



Writing a Research Paper

For most areas of science, from biology to physics, writing a research paper is one of the most important skills.

You can design [1] the greatest experiment on earth but if you cannot write a good report then nobody will take your results seriously.

The first thing you must do is make sure that you have designed and performed a good experiment [2]. Once it is finished and you have lots of results [3], you can present them to the world.

Most science reports should have the same layout:

- Title
- Introduction
- Method
- Results
- Discussion
- Conclusion
- References

Most use this or a similar outline [4] when writing a research paper [5].

The banner features the Explorable logo and the text "Quiz Time!". Below the logo are three quiz cards:

- Quiz: Psychology 101 Part 2
- Quiz: Psychology 101 Part 2
- Quiz: Flags in Europe

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Title

The title must not be too long but must describe exactly what your experiment is about.

For example, "Mold Growth" tells us nothing whereas "The Effect Of Temperature On Mold Growth" lets everybody know what the experiment is about.

Introduction

In [this section](#) [6] it is important to give the reasons why you picked this experiment and show the background research you did for it.

You have to assume that somebody reading your experiment may know nothing about the subject so you must give them a quick summary.

You could let them know a little about 'The Life Cycle of Mold' or 'The History of Pendulums'. There is one problem; how do you keep your introduction short whilst trying to teach somebody about your subject?

This is where you use references, sometimes called citations. For every piece of information included, you should let the reader know where it came from.

Whether from books, magazines, the internet or your teacher, if you include your references, somebody interested in your subject can easily read them and find out more.

Finally, you should include your [hypothesis statement](#) [7]. This is what you are trying to prove or disprove. For example 'Mold grows quicker at higher temperatures' or 'Expensive brands of paper towel absorb more water than cheaper ones' are [testable hypotheses](#) [8].

Method

Here you must describe exactly the [equipment and methods](#) [9] you used.

What you must remember is that somebody might want to test your results so you must make sure that they are able to perform exactly the same experiment with exactly the same equipment.

It is a good idea to include a list of all the equipment you used and step by step instructions on what you did.

Results

Here you describe what you found. In [this section](#) [3], you should not discuss what your results mean; only what you found. You must try to be exact and give numbers instead of just observations.

Use [graphs and tables](#) [10] as they are easier for people to understand easily. Be careful not to put in lots of graphs just for the sake of it. Every graph and table should be clear and referred to in the text.

Discussion

The discussion [11] is where you interpret your results and try to explain what they mean. This is called significance. You should point out whether your hypothesis [12] is proved, disproved or inconclusive, if you are not sure one way or the other.

If your hypothesis is proved, great, but the world of science does not stay still. Here you should speculate where science goes next or what experiments you could do next.

For example, in the case of the mold bread experiment [13], after testing the effect of temperature, you could check whether the amount of light has an effect on the rate of growth.

If your hypothesis was wrong or unproven, this is not a problem. There is no right and wrong in science, only answers. Even if your hypothesis was wrong, the world of science has still learned something.

In the discussion you must describe why the experiment did not give the results you expected. Maybe your initial hypothesis was wrong, but maybe there were some flaws in your experimental design [1] or method.

You should describe why it might be wrong or what changes you would make if you were to repeat the experiment again. Be honest. Nobody is going to punish you for having these problems, only for not understanding why.

Even great scientists like Charles Darwin and Stephen Hawking have had flaws in their theories so you are in good company if your experiment [2] did not work out exactly how you planned!

Conclusion

It is always a good idea to write a short summary of the conclusion [14] at the end of the report to make everything a little clearer to the reader.

Bibliography

It is good practice to list [15] the books, magazines and websites from where you found out your background research when writing a research paper. This makes sure that somebody who is interested in your subject can find out a little more.

For a book, you should include the name of the author, the title, the date it was written and the page numbers of where you found the information.

For magazines you should include the name of the author, the title of the magazine, the issue number and/or date, and the name of the article.

For a website you should put the exact website address and the date you looked at it.

Not every science report or article insists that you have a bibliography [15] but if you want to follow a career as a scientist it is a good idea to get used to it now.

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