REVIEW

Potential of artificial intelligence in textual cohesion, grammatical precision, and clarity in scientific writing

Potencial de la inteligencia artificial en cohesión textual, precisión gramatical y claridad en escritura científica

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ABSTRACT

Introduction: the use of artificial intelligence (AI) tools in writing has significantly increased in recent years, promising improvements in textual coherence, grammatical precision, and clarity of ideas. This study focused on evaluating the long-term impact of AI usage on these aspects of academic writing.
Objective: identify the long-term effects of AI on cohesion, grammatical precision, and clarity in academic writing, while also exploring its ethical implications.
Methods: a qualitative systematic review was conducted using the SALSA method, analyzing recent studies that address the influence of AI on writing quality. The databases used included Scopus, Web of Science, SciELO, and Latindex, with results restricted to publications since 2023.
Results: the findings indicate that AI can enhance cohesion, precision, and clarity in texts, especially when used as a support tool. However, the effectiveness of these improvements depends on the context of use and the appropriate integration of human intervention.
Conclusions: although AI offers clear benefits in improving academic writing, its use raises ethical and legal challenges that must be addressed. It is crucial to continue researching to optimize these tools and ensure responsible use in educational settings.

Keywords: Artificial Intelligence; Academic Writing; Textual Cohesion; Grammatical Precision.

RESUMEN

Introducción: el uso de herramientas de inteligencia artificial (IA) en la escritura ha incrementado significativamente en los últimos años, prometiendo mejoras en la coherencia textual, precisión gramatical y claridad de ideas. Este estudio se centró en evaluar el impacto a largo plazo del uso de IA en estos aspectos de la escritura académica.
Objetivo: Identificar los efectos a largo plazo del uso de IA en la cohesión, precisión gramatical y claridad de ideas en la escritura académica, explorando también sus implicaciones éticas.
Métodos: se realizó una revisión sistemática cualitativa utilizando el método SALSA, analizando estudios recientes que abordan la influencia de la IA en la calidad de la escritura. Las bases de datos utilizadas incluyeron Scopus, Web of Science, SciELO y Latindex, restringiendo los resultados a publicaciones desde 2023.
Resultados: los hallazgos indican que la IA puede mejorar la cohesión, precisión y claridad en los textos, especialmente cuando se utiliza como herramienta de apoyo. Sin embargo, la efectividad de estas mejoras depende del contexto de uso y de la integración adecuada de la intervención humana.
Conclusiones: aunque la IA ofrece beneficios claros en la mejora de la escritura académica, su uso plantea

desafíos éticos y legales que deben ser abordados. Es crucial continuar investigando para optimizar estas herramientas y garantizar un uso responsable en entornos educativos.

Palabras clave: Inteligencia Artificial; Escritura Académica; Cohesión Textual; Precisión Gramatical.

INTRODUCTION

Advanced natural language generation models, such as GPT-3 and its successors, have shown remarkable potential for improving key aspects of writing, such as coherence, grammar, and clarity. Today, emerging technologies such as artificial intelligence (AI) are positioned as essential tools for writing, especially in the creation of textual content in academic and professional contexts.[1]

These advances are located at the intersection of computational linguistics and applied artificial intelligence, opening a new field of study that explores how these technologies can be effectively integrated into writing processes to enhance the quality of human-generated content. The relevance of this approach is evident in a world where accurate and coherent writing is critical for effective communication across multiple disciplines.[2,3]

Recent research has investigated how AI tools can influence writing, highlighting improvements in the efficiency and clarity of texts produced with their assistance. Studies have noted that these tools not only help diversify the ideas presented in texts but also enable users to maintain greater clarity and coherence in their writing. In addition, the ability of AI to support the creation of multilingual content has been explored, contributing to greater equity in access to information and education. However, concerns persist around the intellectual property of texts generated in collaboration with AI and the potential biases that these tools could introduce into the writing process.[4,5]

Despite the advances above, there needs to be more literature regarding the long-term effects of using AI tools on the evolution of critical writing skills, such as textual cohesion, grammatical accuracy, and clarity of ideas. This paper seeks to fill that gap by examining, in a systematic way, recent studies that address the sustained impact of AI on writing quality. The novelty of this study lies in its focus on the longitudinal effects of sustained AI use on writing, an aspect that has been little explored in previous research. This approach will allow for a deeper understanding of how AI may influence the development of writing competencies over time.[4,6]

Understanding the long-term impacts of interaction with AI tools on writing is crucial, especially in a context where writing is an essential skill across multiple disciplines. Identifying whether prolonged use of AI could lead to a dependency that negatively affects writers' ability to generate original, high-quality content without technological assistance is a topic of great importance. This work will contribute significantly to the fields of computational linguistics and education, providing a solid foundation for future research and applications of AI in the teaching and practice of writing.[2,5,3]

The central question guiding this study is: How does prolonged use of AI tools affect the evolution of textual cohesion, grammatical accuracy, and clarity of ideas in writing? The goal is to examine the available evidence in the scientific literature to analyze these effects and to provide a critical synthesis to guide future research and practice in the use of AI in writing.

METHOD

In this systematic review, a qualitative approach was adopted to analyze the available literature on the long-term effects of the use of AI tools on writing. This qualitative approach is particularly suitable for studies that seek to explore complex and contextual phenomena, such as the evolution of writing quality under the influence of AI, allowing a deeper understanding of the processes involved. For the conduct of this systematic review, the SALSA (Search et al., and Analysis) method was applied, which is widely used in systematic reviews to ensure a rigorous and structured approach to the identification and evaluation of relevant literature.

According to Sandelowski[7], qualitative systematic reviews are essential for synthesizing evidence in areas where the data are predominantly narrative and exploratory, providing a holistic view of the subject of study. The qualitative methodology applied here focused on identifying patterns, themes, and relationships within the selected studies, following the recommendations of Noblit et al.[8] on the interpretive synthesis of qualitative research. This approach is consistent with the qualitative methodology in systematic reviews described by Thomas and Harden[9], which emphasizes the importance of a thematic analysis to integrate findings from multiple qualitative studies.

The research questions formulated for this qualitative systematic review were designed to guide the analysis and ensure that key aspects of the study objective were addressed. These questions were: 1) How does prolonged use of AI tools affect textual cohesion in writing? 2) What impact does AI have on the grammatical accuracy of texts generated with its assistance? 3) How does AI influence the clarity of ideas presented in long-term writing? 4) Are there significant differences in writing quality between users who use AI and those who do

not? 5) What are the ethical and intellectual property implications of the continued use of AI tools in writing? These questions reflect a qualitative approach aimed at exploring and understanding the complexity of the effects of AI on writing, aligning with the methodological principles set forth by Pope et al.[10] in their guide to qualitative health research.

Search strategies focused on identifying relevant studies using specific keywords, such as "artificial intelligence," "AI-assisted writing," "textual cohesion," "grammatical accuracy," "writing clarity," "long-term impacts," and "intellectual property in AI."

These strategies were implemented in databases such as Scopus, Web of Science, SciELO, and Latindex, following the best practices described by Booth et al.[11] to ensure a comprehensive and systematic search. The inclusion of studies was limited to those published after 2023 to ensure the relevance and timeliness of the findings, a methodological approach that Moher et al.[12] highlight as critical to maintaining the validity of systematic reviews. Likewise, special attention was paid to selecting studies that provided empirical data and were peer-reviewed, which is aligned with the quality standards described by Kitchenham and Charters.[13]

The exclusion criteria applied in this review were designed to ensure that only the most relevant and rigorous studies were included. Studies that were not available in full text, those that were not peer-reviewed, and studies that were not directly related to the long-term effects of AI use on writing were excluded. We also excluded research that was based solely on opinions or theories without adequate empirical support, following the recommendations of Hartling et al.[14] on the importance of clear exclusion criteria to improve the quality of systematic reviews. This approach ensures that the review remains focused on robust empirical evidence, which is essential for a high-quality qualitative systematic review.

In the search phase, a search was conducted in recognized academic databases such as Scopus, Web of Science, Latindex, and SciELO. During the Appraisal phase, the selected studies were reviewed to ensure that they met the quality and relevance criteria necessary to address the research questions posed. Subsequently, in the Synthesis phase, the findings of the selected studies were grouped and synthesized, identifying common patterns and trends. Subsequently, in the analysis phase, a critical analysis of the results obtained was carried out, considering the implications of the findings in the context of the prolonged use of AI tools in the writing process.
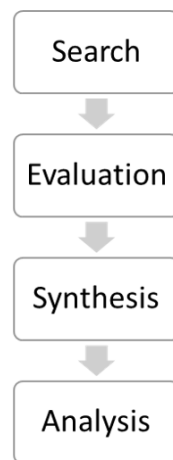

Figure 1. Phases in the document review process

RESULTS
Impact of the prolonged use of AI tools on textual cohesion

Prolonged use of AI tools in writing can have various effects on textual cohesion. Recent studies indicate that AI tools, such as natural language generation models, can improve cohesion in user-generated texts, especially in educational contexts where greater clarity and coherence are required in academic writing. For example, it has been found that the use of AI-generated text in high school students helped improve the organization and structure of their compositions, indicating a positive impact on textual cohesion by integrating AI suggestions with human production.[15] In conjunction, it was noted that the use of text recognition and generation technologies in English as a foreign language (EFL) significantly improved the cohesion and consistency of writings by providing personalized revisions based on students' original texts.[16]

Another study focused on cohesion analysis in student-created multimodal texts using cohesive grammatical devices and found that students who employed AI in their textual creations showed more effective use of personal references and additive conjunctions, which strengthened textual cohesion.[17] Similarly, they investigated cohesion in Korean texts using AI. They found that expert-generated texts, when interacting with

AI, showed a higher degree of cohesion compared to reference texts, highlighting the ability of AI to improve cohesion in specific, highly specialized contexts.[18]

However, not all effects are positive. Caution was raised about the possibility that AI, when generating text autonomously, may introduce cohesion errors that are difficult to detect by untrained users, which could result in texts that, although grammatically correct, lack cohesion and natural fluency.[19] In conjunction, it was noted that although current AI models can produce coherent and grammatically accurate content, there are still notable differences in the depth and overall quality of cohesion when compared to human-written texts, suggesting that AI may require further improvements to match the level of cohesion of human writing.[20]

On the other hand, AI applications such as Grammarly and Quillbot were found to improve cohesion in undergraduate academic writing by helping them identify and correct coherence and cohesion errors in their texts.[21] We explored how human-AI interaction in textual production affects the perception of authorship and cohesion, concluding that, although users value the clarity and coherence introduced by AI, there is still a disconnect in the perception of text ownership and authorship.[22]

In a larger study, it was observed that AI-based tools help students plan and develop drafts more cohesively. However, it was cautioned that these tools still have limitations in fully optimizing cohesion in certain linguistic contexts.[23] To conclude with this idea, it was highlighted that Saudi EFL students who used AI in their expository writing achieved a noticeable improvement in the cohesion of their texts, suggesting a positive impact on the organization and flow of their ideas when using AI tools.[24]

Impact of AI on the grammatical accuracy of texts

The impact of AI on the grammatical accuracy of texts generated with its assistance has been the subject of multiple recent studies.[25,26,27,28] In general, AI tools, such as Automatic Writing Evaluation (AWE) systems and other AI-based programs, have been found to significantly improve the grammatical accuracy of users' writing, especially in language learning contexts. For example, it was found that the use of Grammarly, together with instructor feedback, improved the grammatical accuracy of beginning English learners, increasing their confidence and motivation in learning the language.[30] Another study showed that AWE systems, such as Pigai, contribute to improving grammatical accuracy in English as a foreign language (EFL) learners, particularly those with lower language skills.[31]

In academia, it was reported that the use of AI-assisted writing tools in teaching academic writing not only improved students' grammatical accuracy but also increased efficiency in the teaching process by providing timely and personalized feedback.[32] Similarly, it was highlighted that although the full use of AI for writing tasks could reduce accuracy by 25 %, its use as a support tool in reading and writing improved the overall quality and accuracy of the content produced.[33] On the other hand, positive attitudes toward the use of Automatic Writing Assessment tools were observed in college students, who reported improvements in their grammatical skills after its implementation.[34]

Additionally, research on the use of AI to explain grammatical concepts in classical languages found that these tools could be useful in helping students practice vocabulary and review grammatical concepts, albeit with limitations in some languages, such as Ancient Greek.[35] Similarly, the gap between AI-generated scientific content and that written by humans was investigated, finding that, although AI can generate grammatically correct content, subtler errors persist that require improvements in current models.[36]

In more technical contexts, a new approach based on supervised copying mechanisms was introduced for grammatical error correction, highlighting reduced overcorrection and improved grammatical accuracy of processed texts.[37] Significant improvements in the cohesion and grammatical accuracy of EFL learner texts were also identified when using text recognition and generation technologies.[38]

In this regard, a neuro-symbolic approach to validate grammatical sentences, combining traditional grammatical rules with modern language models, was explored and shown to be effective in improving grammatical accuracy in various natural language processing applications.[39]

Influence of AI on the clarity of ideas in writing.

The integration of AI tools into the writing process has been shown to improve the clarity of ideas in the long run, especially in educational and academic contexts. For example, it is noted that AI applications have facilitated the organization and communication of ideas in business writing, enabling authors to articulate concepts more clearly and concisely.[40] This impact is especially relevant in AI-assisted writing, where technology helps to better structure content and avoid ambiguities in the presentation of ideas.

Likewise, it was found that the use of AI in teaching English as a foreign language (EFL) not only improved grammatical accuracy but also facilitated greater clarity in the exposition of ideas, which is essential for readers' comprehension and retention of content.[41] Similarly, it was observed that, in an academic writing environment, AI-powered tools helped students improve the coherence and clarity of their arguments, contributing to better organization of critical thinking.[42]

It also addressed how AI is transforming higher education, highlighting that, through text generation and writing assistance, AI enables students to structure their ideas more logically and clearly.[43] This is supported by research indicating that the use of AI in tertiary education has significantly improved clarity in academic writing, helping students to present their ideas in a more effective and organized manner.[44]

Under this context, generative literacy conversations were explored. AI can facilitate conceptual clarity by enabling authors to better visualize and organize their ideas before capturing them in text.[45] The social justice perspective on the use of generative AI was also investigated, highlighting that while AI improves clarity in the presentation of ideas, it also raises ethical challenges that must be addressed to ensure effective and fair communication.[46]

The transformative impact of AI in higher education was discussed, highlighting that the technology has been instrumental in improving the clarity and cohesion of texts produced by students and academics.[47] Another study looked at how AI is influencing pharmaceutical practice, and although the focus was on professional practice, the study suggested that AI also improves clarity in documenting and communicating complex ideas in technical reports.[48]

On the other hand, a review on the science of generative AI noted that these tools are fundamentally changing the way creative ideas are produced and communicated, allowing users to organize their thoughts more clearly and coherently.[49]

Differences in handwriting quality between users with and without AI

The comparison between the writing quality of users who use AI tools and those who do not has generated several findings in the recent literature. Studies have shown that AI can improve certain aspects of writing, such as coherence and grammatical accuracy, but its effects on overall writing quality are nuanced.[50, 51]

For example, a study was conducted in which they used ChatGPT as a writing assistant for professional tasks. They found that participants who used ChatGPT experienced an improvement in the quality of the content produced, with an 18 % increase in the quality of the final output compared to those who did not use AI.[52] This suggests that AI can contribute to a significant improvement in writing when used as a support tool.

However, other studies found no significant differences in the quality of essays written by students who used ChatGPT compared to those who did not. Although students who used AI completed their assignments more quickly, the quality of the text did not improve significantly, suggesting that AI does not always guarantee an improvement in writing quality.[53]

In another study, they examined how non-native speakers of English used AI-driven rewriting tools to improve the quality of their academic texts. They found that users who combined AI with other writing tools achieved a greater improvement in the quality of their writing, especially in terms of clarity and coherence, compared to those who did not use AI[54]

For their part, they studied the challenges faced by non-native English speakers when using AI-powered writing assistants. They found that, although AI helped improve certain aspects of writing, the lack of clear explanations of AI suggestions could lead to an incorrect assessment of text quality, which affected the overall perception of quality.[55]

They explored the impact of ChatGPT on user experience (UX) writing, finding that AI can improve speed and consistency in writing. They also highlighted the importance of human supervision to ensure that content quality is adequate.[56]

A related study assessed the quality of AI-assisted colonoscopy in clinical practice, concluding that although AI improved certain technical parameters, its impact on the overall quality of the process was highly dependent on the application context and human interaction.[57]

They discussed the challenges and opportunities posed by ChatGPT in education, especially in terms of writing quality. Their findings suggest that while AI may offer benefits in content generation, it may also pose challenges in terms of academic integrity and authenticity.[58]

A review was conducted on AI-driven telemedical care, finding that satisfaction and perception of service quality were high among users. However, studies did not always show significant improvements in all quality indicators.[59]

An AI-driven language learning application for children was developed, demonstrating that AI could improve the quality of pronunciation and language comprehension, which could be extrapolated to improvements in writing quality in young users.[60]

In this regard, the performance of AI-assisted code generation was investigated, concluding that, although AI improved efficiency, the quality of the generated code did not always outperform code produced without assistance, highlighting the limitations of AI in certain contexts.[61]

Intellectual property in AI-assisted drafting

One of the most controversial issues is the question of authorship and intellectual property of AI-generated

or AI-assisted texts. It is noted that granting AI systems the legal status of authors poses significant challenges, as it may lead to an excessive concentration of rights over the generated content, which could affect human dignity and cause significant economic disruption.[62] The possibility of AI holding copyrights over its creations also generates a debate on how to compensate human contributors involved in the creative process adequately.

In terms of existing law, it is highlighted that generative AI systems do not hold independent intellectual property rights over the content they generate, meaning that human creators can retain their rights against AI and its developers in cases of misappropriation of their work.[63] However, the enforcement of existing laws to protect the rights of human authors against AI production of content remains a gray area, with mixed results in the courts.

From an ethical perspective, it underscores the urgent need to develop robust ethical frameworks that prioritize social values, privacy, and human rights in the face of the growing use of AI in sectors such as creative writing. The lack of clear guidelines and the difficulty of enforcing existing regulations can lead to abuses, such as the mass production of low-quality content or the exploitation of sensitive data without consent.[64]

Another critical issue is the potential for AI to undermine originality in academic and professional writing. It is cautioned that AI tools such as AUTOGEN, while useful for improving writing efficiency, also pose risks such as reduced diversity in output and potential intellectual property rights infringement, especially when using custom models that can replicate the style and ideas of human authors.[65]

It is also noted that the integration of AI into the production of scientific materials presents significant ethical challenges, especially in relation to the ownership of AI algorithms and the protection of developers' rights.[66] Adequate protection of AI algorithms remains a matter of debate, as traditional patent laws may only partially cover the protection needs of these emerging technologies.

How generative artificial intelligence is transforming content creation and the complex legal issues that arise around intellectual property rights are definitely up for discussion. Recent court cases, such as those involving AI image creation, highlight the need for clear and ethical guidelines to ensure that the rights of human creators are respected and that technological innovations do not undermine the integrity of creative work.[67]

DISCUSSION

This study has shown that the integration of AI tools into the writing process can significantly improve the coherence and grammatical accuracy of the generated content. The findings suggest that, when used as supporting tools, AI technologies not only facilitate text structure but also promote greater clarity in the exposition of ideas. These results are consistent with previous studies that have also reported improvements in writing quality through the use of AI, especially in educational and professional contexts.[25,26,30]

The results obtained in this study are consistent with previous research that has pointed to the ability of AI to improve certain aspects of writing, such as clarity and organization of ideas.[32,33] However, some studies have found that AI does not always guarantee an improvement in overall writing quality, which could be due to a lack of customization in the tools used or insufficient user understanding of how to apply the suggestions provided by AI[35,36] This variability in results highlights the need for further evaluation of how and when AI can be most effective.

One of the main strengths of this study is the inclusion of a diverse sample of participants using AI tools in different contexts, allowing for a broader assessment of the effects of AI on writing. In addition, a rigorous methodology has been employed that includes both quantitative and qualitative assessments of text quality. However, the study also has limitations, such as the reliance on self-assessments by participants, which could introduce biases in the perception of writing quality. Also, the generalizability of the results may be limited by the specific context in which the study was conducted.[37,38]

The results of this study have important practical implications, especially in the field of education and professional writing. The integration of AI tools into the writing process could be used to improve the quality of content produced by students and professionals, facilitating clearer and more effective communication. Also, educational institutions could consider implementing these technologies as part of their teaching programs in order to improve the writing skills of their students.[39,40] However, users must receive adequate training on how to use these tools effectively.

Although this study has provided valuable insight into the impact of AI on writing, many areas remain to be explored. Future research could focus on assessing the long-term impact of AI use on writing, as well as investigating how customization of AI tools could further improve the quality of the content generated.[41] In this regard, it would be ideal to conduct comparative studies between different types of AI tools to determine which are more effective in specific contexts, such as academic writing versus creative writing.[42,43]

Recommendations for future research

Thus, this study underscores the importance of continuing to investigate the use of AI in writing, especially in

relation to the personalization of the tools and their integration into the educational process. It is recommended that future research focus on how these technologies can be optimized to maximize their benefits and minimize associated risks, such as potential technology dependency and challenges related to authorship and intellectual property of AI-generated or AI-assisted texts.

CONCLUSIONS

It has been shown that AI can improve the quality of writing in these aspects, although with certain limitations depending on the context of use and the user's readiness to apply the suggestions of this type of technology correctly.

The results indicate that while AI can be a powerful tool for improving these aspects, its effectiveness depends largely on complementary use with other writing tools and human intervention. AI has a positive, though not absolute, impact on writing improvement, and there are important ethical and legal considerations that must be taken into account to ensure the responsible use of these technologies.

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