



CATOLICA
FACULTY OF BIOTECHNOLOGY

PORTO

GENERAL GUIDE FOR THE WRITING OF SCIENTIFIC REPORTS

INTRODUCTION

This document establishes the most common general rules for the preparation and written presentation of scientific work and is used as a guide in different subject areas at the Escola Superior de Biotecnologia of the Portuguese Catholic University. The rules are not exhausted on these pages and each discipline can of course specify complementary or additional guidelines. The information in this guide has essentially been adapted from *Writing Scientific Manuscripts: A Guide for Undergraduates*, 2005, published by the Journal of Young Investigators (available on the Internet at www.jyi.org). The rules for bibliographical citations are based on the APA (American Psychology Association) standards, which are the most widely followed by the academic and scientific community in the exact sciences.

THE REPORT STRUCTURE

Each report must comply with the following rules in terms of overall appearance:

- Text printed on A4 paper (preferably double-sided and on recycled paper);
- Font size 12 (except on the cover and titles or subtitles, if appropriate);
- Font Times or Times New Roman;
- 1½ spacing;
- Left- and right-justified text, one column;
- Headings and subheadings in bold;
- 2.5 cm margins all around;
- Document stapled in the upper left corner;
- Non-standard sheets should be placed on standard A4 sheets;
- When printing double-sided, the cover page should have a blank back. All sections preceding the introduction (cover, abstract, etc.) should start on a new page (not on the reverse).

The rules for page numbering must be as followed:

- The cover page and its back (for double-sided printing), as well as the pages with the abstract and table of contents, count for pagination, but their numbering is not shown. In other words, the (Arabic) numbers start on the first page of the introduction.
- Annexes and appendixes are numbered in sequence of the main part of the report;

- The page numbering is centered at the bottom of the page (preferably).
- In longer works, such as internship reports, monographs, theses, etc., where the pre-text (i.e. all the information preceding the main body of the document) takes at least 10 pages, a separate Roman numeral is used for these initial pages.

The cover page must contain the following information:

- Name of university and college;
- Name of the course;
- Name of subject;
- Title of the work;
- Full name of the authors of the report;
- Year, class and, if applicable, the working group to which they belong;
- Date(s) the work was carried out;
- Date the work is delivered.

Table of contents:

- It is only suitable for reports of 6 pages or more, starting with the Introduction;
- It is placed after the summary and before the other sections;
- It only lists the following sections, i.e. it doesn't mention the summary or the table of contents itself;
- The annexes are referred to as any other section.

THE REPORT'S CONTENTS

Each report is the result of a double effort of information and synthesis: it must contain everything that is necessary and nothing that is redundant, so that it is systematic but concise. It should contain the following sections, each one beginning on its own page:

- Summary;
- Introduction
- Material and methods;
- Results;

- Discussion;
- References;
- Annexes (optional).

Abstract

The abstract consists of a single paragraph of no more than 300 words (less than one page) which briefly addresses the following questions:

- Why was the work carried out?
- How was the work carried out?
- What were the main results?
- What were the main conclusions?

The abstract is not an introduction, but rather a summarized overview of the entire work. As a rule, it does not contain references, as these are cited in the rest of the report. Should be as succinct as possible, not ambiguous, and should "tell a complete story", providing readers with the most important part of the work without them having to read any other sections.

The structure of the abstract should be as follows:

- Topic under investigation (one to two sentences explaining why the study was carried out);
- Methods (one to two sentences describing the most important methods used);
- Results (one to two sentences summarizing the main results, based on quantitative information);
- Interpretation (one to two sentences summarizing the conclusions of these results);
- Implications (a sentence showing the importance of these insights, i.e. the value of the work).

Introduction

This section includes all the information necessary to understand the report, but it should not exceed two pages describing:

- Problem being addressed;
- Available knowledge and research previously carried out;
- Concrete objective of the work.

In the introduction, only the knowledge available up until the moment you started the work is covered, always with reference to the respective sources. You should use language that is accessible to colleagues with a similar level of training and you should explain any unusual concepts. The information in the introduction must be relevant to the understanding of the work - providing too much information is as wrong as providing too little.

The structure of the introduction should be as follows:

- Background and/or historical information on the subject area of the work;
- Problem or subject that motivates the research;
- Specific question that will be addressed in the work;
- Research already carried out on this topic;
- Hypothesis that will be tested in this work (for example in the format IF... THEN...);
- Motivation for the research (Why is this problem important? Why is important to test this hypothesis? How will an answer to this problem contribute to improving scientific knowledge, people's lives or the well-being of the planet?)

Material and methods

The purpose of the material and methods section is to make it possible for interested readers to fully repeat the work and verify the results obtained. The description should be exhaustive, but not overly detailed. If several sets of experiments are being carried out, each one should be presented individually in the correct sequence. If an already defined protocol is being followed, this should be mentioned and, in this case, there is no need to repeat the information - just mention any changes to what is mentioned therein. Be aware that this section cannot include any results or comments on how the work was carried out. If necessary, figures or diagrams can be included to help understand the experimental set-up.

Examples of information to include:

- Source of the samples or items of study;
- Sample collection, preparation or processing techniques;
- Statistical or computational analyses carried out;
- Equipment and necessary reactants;
- All the necessary procedures to obtain the final data;
- Negative and positive controls considered.

It may happen that the equipment or substances used are less common. In this case, the supplier should be mentioned (company name, city and country).

Results

This section should include the core results of the work, without giving any interpretation - there is only room for facts here. All comments and evaluations (including explanations for any experimental errors) must be addressed in the discussion section. Usually, the original data is not included - it is presented in an appendix, if appropriate - but rather systematized in tables or figures, so that it is easy for readers to see whether the hypothesis being tested has been confirmed or refuted. Statistical analyses should be summarized in the same way.

Data must be presented with the highest degree of accuracy: if there is no statistical support, you can't talk about "significantly different", for example.

The text must be understandable and provide the most relevant information, without being necessary to use pictures and tables to understand it. In other words, the text should not repeat the data provided by the figures and tables, but should mention the key points, those that are important for understanding the work and evaluating the hypothesis. As throughout the work, this section should be complete without being excessively detailed or containing irrelevant information.

Discussion

This is the section to interpret and evaluate the results previously presented, comparing them with the hypothesis and relevant data available from other studies. Here, the information provided in the introduction is related to that presented in the results, to provide a critical assessment of the overall work. The discussion should answer these questions:

- Do the results allow the hypothesis to be evaluated?
- If so, is the hypothesis validated or rejected? What are the implications?
- If not, should an alternative hypothesis be put forward? Which hypothesis? Why?
- Was this the best way to test the hypothesis?
- Do these results confirm the data obtained previously and by other authors? If not, why not?
- What sources of error were involved in the planning or execution? Do they compromise the reliability of the results?
- How do these results affect the insight of the problem referred to in the hypotheses?
- How should the research continue in the future?

If there are advantages, and no risk of confusing facts and opinions, the Results and Discussion sections could be merged into one: Results & Discussion.

REPORT STYLING

Figures and tables

In a report, all images, schemes, diagrams, drawings, graphs, etc. are considered figures and are numbered sequentially in the order they appear, in Arabic numerals. The only exception is the tables, which follow an independent numbering sequence. The report text should always include a reference (often in brackets) to each figure and table, and these should appear as close

as possible to this reference (but not before). Tables and figures should always be accompanied by some text.

Each figure and table must represent an autonomous unit, i.e:

- Must have clear and simple formatting;
- Have good resolution (particularly important in the case of photos);
- Indicate, in the case of graphs, the name of each axis and each of the series;
- Indicate, where appropriate, the error range;
- Be subtitled so that you understand exactly what is presented and its importance, without having to resort to the general text. The legend should be centred and no greater than 10 sentences.

Figures should be subtitled at the bottom and tables at the top. Each title should always begin with the numerical reference (Figure 1, Table 3...), followed by a hyphen and the respective title. The remaining sentences of the subtitle, if any, should remain in the same paragraph.

References

As far as possible, the literature cited in the report should be limited to scientific articles and reference books, although textbooks may also be relevant in some cases. Internet pages from non-credible sources should be avoided.

References appear in two different moments: throughout the text, when the work of a given author is mentioned, and in the references section, when full details of the publication are given.

Throughout the report, the work of other authors should be referenced using their name and date of publication, in brackets. In the case of more than two authors, indicate only the first, followed by the contraction *et al.* in italic format. Examples:

- ... according to recent studies (Charleston, 2005; Albertson et al., 2004) plate tectonics involves ...
- ... the work of Batt and Williams (2006) showed that the analyses ...
- ... the most recent hypothesis (Cornell, 2008) points to a climate evolution ...
- ... an alternative interpretation has already been put forward (Gepts and Hilbeck, 2007) ...

At the end of the report, the reference section makes it possible to clearly identify which works are referred to in the text. Only these should appear in the list, which should be organised in alphabetical order by the first word of each reference. There are different formats for presenting

these references depending on the type of work in question. The most common ones are listed below.

For scientific articles: first author's surname, initial of first author's first name; second author's surname, initial of second author's first name (year) Article title [first initial capitalised]. Name of the journal (in italic), volume number: start page - end page. In the case of more than two authors, indicate only the first author followed by a contraction (et al.).

Examples:

Russel, S.; Radcliffe, R. (1954) Note on the anaerobic growth of *Escherichia coli* in liquid medium. *Journal of Bacteriology*, 178: 341-354.

Schubert, D. (2008) The problem with nutritionally enhanced plants. *Journal of Medicinal Food*, 11:1-5.

Zangerl, A. et al. (2001) Effects of exposure to event 176 *Bacillus thuringiensis* corn pollen on monarch and black swallowtail caterpillars under field conditions (Efeitos da exposição ao pólen de milho do *Bacillus thuringiensis* do evento 176 em lagartas monarca e rabo de andorinha-preto em condições de campo). *Actas da Academia Nacional das Ciências*, 98:11908-11912.

For books: first author's surname, initial of first author's first name; second author's surname, initial of second author's first name. (year) Book title [in italic and first initial in capital letters]. Edition number, city: publishing organisation. In the case of more than two authors, indicate only the first author followed by the contraction et al. If the author is a group or organisation, the name is not changed. Note that the information about the edition (number and place) appears as it is in the work (and not translated). Also note the capitalisation after the colon in the title.

Examples:

Miller, G. (2007) *Living in the environment*. 15th ed., New York: Thomson Learning.

Boston Women's Health Book Collective (1976) *Our bodies, ourselves: A book by and for women*. 2nd ed., New York: Touchstone.

For self-authored chapters in books with an editor: surname of the first author, initial of the first author's first name; surname of the second author, initial of the second author's first name (year) Title of the Chapter [first initial in capital letters]. in [in italics] Name of the book's editor (ed.) Title of the Book [in italic and first initial in capital letters]. Edition number. (pp. beginning page-end page of chapter) [in brackets]. City: editor. In the case of more than two authors, indicate only the first one followed by the contraction et al.

Example:

Pusztai, A. *et al.* (2003) Genetically modified foods: Potential human health effects. *in* J. D'Mello (ed.) *Food safety, contaminants and toxins*. 1st ed. (pp. 347-372). Cambridge: CABI Publishing.

For documents available on the Internet: surname of the first author, initial of the first author's first name; surname of the second author, initial of the second author's first name. (year) Title of the document [in italic and first initial in capital letters]. Editor. Date accessed - day, month, year at full URL address

In the case of more than two authors, indicate only the first one followed by the contraction *et al.*

Example:

Silva, A. *et al.* (2005) *Nitrofuranos*. Autoridade de Segurança Alimentar e Económica. Acedido em 24 de Julho de 2008 em www.asae.pt/pt.htm

If the document on the Internet is an exact and complete transcription of a printed document (such as an article in a scientific journal, published on paper but is also available in electronic format), should be added after the title of the document and in square brackets [electronic version]. If there is any doubt as to whether the digital version is exactly the same as the printed version, add the date of access as well as the website address; if there is no doubt as to the identity of the two versions, these indications are optional.

Example:

Herremans, I.; Reid, R. (2002) Developing awareness of the sustainability concept [versão eletrónica]. *The Journal of Environmental Education* 34:16–20. Acedido em 21 de Janeiro de 2007 em www.tandf.co.uk/journals/vjee

Plagiarism

All information that has not been directly produced by the authors of the report has been obtained from some source, which must necessarily be indicated using the referencing mechanism detailed above. If words or phrases are transcribed from the cited document, then inverted commas must be used to make their citation clear. When the information is provided in other words, there is only room for the normal quotation of the original authors.

Additional rules

The report must be written in the past tense and in the third person passive voice. For example, instead of "I weighed the samples..." use "The samples were weighed...".

Words including for example, the Latin names of living beings, should be written in italic and without inverted commas or underlining.

Sentences must not begin with numbers: if it is absolutely necessary to start the sentence with a number mention, it must be written out in full. Within sentences, the numbers one to nine must also be written out in full, unless they have an unquestionable numerical meaning (examples: the supplementary number in Totoloto was 4; the result of the colony count on the plate was 7). For numbers equal to or greater than 10, use numerical notation. Numbers associated with units (e.g. 3 kilometres) should always be written in numerical notation.

Before submission, the report must be carefully proofread by all authors. Spelling, grammar and punctuation errors are not allowed.