

Essential Components of Scientific Papers

After conducting an experiment or researching a particular topic, writing a scientific paper is a popular method of sharing this knowledge with other scientific community members. Most scientists will refer to other scientists' papers when conducting their research, so these papers are integral to the development and evolution of science's collaborative field.¹

All scientific papers should follow a universal framework so that readers can efficiently locate the information that they are looking for.² The essential components of a typical scientific paper are described below in detail:

1. **Title:** The title is the element of the paper that will be immediately visible to the reader. In a short sentence, it should provide a solid understanding of the contents of the study. The species, groups, demographics and the independent/ dependent variables.³ If another scientist wishes to reference this paper in their research, the title should be descriptive enough for the reader to discern if it is of interest or not. Below is an example of a complete designation for a scientific paper:⁴
1. **Abstract:** An abstract gives the reader a small glimpse into the paper's contents and how that information is relayed. In short, it should be a concise summary of an otherwise long article in the length of a paragraph. Often, this is the only component of the paper, along with the title provided to the public; the rest must be purchased. Most abstracts include a summary purpose, methods, results, and conclusions of the study. They are usually written after the rest of the paper has been completed, making it easier to highlight the key points effectively. Please refer to our guide titled "[Abstracts: What They Are & How To Write Them](#)" for further information on how to write a useful abstract.
1. **Introduction:** The introduction of a scientific paper is the first paragraph that dives into the study's detail. It should begin by providing the context necessary to prepare the reader to understand the entire paper fully.¹ This information should include the reasoning behind the experiment or study, along with any background knowledge required to understand the topic of interest.

The introduction will also introduce the importance of the work presented. This can be accomplished by referencing any previous research on the topic and the gaps and questions that may have been left unanswered.² It is likely that one of these unanswered questions will be the basis of the research question, which should also be stated in the introduction. This is the question that created a purpose for the experiment.³ Showing the reader the importance of the work will keep them engaged in the problem and eager to read about the findings presented later on.

Lastly, it is vital to clearly state the hypothesis that was formulated before conducting the experiment.³ This would have been the initial prediction of the researcher before any testing had begun. Through the paper, the reader will find out if this hypothesis was correct or proven to be incorrect after interpreting the results.

1. **Methods:** The methods section should describe precisely how the experiment was carried out. There should be an adequate amount of clarity and explanation behind the reasoning for using specific methods. Each choice that was made regarding the experimental setup and process should be justified.¹ For example, if a particular set of values were used during testing, these should be explained. Anything concerning the experimental design should be in this section, such as the materials and equipment used, how the participants were picked, and the demographic from which these participants were selected. Also, the use of any scientific techniques or strategies should be explained.³
2. **Results:** This is where the observations and data collected from the experiment should be presented. There are different methods of explaining this data to readers, but it is beneficial to use visualization techniques such as graphs and tables to give the information clearly and effectively.³ Along with these visuals, there should be descriptions available for the reader to reference while looking at the data.² The combination of graphs, tables, and words should be enough to make the material understandable. Any summaries included should be completely unbiased. Everything that is stated should be directly verifiable if the reader looks at the data. The results section should not discuss any conclusions that were created from the data nor how the results relate to the hypothesis.² This will be addressed in the next section.
3. **Discussion:** Following the results, this section discusses the author's interpretation of the products and data. First of all, the author should answer whether the experiment's results support or neglect the initial hypothesis.² The discussion section opens up the floor to talk in detail about the implications of these results and also how they compare to the work of other scientists.³ If the results were far from initially expected, then potential experimental flaws can also be brought up, such as faulty equipment, human error, and any other observations or areas of improvement for future experiments of a similar kind. These flaws could be used to explain any unexpected data points.² This is effectively the conclusion of the paper's information-based part, so the last few sentences should be dedicated to translating these results into real-world scenarios and how further research can be done on this topic.³
4. **Acknowledgements:** It is very important to recognize the hard work of any people of organizations involved in the research, and that is the purpose of this section. The acknowledgements would include any other authors, professors, venues such as labs, institutions, and any external funding sources.³
5. **References:** Finally, the references section should include the full citations of any material that was used, such as websites, papers, books, journal articles, and other sources. The list serves to

acknowledge any sources of information used and provides readers with extra background information to check out.³ Most writers use the APA format for scientific papers.

It is also necessary to use in-text citations when directly referencing or quoting anything from other sources anywhere in the paper, such as statistics or findings. When citing these sources in the article, follow this format: (Last name of the author, Publication date).

When writing any scientific paper, following this general framework will ensure a persuasive and well-thought-out essay containing all of the necessary information for the reader to understand the entire study. Following these guidelines will make a scientific paper accessible to the rest of the scientific community. Its clarity will make it usable in the research of scientists who share similar goals and interests.

References

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4. Balducci, S., Sacchetti, M., Haxhi, J., Orlando, G., D'Errico, V., Fallucca, S., Menini, S., & Pugliese, G. (2014). Physical exercise as therapy for type 2 diabetes mellitus. *Diabetes/metabolism research and reviews*, 30 Suppl 1, 13–23.
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