

Introduction To Scientific Writing A Review

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ABSTRACT

Scientific writing is a technical form of writing that is designed to communicate scientific information to other scientists. Scientific writing is predicated on the rigors of scientific inquiry; therefore, it must reflect the same precision as that demanded in the research process. Successful scientific writing depends on the individual writer's projection of a shared professional context. Writers seek to embed their writing in a particular social world which they reflect and conjure up through approved discourses. The objective of scientific writing is to record data and all ideas which must be supported by evidence, with appropriate citations of the source of the evidence. This paper therefore looks at introduction to scientific writing, types of scientific writing and their styles. This is underscored by the fact that without a written record of the findings and observations of researchers, no proof exists that any research was conducted. Scientific writing should build on and extend prior research. Becoming familiar with existing scientific literature is a crucial first step in planning. In fine understanding the criteria of doing good scientific research is key for communicating your findings in a clear and interesting fashion focusing on the subject matter.

Keywords : Scientific Writing Types, Writing Styles

Article Info

Volume 9, Issue 1

Page Number : 56-63

Publication Issue

January-February-2022

Article History

Accepted : 10 Jan 2022

Published : 20 Jan 2022

I. INTRODUCTION

Scientific writing is a technical form of writing that is designed to communicate scientific information to other scientists, (Joseph Mugah ,2019). Scientific writing is predicated on the rigors of scientific inquiry, therefore it must reflect the same precision as that demanded in the research process. All ideas must be supported by evidence, with appropriate citations of the source of the evidence, (Angelika Hofmann, 2017). Scientific writing represents an original work of scientific research or study. It can be an addition to

the ongoing study in a field, ground breaking, or a comparative study between different approaches. This distinction is important because the writer is communicating highly technical information to others who might, or might not, be as knowledgeable; they may be from a different discipline; they may, or may not, be a native speaker of the language used, (Golebiowski, 2017). Many journals have international audiences, so precise communication helps prevent misunderstandings and mistranslations in other contexts. Communicating facts, figures, and methods used in research as well as the description of

the result has to be precise and exact. The research question, hypotheses, methods, analysis, and conclusions must be stated clearly and simply, (Astuti, Mohammed, & Zars, 2019).

Successful academic writing depends on the individual writer's projection of a shared professional context. Writers seek to embed their writing in a particular social world which they reflect and conjure up through approved discourses. As a result, the genres of the academy have attracted increasing attention as they offer a rich source of information about the social practices of academics for example, (Gupta & Kasugap, 2019) argues that discourses are systematically organized sets of statements which give expression to the meanings and values of an institution.

Besides communication of a finalized piece of research, the written work is the basis for further opinions, views and critiques from fellow professionals and academics separated by time and distance. Most importantly, it represents the only permanent record of scientific work that has been completed. Writing equips us with communication and thinking skills. Writing expresses who we are as people, makes our thinking and learning visible and permanent. It also fosters our ability to explain and refine our ideas to others and ourselves, (Ahmad & U.K, 2016). The main objective of scientific writing is to record data. Without a written record of the findings and observations of researchers, no proof exists that any research was conducted and valuable information obtained after a lot of effort may be lost. A goal of scientific writing is to communicate scientific information clearly and concisely. Flowery, ambiguous, wordy, and redundant language run counter the purpose of scientific writing, (Mouton & Yakhontova, 2017).

Why is Scientific writing Important?

Scientific writing is both a testing device and a teaching device. When handled correctly, it empowers one to: Learn and read an assignment carefully, research the nuances of set topic, refine focus to a strong, offer arguable thesis and select the best evidence to prove the analysis of dissertation, (Bartholomae, 2015).

II. LITERATURE REVIEW

2.1 TYPES OF SCIENTIFIC WRITING

Different types of writing have their own particular tone or style. In scientific writing, the tone is generally formal, objective and informative. Examples of scientific writing include lab reports, journal article summaries, and research proposals and grant applications. The four main types of academic writing are descriptive, analytical, persuasive and critical. Each of these types of writing has specific language features and purposes, (Blyer & Thralls, 2014).

2.1.1 Descriptive scientific writing

The simplest type of academic writing is descriptive. Its purpose is to provide facts or information. An example would be a summary of an article or a report of the results of an experiment. The kinds of instructions for a purely descriptive assignment include: identify, report, record, summarize and define. Its purpose is to provide facts or information. i.e. Summary of an article or a report of results of an experiment, (Polychronounce & Alnomoun, 2015). Descriptive scientific writing is guided by terminologies such as: identify, report, record, summarise. It requires one to develop writing style and perhaps think more deeply about what has been read or experienced, in order to make more meaningful conclusions.

2.1.2 Analytic scientific writing

Analytical writing style involves reviewing what has been read in light of other evidence. It shows the thought processes one has gone through to arrive at a given conclusion and discusses the implications of this, (Swales & Ventola, 2018). Most academic writing is also analytical. Analytical writing includes descriptive writing, but also requires one to re-organize the facts and information described into categories, groups, parts, types or relationships. The Analytical Writing measure assesses critical thinking and analytical writing capabilities. It evaluates ability to communicate, support complicated ideas, design test arguments, engage in a clear and intelligible discussion of an issue. It doesn't assess how much one knows about a specific topic.

2.1.3 Persuasive Academic writing

Academic persuasive writing is research-based articles intended to encourage others to see your point of view on a topic of interest or discussion. It is the way of creating a persuasive argument by evoking an emotional response in the audience/reader, (Salager & Meyer, 2014). *Persuasive writing* is used to convince or persuade a reader that the writer's opinion of a topic or cause is correct. This research-based article intends to encourage others to see the researcher's point of view on a topic of interest or discussion. The reader must be convinced that the author is an authority and merits attention. Adverts and newspaper columns are good examples of persuasive writing. Though there are many techniques to write persuasively, most persuasive texts include a central argument, evidence to support the point and a conclusion, to summarize the text, (Mouton & Yakhontova, 2017). Persuasive writing has to sway your reader intellectually and emotionally. Persuasive techniques include:

- Establishing trust and develop credibility. In scientific research, the author must establish credibility as a rigorous and expert researcher, (Stephen Heard,2017).
- Understanding the reader's purpose and align your own.
- Paying attention to language.
- Considering tone.
- Using rhetoric and repetition.

2.1.4 Critical writing

Critical writing analyses and evaluates information, usually from multiple sources, in order to develop an argument. It is an appeal to logic and reason. It is used to persuade an audience by logical thought, fact and rationality, (Bazerman, 2016). It identifies, questions and assessing deeply held assumptions about knowledge, the way we perceive events and issues, beliefs, feelings, and actions, (Angelika Hofmann, 2017). It identifies questions and assessing our deeply held assumptions about our knowledge, the way we perceive events and issues, our beliefs, feelings, and actions. Critical writing can be split into three parts: Description, Interpretation and Outcome. A mistake many beginning writers make is to assume that everything they read is true and that they should agree with it, since it has been published in an academic text or journal. Stages of writing an excellent critical essay are:

1. De-code the essay title.
2. Plan your essay.
3. Research your subject.
4. Structure your essay.
5. Develop your argument and introduce counter-arguments.
6. Use relevant evidence.
7. Develop your academic writing style.
8. Find out how to present your work.

2.2 WRITING STYLES

Three main writing styles are: descriptive, analytical and reflective. A *critical analysis* paper asks the *writer* to make an argument about a particular book, essay, movie, etc. The goal is twofold: one, identify and explain the argument that the author is making, and two, provide your own argument about that argument, (Bartholomae, 2015). Analytical writing style is often called for at university level. It involves reviewing what has been read in light of other evidence. Analytical writing shows the thought processes through which one arrives at a given conclusion and discusses the implications of this. A *Critical Reflection* (also called a *reflective* essay) is a process of identifying, questioning, and assessing our deeply-held assumptions about our knowledge, the way we perceive events, issues, our beliefs, feelings, and actions. Basic reflective writing can be split into three parts: Description, Interpretation and Outcome. The stages of the scientific method are often incorporated into sections of scientific reports. These are: -

Title: A title should be of the fewest words possible, accurately describing the content of the paper. Is the title clear and informative, and does it reflect the contents of the report or paper?

Abstract: A well-defined abstract allows the reader to identify the basic content of your paper quickly and accurately, to determine its relevance, and decide whether to read it in its entirety. The abstract briefly states the principal, scope, and objectives of the research. Does your abstract describe the background for your study, clearly state the research problem, briefly describe the methods used to investigate the problem, state the results obtained, summarize conclusions and link these back to the study context? In a nutshell, the abstract should say what your study is about and explain why it matters. Different disciplines may expect abstracts to be written in a particular style, (Blyer & Thralls, 2014).

Introduction: The introduction discusses the issue studied and discloses the hypothesis tested in the experiment. This is usually structured as a literature

review in a paper or larger report. In an undergraduate science report, you should explain the motivation for your current experiment or study and reference relevant background readings or articles. You should also provide a clear statement of the research questions and describe how this link to the study background or context. An overview of what is included in the report including a brief overview of the methods used and the expected results, (Mouton & Yakhontova, 2017).

Methods: This section is the 'recipe'. The step-by-step procedure, notable observations, and relevant data collected are all included in methods and results. It describes what has been done and how it was done. For the report to be a practical, useful document and for the results to be reproducible, a trained person should read the report to replicate the study from the information provided and accurately and fully describe experimental procedure, (Hamby, 2015).

Results: Results display findings, figures, and tables of study. It represents the data, condensed, and digested with important trends that are extracted while researching. Since the results hold new knowledge, it is important that data is simple and clearly stated. In this section you report what you found in your investigation. Check correctly formatted, labeled and captioned all tables and figures, Check lab manual for specific instructions but refer to the introduction to tables and figures in the next section for general advice. Correctly check reported descriptive, inferential statistics and used tables and/or graphs to support clear communication of results. Ensure that tables and figures are located soon after the text in which they are introduced, (Mouton & Yakhontova, 2017).

Discussion: The discussion section consists of the author's analysis and interpretations of the data. Additionally, the author may choose to discuss any discrepancies with the experiment that could have altered the results. This is where discussion and interpretation of results, comment on whether the research supports original hypotheses or answers your

research questions is done. If results do not fully answer original questions, or fail to support a hypothesis, it's important to explain why this might be the case, (Gosden, 2016). Acknowledge any limitations to the study design in this section. Speculate on future research that may be helpful to answer unresolved issues, or point out new research questions that have arisen out of research. Finally, link findings back to the original context or motivation for the study or experiment. It may be a very small contribution but it is important to explain how your study adds to or supports, existing knowledge.

The conclusion summarizes the experiment and will make inferences about the outcomes. The paper will typically end with an acknowledgments section, giving proper attribution to any other contributors besides the main author(s), (Astuti, Mohammed, & Zars, 2019).

Reference and Appendices: A list of references presented alphabetically by author's surname, or number, based on the publication, must be provided at the end of scientific paper. The reference list must contain all references cited in the text. Include author details such as the title of the article, year of publication, name of journal or book or volume, and page numbers with each reference. Specific details to check include: Double-checking that all references used in the body of the text and that citations and references match, (Joseph, Alan, & Gross, 15 May 2007). As a general rule keep direct quotations to a minimum. Describe the work of others in your own words and reference your sources. This will also help to better understand the science that others have carried out. Make sure you have applied the appropriate referencing style correctly and consistently. Check any online references to ensure they are accessible. Characteristics of good scientific writing include:

- **It must be set within the context of other published work.** Because science builds on and corrects itself over time, scientific writing must

be situated in and reference the findings of previous work, (Mouton & Yakhontova, 2017). This context serves variously as motivation for new work being proposed or the paper being written, as points of departure or congruence for new findings and interpretations, and as evidence of the authors' knowledge and expertise in the field.

- **Concise and precise.** A goal of scientific writing is to communicate scientific information clearly and concisely. Flowery, ambiguous, wordy, and redundant language run counter to the purpose of the writing.
- Clear - it avoids unnecessary detail.
- Simple - it uses direct language, avoiding vague or complicated sentences.
- Impartial - it avoids making assumptions (Everyone knows that) and unproven statements (It can never be proved that)
- Structured logically- ideas and processes are expressed in a logical order. The text is divided into sections with clear headings;
- Accurate - it avoids vague and ambiguous language such as about, approximately, almost;
- Objective - statements and ideas are supported by appropriate evidence that demonstrates how conclusions have been drawn as well as acknowledging the work of others.
- Neutral - It avoids making assumptions and unproven statements.
- It represents how and where data were collected and supports its conclusion with evidence.
- Avoids Technical terms and Jargon are used only when they are necessary for accuracy.

Different fields have different conventions for writing style, and individual journals within a field usually have their own style guides. Some issues of scientific writing style include: Some style guides for scientific writing recommend against use of the passive voice,

while some encourage it. In the mathematical sciences, it is customary to report in the present tense, (Swales & Ventola, 2018). Some journals prefer using "we" rather than "I" as personal pronoun or a first-person pronoun. The word "we" can sometimes include the reader, for example in mathematical deductions. The acceptability of passive voice in scientific writing is inconsistent. It is not always wanted, but is sometimes encouraged. One reason that passive voice is used in scientific writing is that it is beneficial in avoiding first-person pronouns, which are not formally accepted in science. In practice, scientific writing is much more complex and shifts of tense and person reflect subtle changes in the section of the scientific journal article. Additionally, the use of passive voice allows the writer to focus. In order to get published, papers must go through peer review by experts with significant knowledge in the field. During this process, papers may get rejected or edited with adequate justification.

Identify the point: Unlike other writing styles, scientific writing needs to have a clear point. It needs to be obvious to the reader what they get out of reading your work, answering the question, "what's in it for me?" A 'point' has three elements: a problem, a gap in our understanding of that problem, and a contribution towards filling in that gap, (Golebiowski, 2017) The 'problem' should be one that many other people care about (especially if you want it to be cited). Identifying the 'gap' is synonymous with conducting a thorough literature review. And you should be able to clearly state the contribution in a handful of sentences. Not only do you need to identify the point, but you need to weave it throughout your work so that the reader can follow, without losing hope that they will arrive at the promised destination.

Empathize with your readers: Remember, the whole point of writing is for people to read what you have written. It doesn't matter how great your research is if you confuse your reader or put them to sleep on

page two, (Mouton & Yakhontova, 2017). You need to identify your target audience and write for them. In many ways, you are the worst possible reader for your work because you already understand everything. To write well, you have to put yourself into a novice's shoes and ask yourself, "if I knew little or nothing, would I understand or care about this?"

Start writing early: Start writing very early, long before the research. This accomplishes a few things. Firstly, it provides a check on understanding of the subject matter (it's hard to write about something if you don't understand it). Conduct a thorough literature review (you can't write a good introduction unless you are aware of what has already been done). And it helps one to determine what research direction will provide the most cogent manuscript. This is important because often a manuscript is the primary output of research, so the research should be guided by the manuscript needs, to some extent, (Polychronou & Alnomoun, 2015).

2.3 Figures

Figures illustrate a trend in your data or a feature of your data. Graphs, photographs or illustrations follow the convention for a figure. Key points for figure presentation include: Figure caption goes below the figure. Use normal case not title case for the caption. Number the figure followed by the caption. Refer to the figure by number in the text. For graphs, you usually plot the independent variable on the x axis, (Gupta & Kasugap, 2019).

2.4 Tables

Use tables when you need to present or group data in a logical way. Key points for table presentation include: Table caption that goes above the table. Use normal case not title case for the caption. Number the table followed by the caption. Refer to the table by number in the text. Horizontal lines are used only to separate headings from data. Avoid vertical lines to separate columns. Use figures to illustrate a trend in

your data or a feature of your data. Graphs, photographs or illustrations follow the convention for a figure, (Bazerman, 2016).

The first time you use a technical term, make sure you define it. In some disciplines it is usual to bold the term the first time you use it and thereafter use a normal typeface. Similarly, define acronyms or abbreviations the first time you use them and thereafter just use the acronym (Blyer & Thralls, 2014).

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2.6 References

In the end reference, separate information about author(s), date, title, edition and publication as follows: Author(s), Date, Title, Edition, Place of Publication, Publisher, Extent, Notes, Extend include pagination of number of volumes; Notes provide information about location such as URL for online works, (Blyer & Thralls, 2014).

III. CONCLUSION

Good research is meaningless unless you can communicate your findings in a clear and interesting fashion by providing a check on understanding of the subject matter. Sentences and paragraphs should be in a logical order so that the reader can easily follow the argument and reach the same conclusion as the researcher. Each paragraph should be able to stand on its own and be internally cohesive. Scientific writing needs to have a clear point. The whole point of writing is for people to read what has been written. Writing should start very early, long before the research.

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Cite this article as :

Rose Khamusali Okwemba, "Introduction To Scientific Writing A Review ", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 1, pp. 56-63, January-February 2022. Available at doi : <https://doi.org/10.32628/IJSRST218631>
Journal URL : <https://ijsrst.com/IJSRST218631>