

The Parts of a Laboratory Report

Introduction: *What is the context in which the experiment takes place?*

The primary job of any scientific Introduction is to establish the purpose for doing the experiment that is to be reported. When scientists do research, the main purpose that guides their work is to contribute to the knowledge of their field. That's why the scientific context they establish in their introductions usually consists of summarizing previous research reports published in the field. A scientific contribution to the knowledge of the field can be understood only within the context of what other scientists have done.

The main purpose of writing a lab report, of course, is not to contribute to the knowledge of the field; but to provide you the opportunity for learning. That's why it's important to begin the lab by establishing that learning context. The **learning context** provides a way for you to situate the lab report within the overall purpose for doing the lab in the first place: **to learn something about the science of the course you are taking.**

An effective introduction to a lab report typically performs the following tasks, generally in the order presented:

1. it establishes the learning context for the lab by:
 - a. saying what the lab is about, that is, what scientific concept (theory, principle, procedure, etc.) the researcher is supposed to be learning about by doing the lab; and
 - b. giving the necessary background for the learning context by providing pertinent information about the scientific concept (this information can come from the lab manual, the textbook, lecture notes, and other sources recommended by the lab manual or teacher; in more advanced labs you may also be expected to cite the findings of previous scientific studies related to the lab).
2. it provides the primary goals of the lab by:
 - a. presenting the objective(s) for the experimental procedure (what is being done in the experiment, such as to measure something, to test something, to determine something, etc.); and
 - b. defining the purpose of the lab (the way the experimental procedure is linked to the learning context).
3. it offers a hypothesis for the experimental procedure by:
 - a. stating the hypothesis, or the best estimation of the outcome of the lab procedure; and
 - b. explaining the scientific reasoning that leads the researcher to that hypothesis.

Materials and Methods: *What did you do and how did you do it?*

There are various other headings one may find for this section of the report, such as "Experimental Procedure," "Experimental," or "Methodology." Sometimes Materials and Methods may be separated in different sections. But however it is titled, the main tasks of the Materials and Methods are to describe (1) the lab

apparatus and the laboratory procedure used to gather the data and (2) the process used to analyze the data.

Materials and Methods takes the reader step by step through the laboratory procedure that the experimenters followed. The rule of thumb in constructing this section is to provide enough detail so that a competent scientist in the field can repeat, or replicate, the procedure. The challenge, however, is to do so as efficiently as you can. This means, for example, not including details that the same competent scientist already knows, such as descriptions of standard procedures that most everyone in the field would already be familiar with.

Results: *What did you find?*

This is the heart of the scientific paper, in which the researcher reports the outcomes of the experiment. *Report* is a key word here because Results should not contain any explanations of the experimental findings or in any other way interpret or draw conclusions about the data. Results should stick to the facts as they have been observed.

Generally speaking, the Results begins with a succinct statement (a sentence or two) summarizing the overall findings of the experiment. After that the Results integrates both visual (graphs, tables, drawings) and verbal (words) representations of the data. The verbal descriptions consist of series of findings (general statements that summarize or give the important point of a visual) and support for the findings (further details about the data that give pertinent information about the findings).

Discussion: *What does it mean?*

The purpose of the Discussion is to interpret your results, that is, to explain, analyze, and compare them. This is the point at which the researcher stands back from the results and talks about them within the broader context set forth in the Introduction. It is perhaps the most important part of the report because it is where you demonstrate that you understand the experiment beyond the level of simply doing it. Do not discuss any outcomes not presented in the Results.

The Discussion section often begins by making a statement as to whether the findings in the Results support or do not support the expected findings stated in the hypothesis. It's important to make such a comparison because returning to the hypothesis is crucial to basic scientific thinking. The statement of support or non-support then leads to the next logical issue, an explanation of why the hypothesis was or was not supported by the data. The explanation might focus on the scientific reasoning that supported the original hypothesis (based on the scientific concept on which the lab is founded) and on changes to or errors in the experimental procedure and how they could have affected the outcomes. The Discussion also provides the opportunity to compare the results to the research of others.

Conclusion: *What have I learned?*

The Conclusion returns to the larger purpose of the lab, which is presented as the learning context in the Introduction: to learn something about the scientific concept that provides the reason for doing the lab. This is where you demonstrate that you

have indeed learned something by stating what it is you have learned. This is important because it helps you to understand the value of the lab and convinces the reader that the lab has been a success. It's important, then, to be specific, providing details of what you have learned about the theory or principle or procedure at the center of the lab.

Abstract: *What is the essence of the report?*

The Abstract is a miniature version of the lab report, one concise paragraph of 80-200 words. Its purpose is to present the nature and scope of the report. In the scientific literature, abstracts must be stand-alone documents, whole and self-contained, because they are often published by themselves in research guides.

To create a miniature version of the report, abstracts usually consist of one-sentence summaries of each of the parts of the report (sometimes two sentences are necessary for especially complex parts). And those sentences are arranged on the order that the parts come in the report: Introduction, Materials and Methods, Results, Discussion/Conclusion.

Title: *What is the report about?*

The main job of the title is to describe the content of the report. In science, a title usually tells the reader what the subject of the experiment and the key research variables are, and it often gives an indication of what research methodology was used. Titles are especially important to scientists because articles are typically indexed according to key words that come from the title. So when scientists are searching for research articles, it is those key words that lead them the articles they need. It's necessary, then, that titles be fully informative about the content of the report.

References: *What sources were used?*

This is a list of the references that were cited in the lab report, including the lab manual, any handouts accompanying the lab, the textbook, and sources from the scientific literature. The format for references differs in different fields and even within the same field. It's important that you check with you teacher or lab manual to find out what is expected of you.

Appendices: *What additional material is included?*

Appendices are places where you put information that does not deserve to be included in the report itself but may be helpful to some readers who want to know more about the details. The kinds of information you might find in an appendix are:

- detailed drawings of apparatus, sources of hard-to-find materials, or other information related to the methodology of the experiment;
- calculations that elaborate on those that are in the Methods;
- raw data in tables, drawings, or photographs that may be useful to understanding certain findings.