2022) has indicated that eliminating or suppressing tools like ChatGPT should not be the guide, but instead, their use should be taught to both teachers and students for proper usage, where ethics prevail and critical thinking is present. In which there is a marked gap between reading and writing, as they are two processes and skills that are not always comprehensively addressed in universities. This disparity leads postgraduate students, regardless of their level of technological literacy and writing skills, to seek alternative solutions.

In this context, artificial intelligence (AI) has emerged as a promising solution, becoming a sort of new fuel, a disruptive tool in AW (Bhatia, 2023). Furthermore, it offers opportunities to overcome obstacles and enhance the quality of AW. On the other hand, García-Peñalvo (2023) has indicated that the use of AI in improving AW has become increasingly common, providing students with tools and resources that can enhance their writing skills.

In this way, AI in the perfection of AW offers multiple benefits. One key advantage is its ability to provide instant grammar and spelling corrections, which helps students improve the accuracy and fluency of their writing. Additionally, AI tools can provide vocabulary suggestions, helping students enrich their lexicon and use more appropriate terms in the academic context (Zhai, 2022).

Another important benefit of AI in AW is its capacity to provide feedback and improvement suggestions regarding the structure and organization of the text (Ventayen, 2023). These tools can analyze the coherence of the content and offer recommendations for a clearer and more cohesive presentation of ideas (Wang *et al*., 2023). This is especially useful for postgraduate students who seek to enhance their ability to effectively

communicate the findings of their research. In this way, AI in AW can help students streamline the process of revision and editing by automating tasks such as detecting grammatical and spelling errors, allowing students to dedicate more time to critical reflection on the content and argumentation of their writing.

Academic writing and the use of Artificial Intelligence

In the field of postgraduate studies, it is crucial for students to continue honing their ability to generate knowledge through the writing of scientific articles. In light of the growing demand for AW and the need for guidance, AI has emerged as an opportunity to enhance the quality of these writings through the use of innovative technologies. Therefore, the present study focused on ChatGPT, an AI platform that has proven to be effective in text generation.

The existing literature indicates successful applications of AI in text generation, particularly in academic writing. Notably, the GPT-3 (Generative Pre-trained Transformer 3) language model has gained attention in recent research for its capability to produce high-quality and coherent texts. Vera's study in 2023 highlights GPT-3's effectiveness in tasks such as essay generation, summarization, and question-answering, showing promising outcomes. An example is a pilot test conducted at Coast University in Colombia in the same year, where the Grammarly tool, known for enhancing grammar and syntax, was employed to improve postgraduate students' essays, resulting in positive effects. Exploring the connection between Grammarly and Chat, as previously mentioned, both tools leverage language models like GPT-3 to enhance linguistic aspects, but they serve different purposes. Grammarly focuses on grammar correction, while GPT-3, as discussed earlier, excels in generating contextually coherent and diverse text, enabling applications in various conversational and creative contexts.

Use of Artificial Intelligence

The use of AI in university education is gaining increasing relevance. In this regard, the application of AI in education can enhance the teaching-learning process, and different areas of

application have been highlighted, such as student assessment and behavior, as well as the development of chatbots and virtual assistants (Magallanes Ronquillo *et al*., 2023). In the current university context, the reliance and overuse of AI tools by postgraduate students to improve their AW is discussed and observed as a problem. This excessive dependence raises concerns about the development and refinement of students' writing skills, as there is a risk of limiting their ability to independently and originally generate texts. By excessively relying on these tools, students run the risk of not exercising and strengthening their skills to produce texts autonomously and effectively, which can hinder their academic growth and their capacity to express themselves in an original and personal manner in their scientific work.

Furthermore, the use of automated text generation tools also raises questions about originality and proper attribution of sources. If students heavily rely on these tools, it is crucial for them to be aware of the ethical and legal implications associated with their use and ensure responsible usage by properly citing sources and avoiding the submission of works lacking originality and authenticity. At the same time, AI tools may encounter difficulties in adapting to the specific needs of different academic disciplines, as each field of study has its own writing conventions and particular requirements.

Thus, it is possible that AI tools may not fully capture the subtlety and individual style of each discipline or writer, as one of the most significant challenges lies in evaluating the quality of texts generated by AI tools. However, while these tools can provide an initial foundation for writing, students may encounter difficulties in receiving precise and specific feedback on the quality of their writing. Aspects such as coherence, argumentative rigor, and structure may require the intervention of professors or professional proofreaders. Therefore, it is important for students to recognize that the use of AI tools does not replace the need to receive expert feedback and to work on the development of their scientific research and writing skills.

The excessive dependence of postgraduate students on AI tools to improve their AW poses significant challenges. It is crucial to find an appropriate balance between the use of these tools and the development of students' own writing skills. Regulating their use is the responsibility of universities themselves. Furthermore,

it is necessary to address ethical concerns related to originality and proper source attribution, as well as to consider the adaptability of AI tools to different disciplinary contexts. By addressing these issues, a more solid development of research and academic writing skills can be promoted.

Academic Writing and Artificial Intelligence

Research and AW play a crucial role in the success of postgraduate students, and the use of AI tools can provide an efficient and effective solution to enhance this (Fajardo Aguilar *et al*., 2023; Roman Acosta, 2023). In various postgraduate programs, the lack of guidance and dedicated resources for research and AW creates an urgent need to seek alternatives. In this sense, knowledge about how AI can improve the research and AW of postgraduate students has become a topic of great interest to the academic community. AI has the potential to support students in different aspects of AW, such as grammar, coherence, and structure. Additionally, through the use of advanced algorithms, these tools can detect errors and offer precise suggestions to improve the quality of texts.

Furthermore, AI can provide additional resources, such as automatic summary generation or search for relevant information, facilitating the research and writing process. By leveraging AI support in AW, postgraduate students can achieve a more efficient and higher-quality process. However, it is important to note that AI should not completely replace the development of fundamental writing skills. Students should consistently cultivate their ability to express themselves in an original manner and develop strong critical thinking. Therefore, AI should be seen as a complementary tool that supports and enhances existing skills rather than replacing them entirely.

In this way, the use of AI tools to improve AW in postgraduate students is a topic of great potential value in the academic field, which cannot continue to be overlooked within universities. Although these tools offer efficient and effective solutions to improve the quality of texts, it is essential for students to continue upwardly developing their reading and writing skills, all while striking an appropriate balance between the use of AI and the development of personal skills.

Concepts and theories about Artificial Intelligence

The theoretical framework of this research has been based on the contributions of various authors in different areas of science and technology. Firstly, Heaton (2018), Echeverri Torres & Manjarrés-Betancur (2020), and Belman-Lopez *et al*. (2020) have explored the ability of machines to learn from data without explicit programming, which has formed the basis of machine learning. Similarly, Salazar Torres & Girón Cardenas (2021), Ayala Franco *et al*. (2021), and Han *et al*. (2022) have presented the fundamental concepts of data mining and its application in various fields, highlighting its relevance in the analysis of large datasets. Additionally, Vega *et al*. (2020) have explained how machine learning can improve statistical inference and prediction by providing tools and algorithms to extract patterns and knowledge from data.

On the other hand, authors such as Purves *et al*. (2018) and Meléndez *et al*. (2023) have proposed methods for the analysis of opinions and feelings expressed in texts, which has been relevant in understanding emotions and attitudes in automated text processing. In the field of natural language, Meyer *et al*. (2020) have addressed text comprehension and generation, analyzing techniques and approaches for processing human language. Also, Arismendi Sarzur & Condori Quenta (2022) and Ulloa Valenzuela (2023) have explored the use of chatbots as intelligent agents to automate conversations, which has applications in human interaction with AI systems.

It is important to mention that ChatGPT, the AI language model used in this research, was developed by OpenAI based on the GPT-3.5 architecture. Although there is no specific author for the concept of this tool, it can be attributed to a team of developers from the aforementioned company (OpenAI, 2020). In this way, the model has been trained using a wide range of texts and has demonstrated interesting abilities in natural language generation.

Within this line of thought, Rodríguez *et al*. (2019), Ocaña-Fernández *et al*. (2019), García Villarroel (2021), Parra-Sánchez (2022), and Lopezosa *et al*. (2023) have pointed out that AI is transforming higher education by automating repetitive and laborious tasks, allowing researchers to dedicate more time to data interpretation and analysis. Thus, AI is also being used to

generate new knowledge and discoveries in a variety of fields. These authors highlight the potential of this technology to enhance the research and learning process in higher education.

The production of high-quality scientific articles is a fundamental requirement in the academic field, and continuous improvement of this skill is crucial for success in higher education and research in general. In this context, AI technology, represented by ChatGPT, has emerged as a potentially valuable tool to support AW. However, there is a gap in understanding how postgraduate students perceive and use ChatGPT in their AW process, as well as its impact on the quality of their scientific output. Therefore, this research is justified as an effort to fill this knowledge gap and provide a deeper understanding of the usefulness and implications of ChatGPT in enhancing AW in higher education.

That is why, the objective of this research is to describe the results obtained through the study carried out by PLAGCIS, which refer to the use of ChatGPT to enhance AW in postgraduate students in different Latin American countries. To achieve this, the following research question was formulated: How do postgraduate students in Latin America perceive and use ChatGPT in the process of enhancing their AW skills, and what is its impact on the quality of the scientific articles produced? This central question was broken down into specific elements that allowed addressing aspects such as the perception of the usefulness of ChatGPT; the ethical use of the tool; as well as the frequency of use and differences according to the demographic characteristics of the postgraduate students.

Methodology

The methodology was based on a quantitative approach, following the guidelines of authors such as Lafuente Ibáñez & Marín Egoscozábal (2008) in the use of surveys. This approach enabled the collection of quantifiable and accurate data on the participants' perceptions and views on the subject of study. Likert style surveys provided a suitable structure for measuring participants' responses on a scale of agreement or disagreement, facilitating the statistical analysis of the responses (Wheelwrigh *et al*., 2020).

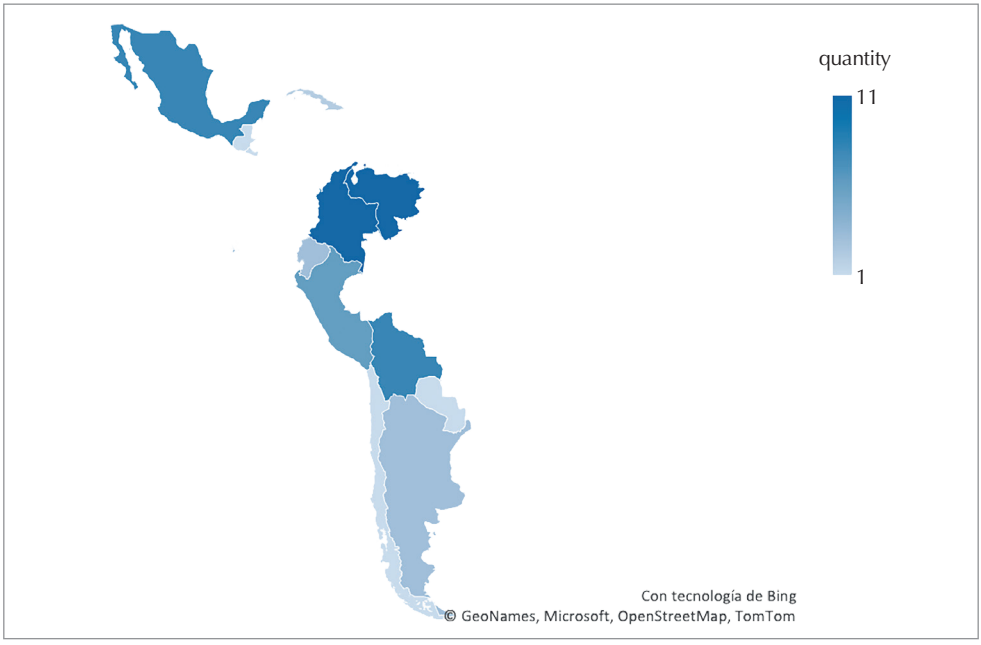
Moreover, this approach allowed for a rigorous and objective evaluation of the variables under study. With a descriptive-explanatory scope, the research not only detailed the characteristics

inherent to the sample but also sought to understand and explain the relationships between different variables. A non-experimental design was chosen for the study, ensuring that the subjects were observed in their natural context without external interventions.

Population and Sample

The target population of this research consisted of postgraduate students from various Latin American countries. To achieve a representative sample, a non-probabilistic sampling method was employed, which means that the obtained results could not be extrapolated to the entire population of postgraduate students in the region. However, this diversified approach allowed for valuable insights from different contexts and academic experiences.

Figure 1. Postgraduate students by country of origin.



Note: Under the premise of a study encompassing a total of 57 postgraduate students, a remarkable geographical diversity is highlighted in the distribution of participants according to their country of origin. Colombia and Venezuela top the list with 11 representatives each, followed by Mexico and Bolivia with 8 students each. Peru contributes with 6 students, while Argentina and Ecuador have 3 each. Cuba, Paraguay, El Salvador, and Guatemala show a more modest presence, with 2 and 1 student(s) respectively. This varied distribution reflects a mosaic of nationalities in the sample, showcasing the cultural and geographical richness among the involved postgraduate students.

In the context of the research, a significant distribution of postgraduate students according to their country of origin was observed. The sample, consisting of a total of 57 students, revealed considerable geographical diversity. In this regard, Venezuela, Mexico, Bolivia, Colombia, and Peru stood out with a high representation in the sample, totaling 41 students, which accounted for 71.9% of the total sample.

This geographical diversity indicated that these five countries had a prominent presence in the research, demonstrating a diverse and robust database. This extensive geographical representation provided a valuable opportunity to analyze perspectives and experiences of students from different countries regarding the use of ChatGPT in improving their AW skills.

Data Collection Instrument

The instruments underwent a validation process by experts in the field (11), ensuring high validity. Reliability was obtained through Cronbach's alpha coefficient, with values of 0.89 and 0.91 respectively (Heo *et al*., 2015). To facilitate data collection, the digital tool Google Forms was chosen. The questions were closed-ended and addressed various aspects related to the use of ChatGPT in AW. These questions focused on the frequency of the use of ChatGPT, perceived usefulness in improving AW, and ethical issues related to its use. To measure participant responses, a 5-point Likert scale was used.

Variables

The research focused on two main variables related to the use of ChatGPT in AW. Variable 1 explored participants' perception of the usefulness of ChatGPT, and its dimensions included its effectiveness in improving AW, ethical considerations, attribution issues, tool dependency, and recommendation for its use to others. On the other hand, Variable 2 focused on the use of this tool for enhancing AW skills, and its dimensions included the perception of improvement in writing skills, the consideration of chatbot as an alternative for receiving guidance or training, and the frequency of use of the tool by participants.

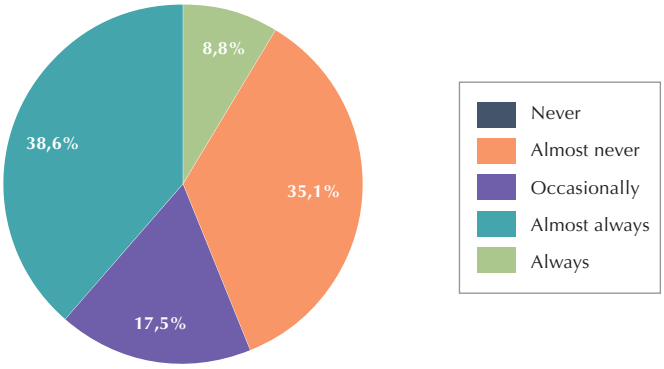
Results

The obtained results provided valuable information about how participants perceived and experienced the use of this tool in various aspects of AW. Additionally, a comprehensive analysis was conducted that addressed both general trends and individual variations among participants.

This analysis was compared with existing literature, allowing for the contextualization of the findings. The practical and theoretical implications derived from the results were also extensively discussed. In this process, both the potential advantages and limitations of this tool in relation to the field of study were identified. It is worth noting that these findings not only promote the advancement of future research, but also provide crucial information for designing more effective strategies in the implementation of AI in the academic setting.

The analysis of the question "I used ChatGPT to write texts" revealed patterns of use among postgraduate students. 38.6% indicated that they occasionally used it as an option to generate content and structure ideas in academic writings. On the other hand, none of the participants used it frequently. Therefore, the results indicated that the majority considered ChatGPT as an occasional option, recognizing its usefulness in content generation. A considerable number preferred not to use it, either because they preferred traditional methods or because they encountered limitations. This highlights the importance of considering individual preferences and varied approaches in AW. See Figure 2.

Figure 2. Writing texts using ChatGPT.

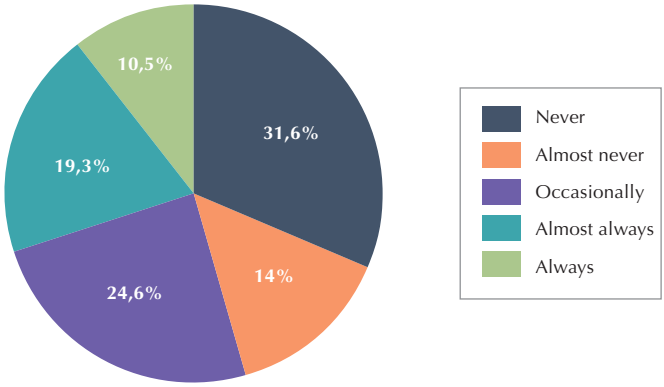


Source: Own elaboration.

In the dimension of ethical use and attribution, diverse perceptions were observed among postgraduate students. In this way, 31.6% of participants never included an acknowledgement or attribution statement when using text generated by ChatGPT, raising ethical concerns about misappropriation of authorship and lack of transparency in academic work. On the other hand, another group (24.6%) did so occasionally, showing awareness of the importance of ethical attribution but lack of consistency.

In summary, some students did not consider attribution relevant, while others were aware and consistent. These results highlighted the importance of promoting further education on ethics and proper attribution in the use of automated text generation tools like ChatGPT. A stronger understanding was required to address ethical issues such as misappropriation of authorship and transparency in presenting academic work. By fostering greater awareness, a more ethical and responsible use of ChatGPT in AW could be ensured. See Figure 3.

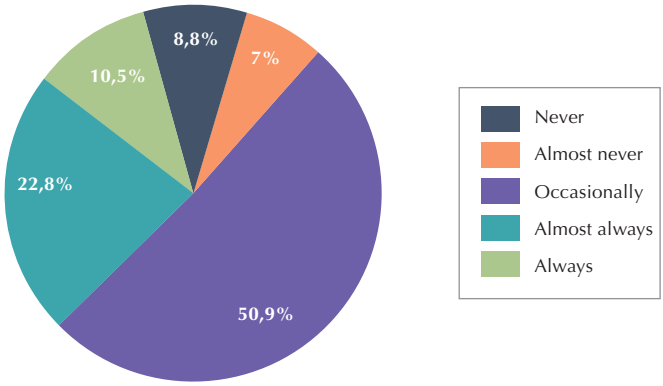
Figure 3. Acknowledgment or attribution when using text generated by ChatGPT.



Source: Own elaboration.

The analysis revealed that a considerable number of postgraduate students used ChatGPT as an alternative to receive guidance or training in AW when they had time constraints (22.8%). These findings highlighted the importance of considering individual preferences and limitations when assessing the feasibility of ChatGPT as an alternative in time-limited situations. See Figure 4.

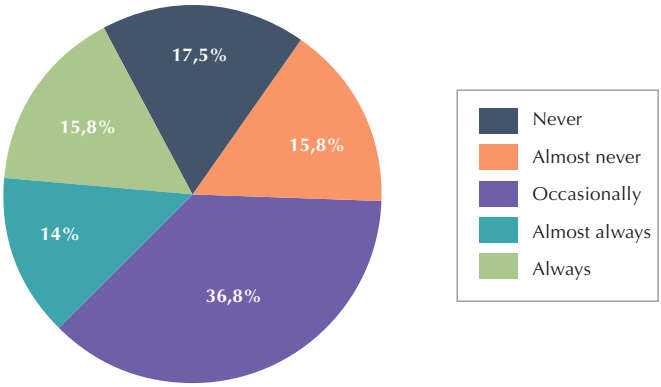
Figure 4. Alternative for students who do not have time for guidance.



Source: Own elaboration.

The analysis revealed various perceptions and attitudes among postgraduate students regarding the ethical use of ChatGPT in scientific writing. Some occasionally rejected its use due to ethical concerns, demonstrating interest in academic integrity (36.8%). Another group almost always rejected it for ethical reasons (14%), while a third group never rejected it due to trust in its ethical ability or lack of awareness about ethical implications (15.8%). These findings highlight the importance of ethical awareness and informed decisions when using automated tools in the academic field. See Figure 5.

Figure 5. Refusal to use ChatGPT due to ethical concerns.



Source: Own elaboration.

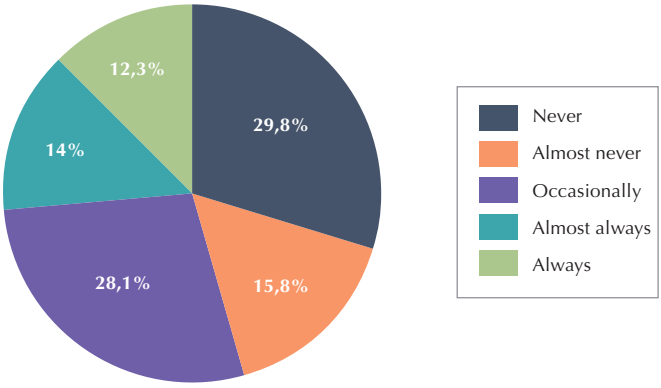
The analysis highlighted the diversity in training among postgraduate students regarding the ethical use of ChatGPT in scientific writing. Some received specific training, demonstrating preparedness for responsible use. Others had occasional training (28.1%), indicating intermittent exposure to the topic. However, it is concerning that some never received training (29.8%), signaling a lack of awareness or opportunities to address ethical implications. This emphasizes the importance of providing training to prevent issues such as plagiarism or failure to acknowledge sources. Therefore, it is crucial to implement programs that address ethical considerations and promote good practices in the use of ChatGPT and similar tools.

Concerning the ethical use of ChatGPT, the results reveal that some students have received training or instruction on the ethical use of the tool, which has provided them with a deeper understanding of the ethical challenges associated with its use in academic writing. These students are better prepared to appropriately address ethical implications and make informed ethical decisions in their AW. However, a significant percentage has never received training in this aspect, indicating a lack of awareness or opportunities to address the ethical considerations of using ChatGPT. Therefore, it is essential to implement

training and awareness programs to ensure that all students are adequately prepared and aware of the ethical implications in their AW.

This will ensure responsible use and preserve academic integrity. See Figure 6.

Figure 6. Training received on the ethical use of ChatGPT.



Source: Own elaboration.

Discussion

In terms of the variable "enhancing AW skills," indicators such as the use of ChatGPT to correct spelling or grammatical errors in academic writing are employed. The results reveal different patterns of use among students. Some indicate that they almost always use this tool to correct errors, relying on the accuracy and efficiency of the tool. On the other hand, others use it occasionally as a supplementary option, while some never use it, relying on traditional correction methods. These findings suggest that students have different approaches to how they use this AI to enhance their AW skills.

Regarding the indicator related to the "ethical use of ChatGPT in scientific article writing," the results show that only a minority percentage of students have received regular training on the

ethical use of the tool. Some indicate having received training almost always or occasionally, while a significant proportion has never received instruction in this aspect. This highlights the need to implement systematic and continuous training programs to ensure that students are adequately prepared and aware of the ethical implications when using ChatGPT in academic writing.

Furthermore, the results demonstrate a diversity of perceptions and practices among postgraduate students regarding the use of ChatGPT in their AW. On one hand, some students trust the tool's ability to enhance their writing skills by using ChatGPT to correct spelling or grammatical errors in their academic writings. These students consider the tool to be efficient and accurate, enabling them to improve the quality and accuracy of their texts. However, other students prefer traditional correction methods, relying on their own knowledge and skills in spelling and grammar or seeking guidance from teachers and peers.

Regarding the originality of academic papers, students show different perceptions and concerns. Some acknowledge that the use of ChatGPT can impact the originality of their work, although they do not consider it as a determining factor in all instances. These students are aware of the need to supervise and appropriately adapt the texts generated by ChatGPT to ensure the originality of their academic papers. On the other hand, other students trust their ability to use the tool responsibly and maintain the originality of their research, taking additional measures such as carefully reviewing and editing the generated texts.

The variables and indicators used allow to evaluate the improvement of AW skills and the ethical use of the tool. These findings highlight the importance of considering individual preferences and ethical awareness of students when using ChatGPT and they emphasize the need to implement appropriate training programs to promote responsible and ethical use of the tool in AW.

It is worth noting that, in a certain sense, there is a relationship with what Vega Jiménez *et al*. (2023) have described, stating that in educational contexts, regulatory policies should be implemented to ensure academic excellence, particularly in scientific writing, where AI plays a complementary role but should not be the sole decision-maker in processes and research without proper supervision by specialists and researchers. Therefore, the use of ChatGPT in current educational contexts

is an advantage; however, it should be ensured that it is implemented correctly without infringing laws, regulations, and academic norms that indicate a lack of professional ethics.

Additionally, similarities can be observed with the study presented by Sarrazola (2023), who states that when a careful and detailed examination is conducted on the information provided by ChatGPT, students develop critical thinking and engage in a feedback process that varies depending on the knowledge they have previously acquired. This is due to the synthesis and filtering analysis to which they are subjected by the tool. Therefore, the academic context is considered a space that contributes to the intellectual enrichment of students, where debates, lectures, and talks are held on how ChatGPT should be used to assist and complement scientific writing. Emphasis is placed on the advantages it can provide, as long as the data is used correctly and practices such as plagiarism are avoided.

Likewise, there are similarities with the results described by Vera (2023), who mentions that although ChatGPT provides various benefits, it is essential to consider several aspects, including ethical concerns and challenges associated with the use of this AI in academic contexts. Therefore, in current educational institutions, there should be a focus on studying and understanding the impact of these tools, allowing both students and teachers to gain knowledge about them and avoid their misuse.

Currently, systematic monitoring should be applied to the implementation of ChatGPT when generating high-quality manuscripts such as scientific articles, essays, and theses (Marche, 2022). Attention should be paid to the incorporation of this AI into academic practice because, despite relying on advanced language models, they are still prone to errors, which can lead to the dissemination of false, incorrect, and inaccurate information. Hence, its use should always be regarded as a supplement and not as a decision-maker.

Conclusions

This study underscores the pivotal role of academic writing (AW) as a conduit for disseminating research outcomes within the scientific realm. Notably, challenges persist in integrating effective AW training in both undergraduate and postgraduate programs, prompting a need for innovative solutions. The

research sheds light on the increasing prominence of artificial intelligence (AI), particularly exemplified by ChatGPT, as a transformative tool in overcoming AW hurdles. While AI offers distinct advantages, ethical considerations and the preservation of critical thinking skills are paramount in its integration into educational frameworks.

In the context of postgraduate studies, the demand for honing knowledge generation through scientific article writing is evident. AI, represented here by ChatGPT, emerges as a potent force to elevate the quality of academic writing. The study delves into the successful applications of AI in text generation, highlighting the efficacy of GPT-3 in producing coherent and high-quality texts. However, a cautious approach is advocated, emphasizing AI's role as a complement rather than a replacement for fundamental writing skills. Balancing the use of AI tools and nurturing personal writing skills is crucial for fostering a comprehensive development of postgraduate students.

Theoretical foundations drawn from various authors have elucidated the machine learning capabilities, data mining applications, and text comprehension advancements that underpin AI technologies. The use of AI tools, such as ChatGPT, in academic settings is expanding, offering efficient solutions for enhancing writing skills. However, this expansion warrants a careful equilibrium, as an overreliance on AI may impede the independent development of students' writing capabilities. Ethical considerations surrounding originality, proper source attribution, and adaptability to diverse disciplinary contexts remain key challenges. Moving forward, universities play a pivotal role in regulating AI tool usage, ensuring a balanced integration that promotes both the advantages of AI and the continued development of students' writing and critical thinking skills.

References

Arismendi Sarzur, C. J., & Condori Quenta, J. C. (2022). Categorización de procesos de estudio y aplicación de la inteligencia artificial en el sector empresarial de servicios de la ciudad de La Paz. [tesis de licenciatura, Universidad Mayor de San Andrés]. https://repositorio.umsa.bo/bitstream/handle/123456789/31720/TD-3109.pdf?sequence=1&isAllowed=y

Ayala Franco, E., López Martínez, R. E., & Menéndez Domínguez, V. H. (2021). Modelos predictivos de riesgo académico en carreras de computación con minería de datos educativos. *Revista de Educación a Distancia (RED)*, 21(66). https://doi.org/10.6018/red.463561

Belman-Lopez, C. E., Jiménez-García, J. A., & Hernández-González, S. (2020). Comprehensive analysis of design principles in the context of Industry 4.0. *Revista Iberoamericana de Automática e Informática Industrial*, 17(4), 432-447. https://doi.org/10.4995/riai.2020.12579

Bhatia, P. (2023). ChatGPT for academic writing: A game changer or a disruptive tool? *Journal of anaesthesiology, clinical pharmacology,* 39(1), 1–2. https://doi.org/10.4103/joacp.joacp_84_23

Codina, L. (2022). *Cómo utilizar ChatGPT en el aula con perspectiva ética y pensamiento crítico: Una proposición para docentes y educadores*. Lluís Codina. https://www.lluiscodina.com/chatgpt-educadores/

Echeverri Torres, M. M., & Manjarrés-Betancur, R. (2020). Asistente virtual académico utilizando tecnologías cognitivas de procesamiento de lenguaje natural. *Revista Politécnica*, 16(31), 85-96. https://doi.org/10.33571/rpolitec.v16n31a7

Escobar, M., Garbarini, M., & D'Amato, S. L. (2019). Programa para el Fortalecimiento de la Lectura y la Escritura (PROFLE): Instituto de Estudios Iniciales, Universidad Nacional Arturo Jauretche, República Argentina. *Revista Argentina de Educación Superior,* (19), 64-77. https://dialnet.unirioja.es/descarga/articulo/7204536.pdf

Fajardo Aguilar, G. M., Ayala Gavilanes, D. C., Arroba Freire, E. M., & López Quincha, M. (2023). Inteligencia Artificial y la Educación Universitaria: Una revisión sistemática. *Magazine De Las Ciencias: Revista De Investigación E Innovación*, 8(1), 109–131. https://doi.org/10.33262/rmc.v8i1.2935

García Villarroel, J. J. (2021). Implicancia de la inteligencia artificial en las aulas virtuales para la educación superior. *Orbis Tertius - UPAL*, 5(10), 31–52. https://www.biblioteca.upal.edu.bo/htdocs/ojs/index.php/orbis/article/view/98

García-Peñalvo, F. J. (2023). La percepción de la Inteligencia Artificial en contextos educativos tras el lanzamiento de ChatGPT: disrupción o pánico. *Education in the Knowledge Society (EKS)*, 24, e31279. https://doi.org/10.14201/eks.31279

Han, J., Pei, J., & Tong, H. (2022). *Data mining: concepts and techniques*. Morgan kaufmann. http://rizalespe.lecture.ub.ac.id/files/2015/10/DM-04-1-Klasifikasi.pdf

Heaton, J. (2018). Ian Goodfellow, Yoshua Bengio, and Aaron Courville: Deep learning: The MIT Press. *Genetic Programming and Evolvable Machines*, 19(1-2), 305-307. https://doi.org/10.1007/s10710-017-9314-z

Heo, M., Kim, N., & Faith, M. S. (2015). Statistical power as a function of cronbach alpha of instrument questionnaire items. BMC Medical Research Methodology, 15(1). https://doi.org/10.1186/s12874-015-0070-6

Lafuente Ibáñez, C., & Marín Egoscozábal, A. (2008). Metodologías de la investigación en las ciencias sociales: Fases, fuentes y selección de técnicas. *Revista Escuela de Administración de Negocios,* (64), 5–18. https://doi.org/10.21158/01208160.n64.2008.450

Lopez, M. E., & Bustos, M. A. (2021). ¿Matar al autor? Desafíos de la escritura académica en la Licenciatura en Psicopedagogía. *Cuadernos de Educación*, (19), 143-154. https://revistas.unc.edu.ar/index.php/Cuadernos/article/download/34140/34590

Lopezosa, C., Codina, L., & Ferran-Ferrer, N. (2023). ChatGPT como apoyo a las systematic scoping reviews: integrando la inteligencia artificial con el framework SALSA. *Col·lecció del CRICC*. https://diposit.ub.edu/dspace/handle/2445/193691

Magallanes Ronquillo, K. K., Plúas Pérez, L. del R., Aguas Veloz, J. F., & Freire Solís, R. L. (2023). La inteligencia artificial aplicada en la innovación educativa en el proceso de enseñanza y aprendizaje. *LATAM Revista Latinoamericana De Ciencias Sociales Y Humanidades*, 4(2), 1597–1613. https://doi.org/10.56712/latam.v4i2.706

Marche, S. (2022). *The College Essay Is Dead Nobody is prepared for how AI will transform academia*. The Atlantic. https://www.theatlantic.com/technology/archive/2022/12/chatgpt-ai-writing-college-student-essays/672371/

Meléndez, N., Briceño, M., Gibertoni, J., & Lucente, R. (2023). Minería de texto aplicado al análisis de sentimientos para la búsqueda de patrones de motivación en programa de actualización docente. *CIE Academic Journal*, 2(1), 32-40. https://revistas.unicyt.org/index.php/cie-academic-journal/article/download/93/88

Meyer, L., Sun, Y., & Martin, A. E. (2020). Synchronous, but not entrained: exogenous and endogenous cortical rhythms of speech and language processing. *Language, Cognition and Neuroscience*, 35(9), 1089-1099. https://doi.org/10.1080/23273798.2019.1693050

Ocaña-Fernández, Y., Valenzuela-Fernández, L. A., & Garro-Aburto, L. L. (2019). Inteligencia artificial y sus implicaciones en la educación superior. *Propósitos y representaciones*, 7(2), 536-568. http://dx.doi.org/10.20511/pyr2019.v7n2.274

OpenAI. (2020). *GPT-3*. https://openai.com/blog/openai-api/

Parra-Sánchez, J. S. (2022). Potencialidades de la Inteligencia Artificial en Educación Superior: Un enfoque desde la personalización. *Revista Tecnológica-Educativa Docentes 2.0*, 14(1), 19-27. https://doi.org/10.37843/rted.v14i1.296

Purves, R. S., Clough, P., Jones, C. B., Hall, M. H., & Murdock, V. (2018). Geographic information retrieval: Progress and challenges in spatial search of text. *Foundations and Trends® in Information Retrieval*, 12(2-3), 164-318. https://www.nowpublishers.com/article/DownloadSummary/INR-034

Rodríguez, G. C., Gómez-Martínez, R., Martínez-Navalón, J. G., & Prado-Román, C. (2019). Inteligencia artificial para predecir la lealtad a la universidad. *Journal of Management and Business Education*, 2(1), 17-27. https://dialnet.unirioja.es/servlet/articulo?codigo=7291478

Roman Acosta, D. D. (2023). Más allá de las palabras: inteligencia artificial en la escritura académica. Escritura Creativa, 4(2). https://ojs.nfshost.com/index.php/escritura_creativa/article/view/44

Romero González, A. N., & Álvarez Álvarez, M. D. L. N. (2020). La escritura académica de estudiantes universitarios de Humanidades a partir de sus producciones. Estudio transversal. *Revista mexicana de investigación educativa*, 25(85), 395-418. https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1405-66662020000200395

Salazar Torres, J. I., & Girón Cardenas, E. (2021). Análisis y aplicación de algoritmos de minería de datos. *Perspectivas*, 6(21), 71–88. https://doi.org/10.26620

Sarrazola, A. (2023). Uso de ChatGPT como herramienta en las aulas de clase. *Revista EIA,* 20(40), 1–23. https://doi.org/10.24050/reia.v20i40.1708

Ulloa Valenzuela, G. (2023). El desafío del uso de inteligencia artificial para la elaboración de la literatura científica: el caso de ChatGPT, un debate abierto. *Cuadernos Médico Sociales*, 63(1), 27–31. https://doi.org/10.56116/cms.v63.n1.2023.1140

Vega Jiménez, J., Borja Gomez, E. E., & Ramírez Álvarez, P. J. (2023). ChatGPT e inteligencia artificial: ¿obstáculo o ventaja para la educación médica superior? *Educación Médica Superior,* 37(2). https://ems.sld.cu/index.php/ems/article/download/3851/1503

Vega, M. Á., Mora, L. M. Q., & Badilla, M. V. C. (2020). Inteligencia artificial y aprendizaje automático en medicina. *Revista médica sinergia*, 5(8), e557-e557. https://www.revistamedicasinergia.com/index.php/rms/article/download/557/923

Ventayen, R. J. M. (2023). OpenAI ChatGPT Generated Results: Similarity Index of Artificial Intelligence-Based Contents. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4332664

Vera, F. (2023). Integración de la Inteligencia Artificial en la Educación superior: Desafíos y oportunidades. *Transformar*, 4(1), 17–34. https://www.revistatransformar.cl/index.php/transformar/article/view/84

Wang, S., Scells, H., Koopman, B., & Zuccon, G. (2023). Can ChatGPT write a good boolean query for systematic review literature search? *arXiv preprint arXiv*:2302.03495.https://doi.org/10.48550/arXiv.2302.03495

Wheelwright, M., Levine, Z., Garfinkel-Castro, A., Bushman, T., & Brewer, S. (2020). Principal component and factor analysis. *Advanced Quantitative Research Methods for Urban Planners,* 95-120. https://doi.org/10.4324/9780429325038-5

Zhai, X. (2022). ChatGPT User Experience: Implications for Education. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.4312418

Declarations

- **Acknowledgments to:** The Platform for Action, Management, and Social Research (PLAGCIS).
- **Funding:** ChatGPT and its use to improve academic writing in postgraduate students, was funded with internal resources.
- **Data and materials availability:** ert931025@gmail.com
- **Authors' contributions:** Daniel Roman Acosta participated in the systematization of the theoretical foundations, contributed to the methodological design of the research, drafted the initial results, and contributed to the final text writing. Esteban Rodríguez Torres participated in the systematization of the theoretical foundations, contributed to the analysis and integration of results, and wrote the final text. Martha Beatriz Baquedano Montoya participated in the systematization of the theoretical foundations, contributed to the methodological design of the research, oversaw the execution of actions, coordinated their execution, and reviewed the final text. Lilibeth Carolina López Zavala participated in the systematization of the theoretical foundations, contributed to the methodological design of the research, oversaw the execution of actions, coordinated their execution, and reviewed the final text. Alfredo Javier Pérez Gamboa participated in the systematization of the theoretical foundations, contributed to the methodological design of the research, oversaw the execution of actions, coordinated their execution, and reviewed the final text.
- **Conflict of interest:** The authors declare no conflicts of interest.