DOI https://doi.org/10.5281/zenodo.10049652#291

TWIST, 2024, Vol. 19, Issue 3, pp. 776-789

TWIST

Journal homepage: www.twistjournal.net

From Theory to Manuscript: Effective Strategies for Writing Scientific Articles in Geosciences

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Abstract
This article provides a detailed guide on writing scientific articles in geosciences, covering everything from title selection to preparing appendices. An exhaustive literature review was conducted, identifying best practices and critical recommendations for each section of the manuscript. The methodology included reviewing sources such as books, scientific articles, and practical guides and organizing the information thematically. The results underscore the importance of a clear and coherent structure, the proper use of figures and tables, and ethics in scientific research. The discussion highlights the relevance of scientific dissemination, the impact of digital tools, and the need for rigorous peer review. Finally, recommendations are offered for selecting the appropriate journal and increasing publication success. This guide is designed to help geoscience students, technicians, teachers, and novice researchers improve the quality and visibility of their manuscripts, contributing to the advancement of knowledge dissemination in geosciences.

Keywords
Scientific Writing, Geosciences, Research Methodology, Ethics in Research

INTRODUCTION

Writing scientific articles is a fundamental skill for the dissemination of knowledge and the advancement of science. Publishing in scientific journals allows researchers to share their findings with the academic community, contributing to developing knowledge in their field (Gastel & Day, 2016). Moreover, scientific publication is crucial for the professional career of researchers, providing recognition, funding opportunities, and the establishment of international collaborations (Thrower, 2010).

Scientific production significantly impacts the academic, industrial, and technical communities. At the academic level, it promotes innovation and the generation of new knowledge, allowing other researchers to build upon previous studies (Koltay, 2010). In the industrial sphere, scientific publications can translate into technological advancements and improvements in production processes (Bennett, 2010), while in the technical sector, they contribute to better practices, standards, and regulations (Bowling, 2013).

This document aims to provide a detailed guide on how to write an influential scientific article in geosciences. It addresses all the essential components of the manuscript, from the title selection to the preparation of the appendices, with practical recommendations and identifying common errors to avoid. This guide is designed to assist researchers, especially those writing their first article, produce clear, coherent, and well-structured manuscripts.

Writing a scientific article can seem daunting, especially for novice researchers. However, by following a clear structure and paying attention to details, it is possible to create a manuscript that meets the journal's standards and makes a valuable contribution to the field of study (Leung, 2014). As shown in Fig. 1, the key components include a clear and concise title, an informative abstract, an introduction that sets the context, a detailed methodology, well-presented results, a critical discussion, and meaningful conclusions (John et al., 2020).

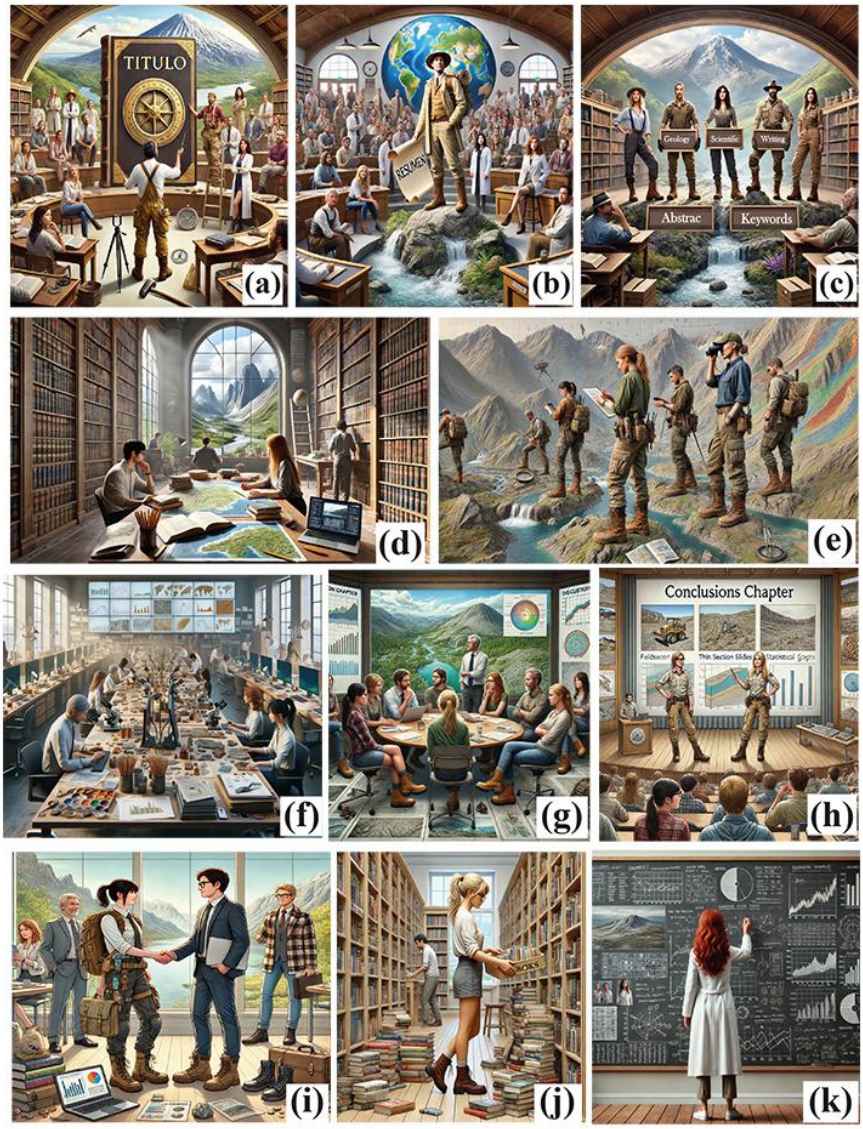

Fig. 1 Graphical representation of the necessary chapters for a scientific article and their workflow. (a). Title; (b). Abstract; (c). Keywords; (d). Introduction; (e). Methodology; (f). Results; (g). Discussion; (h). Conclusion; (i). Acknowledgements; (j). Bibliographic references; (k). Appendices or supplementary material.
Source: Own elaboration

The current state of the research field should be carefully reviewed, and key publications, especially recent ones, should be cited. The Introduction should be comprehensible and connect the points mentioned above with a dynamic flow of reading, making it accessible to scientists outside of the specific research field. Citations should be presented in parentheses, using only the last name of the first author followed by the year, without commas or periods.

Creating and presenting figures, graphs, and tables are essential for effectively communicating data. These visual elements must be clear, well-labeled, and directly relevant to the results presented. Utilizing appropriate figures and tables facilitates the understanding of complex data and reinforces the critical points of the study (Light, 2015). Additionally, it is essential to seek out and identify a suitable journal for the research topic and to follow the journal's guidelines

regarding the format and presentation of these elements (Bennett, 2010). Authors can use artificial intelligence tools to enhance the writing process. These tools can help optimize grammar, writing style, and manuscript coherence, facilitating the creation of a high-quality document (Leydens & Santi, 2006).

This article presents practical tips and strategies based on a review of various guides and articles on scientific writing. An extensive review of the literature supports these recommendations. Ultimately, researchers will be better equipped to communicate their findings effectively and contribute to advancing geosciences.

MATERIALS AND METHODS

To develop this guide on how to write and publish a scientific article in the field of geosciences, a structured methodology was followed, which included a literature review, analysis of recommended practices, and synthesis of effective strategies. The following sections describe the steps to achieve the results presented in this guide.

Various reference sources on scientific writing were reviewed, including books, scientific articles, and practical guides. This review allowed for identifying best practices and recommendations from expert authors in the field.

The collected information was organized thematically, allowing for a systematic comparison of the recommendations from different authors. Special attention was given to the essential components of the manuscript, such as the title, abstract, introduction, methodology, results, discussion, conclusions, acknowledgments, references, and appendices (Fig. 1). This analysis allowed for identifying common and divergent points in the recommendations, facilitating the development of a set of best practices for writing scientific articles.

Specific recommendations on creating figures and tables were reviewed, highlighting the importance of following journal guidelines regarding format and presentation. Using appropriate figures and tables facilitates the understanding of complex data and reinforces the critical points of the study (John et al., 2020; Light, 2015). Additionally, common errors in preparing these visual elements were identified, and strategies were provided to avoid them, thus ensuring effective communication of the data.

The use of artificial intelligence (AI) tools in the scientific writing process is becoming increasingly common. Several available AI tools were analyzed, evaluating their advantages and limitations. These tools can assist in optimizing grammar, writing style, and manuscript coherence, facilitating the creation of high-quality documents (John et al., 2020). The discussion included effectively integrating these tools into the writing process without entirely relying on them to maintain the author's originality and voice.

A qualitative methodology was used to analyze and synthesize the information from various sources. This methodological approach ensured that the resulting guide was comprehensive, detailed, accessible, and practical for students, teachers, technicians, and novice researchers in the field of geosciences.

The guide was then written based on the review, analysis, and synthesis of the information. It was structured logically and coherently, addressing each component of the scientific article clearly and in detail. Practical recommendations were included, as well as the identification of common errors and strategies to avoid them. This aims to help researchers improve the quality of their manuscripts and increase their chances of publication in scientific journals.

RESULTS

Different authors emphasize the need for a clear and coherent structure in scientific articles, which includes title, abstract, keywords, introduction, methodology, results, discussion, conclusions, acknowledgments, references, and appendices (Gastel & Day, 2016; Thrower, 2010). Table 1 presents essential characteristics to consider in the writing of each of these chapters, as described below:

Table 1 Content style and writing of each chapter in a scientific article in the geosciences field

Section	Main Characteristics	Necessary Aspects to Include	Unnecessary Aspects to Include	Recommendations to Consider	Errors to Avoid	Recommended Writing Styles
Title	- Clear and concise - Reflects the study content - Uses relevant keywords	- Specific keywords - Avoid unnecessary jargon - Reflect the main objective	- Complex abbreviations - Ambiguous terms - Excessive details	- Keep between 10-15 words - Avoid technical jargon - Reflect topic and focus - Use keywords - Review accuracy and appeal	- Long or complicated titles - Use of abbreviations - Lack of keywords	- Direct and specific - Clear and understandable - Without excessive technical language
Abstract	- Brief and precise - Provides an overview - Logically structured	- Context and justification - Main methods - Results and conclusions	- Abbreviations - Citations and references - Information not contained	- Limit to 150-250 words - Include important aspects - Avoid new information - Ensure self-sufficiency - Write clearly and directly	- Excessive details - Inclusion of abbreviations - Information not included in the main article	- Clear and concise - Informative and direct - Structured and coherent
Introduction	- Sets the context - Justifies the need - Clearly defines objectives	- State-of-the-art review - Knowledge gaps - Objectives and research questions	- Detailed results - Extensive information not directly related - Too much historical context	- Capture reader's interest - Be concise but informative - Relate to previous studies - Define hypotheses and objectives - Explain relevance and originality	- Too long introduction - Lack of clarity in objectives - Not justifying the need	- Direct and attractive - Informative and clear - Logically structured
Methods or Methodology	- Detailed description - Information for reproducibility - Ethical considerations	- Experimental design - Data collection and analysis procedures - Ethical considerations and approvals	- Raw data - Interpreted results - Irrelevant information	- Be detailed and specific - Ensure reproducibility - Include instruments and techniques - Describe statistical procedures - Detail ethical considerations	- Lack of details - Omission of ethics - Incomplete description	- Clear and precise - Detailed and specific - Logically structured
Results	- Clear and objective presentation - Use of tables and figures - Reporting relevant statistics	- Relevant data and findings - Well-labeled tables, figures, and charts - Applicable statistics and descriptive analysis	- Interpretation of results - Conclusions or discussions - Irrelevant information to the findings	- Present logically - Use tables and figures - Include all relevant data - Report statistics clearly - Be objective without interpretation	- Interpretation of results - Inclusion of irrelevant information - Lack of clarity in presentation	- Objective and clear - Concise and precise - Structured and coherent
Discussion	- Interpretation of results - Identification of limitations - Areas for future research	- Comparison with previous studies - Interpretation of findings - Discussion of theoretical and practical implications	- Raw data - Repetition of results - Irrelevant or out-of-context information	- Interpret with existing literature - Discuss implications - Identify limitations - Suggest future research - Conclude with a summary of findings	- Lack of connection with literature - Not addressing limitations - New unsupported ideas	- Reflective and critical - Clear and concise - Logically structured
Conclusions	- Summary of findings	- Main conclusions - Relevance and	- New data - Excessive details	- Summarize findings clearly - Highlight relevance	- Introduction of new information	- Clear and concise - Direct and precise

	- Relevance and applicability - Proposals for future research	practical applications - Suggestions for future research	- Irrelevant information to the conclusions	- Do not introduce new information - Provide future suggestions - Ensure consistency with presented data	- Lack of clarity - Not highlighting relevance	- Structured and coherent
Acknowledgements	- Recognition of contributions - Mention of funding - Brief and specific	- Names and roles of people and institutions - Funding details - Thanks to reviewers and editors	- Long acknowledgements - Unrelated information - Unnecessary details	- Be brief and specific - Mention significant contributions - Include funding details - Thank reviewers and editors - Ensure clarity and precision	- Long acknowledgements - Omission of important contributions - Irrelevant information	- Brief and specific - Clear and concise - Formal and respectful
References	- Complete and precise - Consistent format - Includes all cited sources	- Journal articles, books, and book chapters - Specified citation format - Complete information to locate the original sources	- Uncited sources - Irrelevant references - Incomplete or incorrect information	- Ensure complete references - Follow citation format - Include all cited sources - Review to avoid errors - Use reference management tools	- Incomplete citations - Uncited references - Lack of format consistency	- Precise and consistent - Clear and organized - Complete and verifiable
Appendices	- Complementary information - Clearly labeled - Logically organized	- Supplementary materials such as questionnaires and additional data - Detailed procedures - Extensive figures and tables	- Essential information for the main text - Irrelevant data - Excessive details	- Include complementary information - Clearly label - Organize logically - Reference in the main text - Maintain quality and rigor	- Inclusion of essential information - Lack of clear labeling - Disorganized information	- Clear and organized - Detailed and specific - Accessible and complementary
Declarations of Conflicts of Interest and Ethics	- Transparency and clarity - Conflict statements - Ethical considerations	- Conflict of interest statements - Institutional approvals and informed consents - Relevant ethical aspects	- Unrelated information - Irrelevant details - Incomplete information	- Be transparent and clear - Include all necessary approvals - Ensure informed consent - Provide ethical details - Review for accuracy and completeness	- Omission of conflicts of interest - Lack of ethical details - Incomplete statements	- Clear and transparent - Concise and precise - Formal and ethic

Source: Own elaboration

Title

The title of a scientific article is fundamental for attracting the reader's attention and accurately and concisely reflecting the content of the study. According to Gastel and Day (2016), a compelling title should communicate the main topic of the study using specific keywords that facilitate indexing and searching in academic databases. This is crucial to ensure that the article is easily locatable and accessible to other researchers. Clarity and conciseness are essential; titles should avoid complex abbreviations and ambiguous terms that might confuse readers (Thrower, 2010). Additionally, a well-crafted title captures the reader's attention and provides an accurate idea of the study's topic and focus (Koltay, 2010). It is advisable to define a provisional title before drafting the manuscript and to formulate the final title after completing the article (Lam Díaz, 2016).

Artificial intelligence (AI) can be valuable in generating scientific titles. AI tools can analyze the article's content, suggest alternative titles that optimize keyword usage, and improve the article's visibility in academic search engines (John et al., 2020). This may include using machine learning algorithms to identify the most relevant and appealing terms and ensuring that the title meets standards of clarity, conciseness, and relevance (Gopen & Swan, 1990).

Abstract

The abstract of a scientific article is a critical section that provides a concise overview of the study, including the context, main methods, key results, and principal conclusions. Its typical length varies from 150 to 250 words, and it should be structured logically and clearly without including abbreviations or citations (Gil et al., 2016). An effective abstract should allow the reader to quickly understand the study's purpose, methods, main findings, and significance of the work (Springer Nature, 2023). According to Wiley (2022), the abstract should reflect all parts of the article, including the study's rationale, the methodology applied, the results obtained, and the implications of the findings. It is essential to avoid unnecessary data or excessive details; instead, the abstract should focus on the most significant aspects of the study. Using clear and direct language is essential to ensure the abstract is understandable to a broad audience (Hillier et al., 2021). Additionally, it is recommended to structure the abstract into sections covering the problem or objective, methods, primary results, and conclusions (Springer Nature, 2023). Like the title, it is a good practice to write the abstract after completing the rest of the article (Lam Díaz, 2016).

Artificial intelligence tools can be useful in writing abstracts. They can help identify and summarize the critical points of the document and ensure the final text's coherence and clarity (Gil et al., 2016). These tools can analyze the content and suggest improvements in the style and structure of the abstract.

Keywords

Keywords are terms or short phrases that capture the most important aspects of a scientific article. They are included immediately after the abstract and facilitate the article's search and retrieval in academic databases and search engines. Keywords allow researchers and readers to quickly identify the study's content and focus, thus enhancing the article's visibility (Gastel & Day, 2016).

Selecting appropriate keywords is a critical step in writing a scientific article. These should be specific and representative of the article's content, encompassing the main concepts, the methodology used, and the most significant findings (Ellison, 2010). For example, in a study on the impact of climate change on marine biodiversity, keywords might include terms such as "climate change," "marine biodiversity," "ecological impact," and "marine ecosystems"

Keywords should align with the terms used in the relevant literature and be consistent with the standards of the field of study. This ensures that other researchers can find the article when searching for information on similar topics. Using synonyms and related terms can also be beneficial in broadening the search scope (Koltay, 2010).

Additionally, artificial intelligence tools can be very helpful in selecting keywords. These tools can analyze the article's content and suggest relevant terms based on search patterns and current trends in academic literature. This optimizes the keyword selection process and improves their accuracy and relevance (Leydens & Santi, 2006).

Introduction

The introduction of a scientific article is essential for establishing the study's context and relevance, justifying the research's need, and clearly defining the objectives. This chapter should include a review of the state of the art and highlight the knowledge gaps the study aims to fill (Gastel & Day, 2016). The introduction should capture the reader's interest by presenting the research problem clearly and concisely (Fig. 2). It is crucial to provide the context that helps readers understand why the study is essential and how it contributes to the existing body of knowledge (Ellison, 2010).

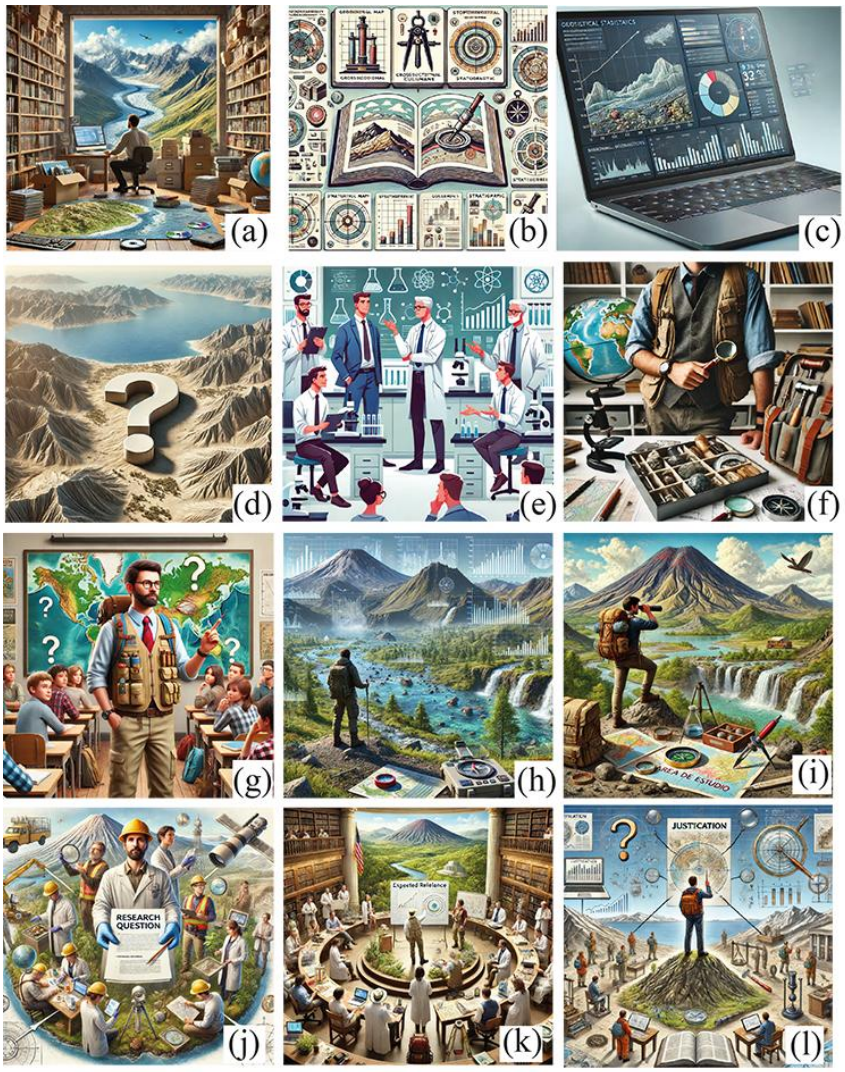

Fig. 2 Diagram of the process of problem identification, scope definition, and writing of the research justification. A. Collection of bibliographic information; B. Review of the relevant literature; C. Analysis and synthesis of information; D. Identification of the problem; E. Identification of the knowledge gap; F. Identification of research tools; G. Selection of the research problem; H. Selection of the research scope; I. Delimitation of the study area; J. Definition of the research question; K. Relevance of the research topic; L. Writing of the justification

Source: Own elaboration

Reviewing the state of the art involves summarizing relevant previous research, highlighting significant findings and earlier studies' limitations. This analysis helps position the current work within the discipline's broader context and justifies the study's need (Light, 2015). It is essential to avoid overloading the introduction with excessive details; instead, it should focus on providing enough information for the reader to understand the importance of the study and the research questions being addressed. The introduction should also clearly define the research objectives and hypotheses. This includes a precise statement of the study's goals and the specific questions it aims to answer (Fig. 2). This clarity helps guide the reader through the rest of the article, providing a clear framework for understanding the methods, results, and conclusions (Markley, 2010). The introduction should include an argumentative paragraph that delineates the study's justification, problem statement, and scope, implicitly answering the questions described in Table 2.

Table 2 Argumentation content in the Introduction of a scientific article in the geosciences field

Questions	Question Definition
What?	- The research topic is briefly explained - The purpose and expected outcomes are described
Why?	- The identified problem in the baseline survey is addressed - Conducted to address a specific knowledge gap
For what purpose?	- The contribution of the generated knowledge is identified - Conducted to contribute to solving an identified problem
How?	- A brief explanation of how the research was conducted - The methods or methodologies applied are briefly and textually cited
Where?	- The specific environment or context of the study is specified, particularly the location where the research was conducted, and the study area is delimited
When?	- Relevant dates or periods of the study are indicated, for example, intervals during which the data presented were collected

Source: Own elaboration

Regarding the inclusion of figures and tables, in the field of geosciences, the introduction often contains location figures and the geological context schema, with the optional inclusion of other crucial figures or tables to establish the study's context. Figures and tables must be clearly labeled and relevant to discussing the content. Artificial intelligence tools can help identify and highlight keywords and essential phrases in the reviewed literature, thus optimizing the writing of the introduction (Koltay, 2010). It is worth noting that it is currently recommended to cite information obtained through artificial intelligence, considering that one does not cite a conversation but rather the product of an algorithm, which is an intellectual work (PUCC, 2024).

Methods or Methodology

A scientific article's methods or methodology section is fundamental for detailing the study design, setting, subjects, data collection, and analysis procedures. This section must provide sufficient detail to allow the reproducibility of the study and address ethical considerations, including institutional approvals and informed consent (Gastel & Day, 2016).

The methodology should explain step-by-step every action taken during the research. This includes clearly describing the experimental or study design and specifying whether it is a qualitative, quantitative, or mixed-method study. It is essential to detail the study's setting and the characteristics of the participating subjects, ensuring that this information is sufficient to replicate the study in another context (Markley, 2010). When describing data collection, it should detail how the data were obtained, what instruments were used, and how the validity and reliability of the collected data were ensured. Additionally, it is important to mention any sampling procedures used and justify them (Ellison, 2010). If the method is well-known, it should be mentioned along with the appropriate bibliographic citation. It must be explained in detail if it is a new or a modified version of a known method (Villagrán & Harris, 2009).

The analysis procedures should be clearly described, including the statistical or data analysis techniques. This section is essential for other researchers to reproduce the analyses and verify the results. Additionally, it should mention how the data were handled and any software used for the analysis (Koltay, 2010). Ethical considerations should also be addressed, indicating the institutional approvals and the informed consent procedures applied, ensuring the study's transparency and integrity (Light, 2015). Regarding the inclusion of figures and tables, these can be useful for illustrating the experimental design, data collection procedures, and analysis methods. For example, a flowchart can show the stages of the study, while tables can summarize the characteristics of the subjects and the instruments used. Artificial intelligence tools can assist in organizing and visualizing these elements, ensuring they are clear and compelling (Koltay, 2010).

Result

The results section in a scientific article is crucial for presenting the research findings clearly and concisely. It must include all relevant data and report applicable statistics without interpreting the results (Gastel & Day, 2016). This section should be logically organized, presenting the most important findings first and using tables and figures to complement the text and enhance the understanding of the data.

Tables help present detailed numerical data and comparisons between different variables or groups. Each table should have a clear title and a legend explaining its content and any abbreviations. The tables must be self-sufficient, meaning the reader can understand them without referring to the text (John et al., 2020). For example, the results of petrographic, geochemical, and geochronological assays could be presented in tables.

Conversely, figures are ideal for visually representing data, making it easier to identify patterns and trends. This section commonly uses bar charts, line graphs, scatter plots, and box plots. Geosciences are expected to include stratigraphic columns, geological profiles, pole diagrams, binary and ternary classification diagrams, and multi-element diagrams. Each figure should be accompanied by a descriptive legend explaining the symbols and abbreviations used and the meaning of the different parts of the graph (Markley, 2010). For example, a scatter plot can show the relationship between two variables, while a box plot can represent the distribution of a variable across different groups. It is essential to present the data objectively and without interpretation. The results should be organized coherently, following the structure outlined in the methodology. Each subsection should focus on a specific data set and results, allowing for a smooth reading and easy understanding of the findings (Ellison, 2010).

Additionally, it is helpful to include tables and figures that summarize the main results to provide a quick overview of the findings. All tables and figures should be cited in the main body of this section and listed in the order they appear in the text (Lam Díaz, 2016). Artificial intelligence tools can assist in creating and optimizing these visual elements, ensuring they are accurate and effective in communicating the results (Koltay, 2010).

Discussion

The discussion is a critical section in a scientific article where the results are interpreted in the context of existing literature. This section explains the significance and relevance of the findings and explores their theoretical and practical implications (Gastel & Day, 2016). It is essential to compare and contrast the obtained results with those of previous studies to place the new knowledge within the broader framework of the discipline.

The discussion should start with a concise summary of the main results, followed by a detailed interpretation. It is crucial to highlight how these findings support, refute, or expand existing knowledge (John et al., 2020). This comparison should be backed by references to relevant previous studies, which helps establish the validity and significance of the new findings.

The study's limitations must be addressed transparently. Identifying and discussing the limitations provides an honest framework of the study's scope and guides future researchers on potential areas of improvement and precautions to consider (Ellison, 2010). This includes methodological limitations, sampling issues, and potential biases that could have influenced the results.

Regarding the inclusion of figures and tables in the discussion, these can be used to illustrate critical comparisons with previous studies or to highlight significant trends emerging from the results. For example, a comparative bar chart can show how the study's results align or differ from previous studies, while a table can summarize the characteristics and findings of similar studies to facilitate comparison (Markley, 2010). In geosciences, binary and ternary diagrams, tectonic discrimination scatter plots, and other figures can be presented to contrast the acquired data with bibliographic data.

The discussion should also include suggestions for future research. These recommendations should be based on the identified limitations and the new questions that the results may have generated. It is helpful to propose specific areas where further research is needed to advance knowledge in the field (Koltay, 2010).

Finally, it is essential to highlight the unique contributions of the study. This can include new methods, unique data, or novel perspectives of the study. Recognizing these contributions helps position the study within the existing literature and underscores its relevance and potential impact. This section is written in the present tense, for example, "these data indicate that..." because the findings of the work are considered established scientific evidence (Lam Díaz, 2016).

Conclusion

The conclusions of a scientific article are essential for summarizing the study's main findings, highlighting their relevance and applicability. This section should provide a clear and concise closure to the article, avoiding introducing new information and aligning the conclusions with the initially stated research objectives (Gastel & Day, 2016). The simplest way to write the conclusions is to list them consecutively or provide a brief recap of the article's content, mentioning its purpose, the primary methods, the most outstanding data, and the most significant contribution of the research (Lam Díaz, 2016).

This ensures that the conclusions not only summarize the results but also demonstrate how these results answer the research questions posed (Ellison, 2010). The conclusions should be expressed clearly and precisely, avoiding unnecessary repetitions of the abstract or other sections of the article. Instead, the focus should be on interpreting the findings and their practical or theoretical relevance, offering a final perspective on the study (Baker, 2012). Additionally, the conclusions may include recommendations for future research. These recommendations should be based on the study's limitations and the new questions arising from the findings. Suggesting specific areas where further research is needed can help guide future studies and build upon the knowledge generated (Koltay, 2010).

These are rare in the conclusions section regarding the inclusion of figures and tables. However, they can help summarize the main results or illustrate the practical implications of the findings. For example, a table summarizing key findings or a figure highlighting the practical applications of the results can provide an adequate visual closure to the article (Leydens & Santi, 2006). It is important to remember that the conclusions should not be repeated in the article's abstract. The abstract is an independent section that should offer an overview of the study, while the conclusions should provide a final and reflective synthesis of the findings (Gastel & Day, 2016).

Acknowledgments

The acknowledgments section in a scientific article recognizes the contributions of individuals and institutions that have provided significant support during the study. This section allows for thanking collaborators who do not meet the criteria for co-authorship, such as research assistants, laboratory technicians, colleagues who provided advice, and reviewers who improved the manuscript with their comments (Gastel & Day, 2016). It is essential to mention any funding received, detailing the organizations or institutions providing financial support for the project. This transparency acknowledges the financial support and highlights the importance of funding sources for scientific research (Leydens & Santi, 2006).
Additionally, editors and reviewers should be thanked for their comments and suggestions, which often result in significant improvements to the manuscript. Acknowledgments should be specific and personal, mentioning names and individual contributions briefly and respectfully (Ellison, 2010). Finally, keeping this section concise and focused is essential, avoiding unnecessary length. Including acknowledgments is a gesture of academic courtesy and professionalism, and it helps to strengthen relationships within the scientific community.

References

The references in a scientific article must list all the sources cited in the document, following the citation format specified by the journal. The references must be complete and accurate, allowing readers to quickly locate the sources (Gastel & Day, 2016). Proper citation ensures the article's credibility and academic rigor and acknowledges other researchers' previous work. Adequate handling of references not only supports the integrity of the study but also provides a map of the relevant literature, helping to contextualize the findings within the framework of existing knowledge (Leydens & Santi, 2006).

There must be a correspondence between the citations made in the manuscript and those included in the references, as readers are generally interested in verifying the data used for the research (Lam Díaz, 2016). Each entry in

the reference list should contain enough information for others to find and consult the sources, such as authors' names, titles of works, journal names, volumes, pages, and years of publication.

Artificial intelligence (AI) tools are fundamental in managing and organizing references efficiently. Tools like EndNote, Mendeley, and Zotero help organize and systematize references and allow for their automatic integration into the text according to the required citation style (Ellison, 2010). These tools can automate the creation of bibliographies, reduce human errors, and save significant time in the writing process. Additionally, AI can help identify relevant sources through advanced search algorithms and citation analysis. AI can also assist in synthesizing and validating references, ensuring that all cited sources are relevant and up-to-date. AI tools can analyze large volumes of data to identify citation patterns and suggest additional references the author may have overlooked. Moreover, these tools can alert authors to potential citation duplications or inconsistencies, thereby improving academic work's accuracy and integrity (Koltay, 2010).

Authors should manually review and verify references generated by AI tools to ensure their accuracy and appropriateness to the study's context. While technology can significantly facilitate the citation process, human oversight remains essential to maintaining high academic standards.

Appendices or Supplementary Materials

The appendices in a scientific article provide additional information that complements the study but is optional for understanding the main text. These can include supplementary data, extensive methodological details, questionnaires, raw data tables, software programs, or any other information supporting the study's findings (Gastel & Day, 2016). The appendices must be clearly labeled and referenced in the main text, presenting the information in a clear and accessible manner.

The appendices should be logically and structurally organized, beginning with a descriptive title indicating the content of each appendix. For example, "Appendix A: Structural Data Presented in Figure 3" or "Appendix B: Geochronological Data." Each appendix should be mentioned appropriately in the main text, allowing readers to know where to find the additional information (Leydens & Santi, 2006). Figures and tables included in the appendices should be labeled consistently with the rest of the document but numbered independently (e.g., Table A1, Figure B2). This ensures that the appendices are self-sufficient and easy to navigate. Tables can present detailed data or additional results not included in the main text due to space constraints, while figures can illustrate complex experimental procedures or complementary results (Ellison, 2010).

Artificial intelligence (AI) tools can significantly contribute to the construction of this section. AI can help organize and systematize large volumes of data, ensuring the information in the appendices is relevant and well-presented. Natural language processing tools can automatically generate data summaries and help format tables and figures consistently (Koltay, 2010).

Conflict of Interest and Ethics Statements

The conflict of interest and ethics statements section is crucial for ensuring the transparency and integrity of the study. This section should declare any conflicts of interest, that is, any circumstances that may inappropriately influence the results or interpretation of the study (Gastel & Day, 2016). Identifying conflicts of interest involves reviewing the authors' financial, personal, or professional relationships that may affect their objectivity. It is essential to be honest and detailed in these declarations to maintain the trust of the reader and the scientific community.

Ethical considerations are also fundamental. This includes obtaining institutional approvals to conduct the study and ensuring all relevant ethical standards are met. Additionally, informed consent must be obtained from participants, clearly explaining the risks and benefits of the study (Ellison, 2010).

To identify unethical and immoral practices, being vigilant about data manipulation, plagiarism, and lack of transparency in methodology and results is essential. Authors should avoid bias in presenting the results and ensure that the data are reported accurately and without omissions (Koltay, 2010). Conflicts of interest should not be hidden, data should not be falsified or manipulated, the work of others should not be plagiarized, ethical approvals and informed consents should not be omitted, and results should not be presented in a biased or misleading manner. The use of artificial intelligence tools can help detect potential conflicts of interest and ensure compliance with ethical standards by automatically reviewing documents and identifying discrepancies or lack of transparency (Cals & Kotz, 2013). Table 3 presents writing tips for the previously described chapters of a scientific article.

Table 3 Recommendations on the writing style of a scientific article

Chapter	Characteristics	Description of Writing Characteristics
Title	Clear and concise	A title should communicate the main topic of the study directly and simply.
	Relevant keywords	Use terms recognized in the field of study to improve the search and reach of the article.
	Avoid ambiguities	Titles should be specific and avoid terms that could be interpreted in multiple ways.
	Indexing	Facilitate the search for the article in academic databases by using appropriate keywords.
	Reader attraction	A good title should be interesting and capture the potential reader's attention.

Abstract	Overview	The abstract should provide a brief and comprehensive description of the study.
	Context	Include the background of the study to place the reader within the research framework.
	Methods	Briefly summarize the methods used to conduct the research.
	Results	Highlight the most important findings of the study.
	Conclusions	Include the main conclusions and their relevance.
Introduction	Context	Describe the background and current state of the field of study.
	Relevance	Explain why the study is important and necessary.
	Objectives	Clearly define the research objectives and questions.
	State of the art	Review existing literature and point out knowledge gaps.
	Hypotheses	Present the hypotheses that the study aims to test.
Methods	Study design	Describe how the research was structured.
	Data collection	Explain how the data were obtained.
	Analysis procedures	Detail the methods used to analyze the data.
	Reproducibility	Ensure that others can replicate the study by following the described methods.
	Ethics	Include institutional approvals and informed consents.
Results	Findings	Present the results obtained from the research.
	Tables and figures	Use visual elements to enhance data comprehension.
	Relevant data	Include all important data and applicable statistics.
	Logical organization	Present the results in an orderly and coherent manner.
Discussion	Objectivity	Report the results without interpretation.
	Interpretation	Analyze the results in the context of existing literature.
	Relevance	Explain the importance of the findings.
	Limitations	Identify and discuss the study's limitations.
	Future research	Suggest areas for future research.
Conclusions	Unique contributions	Highlight the novel contributions of the study.
	Summary	Recap the main findings.
	Relevance	Highlight the importance and applicability of the results.
	Recommendations	Propose suggestions for future research.
	Closing	Provide a clear and concise conclusion to the article.
Acknowledgements	Consistency	Ensure that the conclusions are consistent with the presented data.
	Recognition	Thank those who contributed to the study.
	Funding	Mention the sources of funding.
	Brevity	Be concise and specific in the acknowledgements.
	Editors and reviewers	Thank for the comments and suggestions received.
	Significant contributions	Ensure that all significant contributions are recognized.
References	Citation	Include all sources cited in the article.
	Format	Follow the citation format specified by the journal.
	Accuracy	Ensure that the references are complete and accurate.
	Management tools	Use reference management software.
	Source location	Facilitate readers in finding the original sources.
Appendices	Supplementary information	Include relevant additional material.
	Clear labeling	Ensure that appendices are clearly identified.
	Referencing	Reference the appendices in the main text.
	Accessibility	Present the information clearly and understandably.
	Supplementary material	Include additional data and questionnaires.
Declarations of Conflicts of Interest and Ethics	Transparency	Declare any conflicts of interest.
	Ethics	Address the ethical considerations of the study.
	Institutional approvals	Include details of ethical approvals.
	Informed consent	Ensure participants' consent.
	Integrity	Maintain credibility and ethics in the research.

Source: Own elaboration

Critical Recommendations for Preparing Figures and Tables

The layout and presentation of figures and tables in a scientific article are paramount for effectively communicating research data and findings. Well-crafted figures and tables complement the text and provide a visual and educational way to present complex information clearly and concisely (Gastel & Day, 2016).

Clarity and Simplicity: Figures and tables should be clear, simple, and understandable. Avoid using unnecessary elements that may distract or confuse the reader. Each figure and table should have a specific purpose and contribute to understanding the results.

Labeling and Legends: All figures and tables must be clearly labeled and accompanied by descriptive legends. Legends should explain all symbols, abbreviations, and components of the figure or table, allowing them to be understood independently of the text (Ellison, 2010).

Data in Figures and Tables: Quantitative and comparative data are ideal for table presentation, while data showing trends, patterns, or relationships are more effectively presented in figures such as binary, ternary, multi-element, bar, line graphs, and scatter plots. Qualitative and descriptive data can also be represented in flowcharts or specific maps.

Citation of Figures and Tables: When referencing figures and tables in the text, use a clear and consistent format. For example, "As shown in Figure 1..." or "The data in Table 2 indicate...". Ensure that all figures and tables are numbered sequentially and cited in the correct order in the text (Koltay, 2010).

Figures and tables facilitate the understanding of complex data and allow readers to grasp critical information quickly. Their didactic use is essential in scientific education, where they help illustrate abstract concepts and improve information retention. Data visualization through figures and tables also enables the identification of patterns and anomalies that may not be evident in the text (Leydens & Santi, 2006).

Inclusion of Figures in Chapters: Where to Place Figures?

Introduction: Flowcharts to illustrate the study design or conceptual framework. Geosciences expects to present a location map showing the study area and the locations of the analyzed samples. Specifically, presenting a regional stratigraphic geology diagram in this chapter is beneficial.

Methods: Figures and tables that describe the experimental procedures and study design.

Results: Multi-element, binary, ternary, bar, and line graphs, comparative tables, and scatter plots presenting the main findings. In geology, photographic diagrams showing outcrops, samples, thin sections, and other aspects are often presented.

Discussion: Figures that compare the results with previous studies or illustrate theoretical implications. In geology, this chapter is expected to include graphical representations of paleo-geographic reconstruction models.

DISCUSSION

Importance of Scientific Dissemination in Geosciences

The scientific dissemination of research results in geosciences is essential for increasing public understanding and support for these disciplines. Effective communication of scientific findings can influence policy decisions and natural resource management and promote education and environmental awareness (Gastel & Day, 2016). Dissemination not only strengthens the connection between science and society but can also attract young students to careers in geosciences, fostering a new generation of scientists.

Traditional Structure vs. Current Didactics

Traditionally, scientific articles follow a rigid structure that includes Introduction, Methods, Results, and Discussion (IMRAD). However, the current didactics in the presentation of geoscience articles have evolved to be more accessible and understandable. Incorporating visual elements such as figures, tables, and interactive graphics can improve the comprehension of complex concepts (Ellison, 2010). Modern scientific narrative seeks to balance academic rigor with didactic clarity, facilitating the communication of findings to a broader audience.

Importance of Didactics

Didactics is crucial in preparing scientific articles to ensure the findings are accessible and understandable to a broad audience. A clear and didactic presentation of results facilitates the understanding and practical application of scientific knowledge (Ellison, 2010). We advocate for the structure proposed in the results of this research, which combines scientific rigor with didactic clarity, ensuring that the articles are both informative and accessible.

Inclusion of Digital Tools

Digital tools, including artificial intelligence (AI), have transformed the preparation of scientific articles in geosciences. These tools can analyze large volumes of data, identify patterns and trends, and suggest improvements in the text (Leydens & Santi, 2006). AI can also automate the creation of references and style correction, saving time and reducing errors. Integrating these technologies facilitates the drafting of more accurate and coherent articles.

Role of AI in Article Preparation

Artificial intelligence is increasingly used to prepare scientific articles in geosciences. In addition to assisting with writing and editing, AI can help generate hypotheses, analyze data, and visualize complex results (Koltay, 2010). AI tools can also provide insights based on existing literature, suggest new research directions, and enhance geoscience innovation. Artificial intelligence offers multiple advantages for preparing scientific articles in geosciences. It can efficiently process large datasets, perform complex analyses, and generate accurate visualizations (Leydens & Santi, 2006). Additionally, AI can improve the consistency and clarity of the manuscript, identify errors, and suggest stylistic improvements, resulting in higher-quality and more accurate articles.

Using AI to prepare scientific articles raises important ethical issues and potential conflicts of interest. It is crucial to ensure that AI is used transparently and ethically, avoiding data manipulation and falsification of results (Gastel & Day, 2016). Researchers must declare any significant reliance on AI tools and ensure that the presented findings result from rigorous and honest analysis.

Selecting the Right Journal for Publishing in Geosciences

Selecting the right journal for submitting a scientific article is crucial to ensure its acceptance and visibility. First, it is essential to identify journals specializing in the specific field of study within geosciences. Reviewing recent publications in these journals can help evaluate thematic relevance and audience reach. It is essential to consider the journal's impact factor, which indicates the frequency with which its articles are cited. Journals with a high impact factor tend to have a more rigorous review process but offer greater visibility and prestige. Another critical aspect is reviewing the author guidelines of each journal. These guidelines provide details on the format, length of the article, and citation style, which can influence the decision to submit. Finally, using artificial intelligence tools can facilitate the identification of suitable journals by analyzing the manuscript's content and suggesting journals that have published similar works

Advantages of Double-Blind Peer Review

Submitting a scientific article to a double-masked peer-reviewed journal is crucial in ensuring the quality and credibility of the research. In this process, both authors and reviewers remain anonymous, eliminating biases and ensuring an impartial evaluation based solely on the scientific merit of the work. This rigorous review improves the validity and reliability of the presented results as experts in the field identify potential errors, suggest improvements, and verify the originality and relevance of the study.

Adhering to the review process of the selected journal is essential for the article's acceptance and publication. Following established guidelines and appropriately responding to reviewers' comments demonstrate professionalism and commitment to scientific quality. This process not only refines the manuscript but also contributes to advancing knowledge in geosciences, ensuring that the published research is of high quality and value.

The main scientific indexing bases for geoscience journals are Web of Science, Scopus, and GeoRef. Other vital databases include Google Scholar, Latindex, ScienceDirect, SpringerLink, Wiley Online Library, ProQuest, JSTOR, Directory of Open Access Journals (DOAJ), and Earthquake Engineering Abstracts. These databases provide access to high-impact and visibility journals, ensuring that published articles reach a broad and relevant audience. Indexing in these databases also facilitates the search and citation of works, increasing the dissemination and impact of the research.

CONCLUSION

The comprehensive literature review underscores the importance of a clear and coherent structure in writing scientific articles in geosciences. A precise title, an informative abstract, and a well-founded introduction are essential to capture readers' attention and place the study in the appropriate context. The meticulous description of the methodology and the presentation of results through appropriate figures and tables enhance the understanding and credibility of the scientific work. Combined with a critical discussion and meaningful conclusions, this ensures the article is accessible and understandable, contributing valuably to geosciences.

Including artificial intelligence (AI) tools in the writing and publishing of scientific articles offers significant advantages, such as optimizing grammar, writing style, and manuscript coherence. However, using these tools ethically and transparently is crucial to avoid data manipulation and falsification of results. Declaring conflicts of interest and ethical considerations are essential to maintaining the study's integrity and the scientific community's trust. Double-masked peer review remains a fundamental pillar for ensuring the quality and objectivity of published research.

Selecting the right journal for publication is essential to maximize the visibility and impact of a scientific article in geosciences. Major indexing databases, such as Web of Science, Scopus, and GeoRef, along with other important ones like Google Scholar and ScienceDirect, facilitate the dissemination of research to a broad and relevant audience. Complying with the review processes and the guidelines of the selected journals not only refines the manuscript but also ensures its acceptance and successful publication. This strategic approach to research dissemination strengthens the advancement of knowledge in the field of geosciences and fosters greater collaboration and academic development.

FUNDING INFORMATION

This research was developed within the framework of the "GEological Research Project and Availability of Mineral Occurrences in the Ecuadorian Territory" and was also sponsored by the consulting firm GEORESEARCH & GEOEARTH S.A".

DECLARATION OF CONFLICT

The authors declare no conflicts of interest.

ACKNOWLEDGMENTS

We thank the participation of the students from the Faculty of Engineering in Geology, Mines, Petroleum, and Environment at the Universidad Central del Ecuador, the Faculty of Engineering in Geology and Petroleum at the Escuela Politécnica Nacional, who carried out internship and pre-professional practice activities in the Geological Research Project and Availability of Mineral Occurrences in the Ecuadorian Territory.

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