

The Scientific Paper

Primary Audience: Other scientists

Primary Purpose: To inform other scientists of your lab's work (report findings)

Secondary Readers: public, medical doctors, policymakers, etc.

THUS, because of the specific audience and purpose of the scientific paper, a standard method of presenting work has become established and this is the format that we currently use. Note that although different journals may have slight modifications in the order, titling, and some content of the sections described below, the basic idea remains the same.

Sections, Purpose, and Content of a Scientific Paper:

Abstract

Purpose: To briefly introduce the topic and summarize major findings and conclusions.

Content: No longer than one paragraph, frequently has a word limitation. The general recipe is 1-2 sentences introducing your problem, followed by 3-4 sentences summarizing your major results, and 1-2 sentences explaining your major conclusion. Frequently, this is the last thing you write.

Introduction

Purpose: To introduce your topic and show where there is a gap in the research field.

Move 1: Establish the field or general topic.

This section usually begins with a basic introduction to your overall topic.

Move 2: Introduce the specific problem or issue.

Next, give an explanation of how your research will benefit the "world" of research. In other words, you would explain how your research will be useful to help solve a problem (such as providing a new therapy for a disease) or to further knowledge of your field (such as identifying a new gene that may potentially play a role in development).

Move 3: Define the scope of the problem or issue by summarizing previous research.

Next, give the current state of research on topics relevant to your project. For example, if you were studying bone disease, you would briefly describe the genes that cause the disease.

Move 4: Create a research space by: a) indicating a gap in previous research, or b) indicating a possible extension.

Then, you open up a space for your own project by indicating a gap in the current knowledge that your project will fill. For example, you may know that a certain gene is important for a disease, but you may not know exactly what the gene does. Your project could be to figure out exactly how the gene causes the disease.

Move 5: Introduce present research by: a) stating the aim of the research, b) describing the research, and c) justifying the research.

Finally, you tell the readers what you are going to do. For examples of how you would structure your introduction, ask your mentor for papers related to your project and read the introductions.

Materials and Methods

Purpose: To explain exactly what materials and methods you used to get the specific results shown in your paper.

Content: In general, you should provide enough experimental detail for another scientist to replicate your experiment in his or her own lab. While some procedures are so common that they no longer require explanation in most journals (extracting DNA is commonplace, for instance), you should write out all your procedures for this paper since you do not know what background the people who read your work will have. While you do not need to explain things in extreme detail, there should be enough information written that other summer focus students can understand what is happening. Additionally, protocols from other papers are sometimes referenced; this saves the authors from having to write the same thing over and over again. However, you should avoid doing this on your first paper; it's better etiquette to reference a protocol in a paper that you wrote, as opposed to one that someone else wrote.

Results

Purpose: To present your findings and provide basic interpretation of the results.

Content: The content in this section will depend on your project, and you should talk to your mentor about what you will put in your results. In general, this is where you put your graphs, tables, pictures, or other figures and an explanation of what they are and what they mean with regard to your project. You *do* need to interpret your results for the reader—don't just put up a graph and expect the reader to understand what it means. Also, be sure to label all your figures and refer to them in text. If you don't refer to your figure in your text, it shouldn't be in your paper.

Conclusion/Discussion

Purpose: To explain how your results fill the gap in the field that you talked about in your introduction.

Content: This section will overlap somewhat with your results section. Frequently, results are repeated with more emphasis on how a specific result indicates something more general about your project. This is then followed by an explanation of whether your hypothesis was disproved or not and how you have filled a gap in the field (described in the introduction section). As with your results, this is a section that you should discuss with your mentor, as he or she will know what it is appropriate for you to include.

References

Purpose: To provide the sources of your information for other scientists to verify.

Content: This section can be formatted in a variety of ways and is usually tailored for whichever journal the paper is submitted to. However, all references should contain enough information to look up the paper being referenced.

Acknowledgements

Purpose: To give credit to other people who played critical roles in your research project.

Content: This section is where you would acknowledge YSP for funding your summer experience, thank lab mates for helping you collect and analyze data, and thank people who read your paper or help you revise it. You should only be thanking people directly involved in your research or paper writing. People who should not be thanked include buddies, family, God, *etc.* unless they have provided direct help on your project (you can thank parents or other non-lab people for reading your paper *if* you gave them drafts to read and they actually made comments or suggestions). Sorry, rides to work don't count, although they are nice.

Rhetorical Moves in Introductions

Move 1: Establish the field or topic.

What is the larger issue you are addressing, and why is it important?

Point out the most significant and relevant sources of information to date. Read everything your mentor gives you, but only include in your background those sources that teach you something significant about the causes, constraints and potential resources for addressing the problem.

Move 2: Identify a problem.

What is the IDEAL situation, and how does the CURRENT reality conflict with it? Try an “A but B” problem statement.

Move 3: Define the scope of the problem by identifying key issues to be addressed.

What issues must you explore to understand the problem thoroughly? If available, use existing research and background information to locate these issues. Identify consistent patterns and points of agreement about your specific topic. This section should not be a summary of articles, but a discussion of key points about the problem, supported by sources.

Move 4: Create a research space by:

- a) indicating a gap in previous research,
- b) indicating a possible extension.

Identify inconsistencies and unresolved issues across these texts, to establish what it is known. Name these gaps and unresolved questions as the focus of your research. Revise your introduction to emphasize your unique contributions.

Sum up what we currently know and what we still need to know. Where /in what way can your project extend our understanding of the problem?

Move 5: Introduce current research by

- a) stating its purpose,
- b) explaining the nature of it, and
- c) justifying it.

What is your purpose? What specific question/s will you answer? What is your general approach? Why is this approach the appropriate one? What difference will it make?

Note: Adapted from work done by John Trimbur, Professor, Humanities and Arts, WPI and by Professor Lorraine Higgins, Director of the Center for Communication Across the Curriculum. WPI.