**2018/19**

**Writing for science**

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 **preparation for higher education**

 **academic skills**

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**1. Introduction**

Writing is a significant part of any science degree course. It is important to continue developing your writing skills throughout your studies. If you progress to the honours year of a degree, you will be required to complete a laboratory project or literature dissertation. Learning how to produce good academic writing will help you know how to write good reports and literature reviews and your dissertation; it will also equip you with valuable written communication skills that will serve you well in future employment.

N.B. This guide presents general guidelines and your university, department or lecturer may have their own preferred procedure.

**2. Characteristics of good scientific writing[[1]](#footnote-1)**

* Clear - it avoids unnecessary detail.
* Simple - it uses direct language, avoiding vague or complicated sentences. Technical terms and jargon are used only when they are necessary for accuracy.
* Impartial - it avoids making assumptions (Everyone knows that ...) and unproven statements (It can never be proved that ...). It presents how and where data were collected and supports its conclusions with evidence.
* Structured logically - ideas and processes are expressed in a logical order. The text is divided into sections with clear headings.
* Accurate - it avoids vague and ambiguous language such as about, approximately, almost.
* Objective - statements and ideas are supported by appropriate evidence that demonstrates how conclusions have been drawn as well as acknowledging the work of others.

**3. Scientific report-writing**

Rather than essays, science and engineering students are more likely to be asked to write reports. These are different in form and content to the essays that students in arts, humanities and social sciences write.

**What is a report?[[2]](#footnote-2)**

A report is written for a clear purpose and to a particular audience. Specific information and evidence are presented, analysed and applied to a particular problem or issue. The information is presented in a clearly structured format making use of sections and headings so that the information is easy to locate and follow.

When you are asked to write a report you will usually be given a report brief which provides you with instructions and guidelines. The report brief may outline the purpose, audience and problem or issue that your report must address, together with any specific requirements for format or structure. This guide offers a general introduction to report writing; be sure also to take account of specific instructions provided by your department.

**Structure of a report**

Scientific reports have a standard basic structure, which includes the following:

* Title
* Abstract
* Introduction
* Methods and Materials
* Results
* Discussion
* Conclusion
* References

It is worth bearing in mind that different lecturers may have a specific structure that they prefer, such as a shorter “AMRAD” report structure: aims, methods, results, and discussion.

The components of a science report, which do not necessarily need to be arranged in the order presented here, can be described as follows:

**Title**

This should accurately reflect the contents of the report and be as concise as possible. The titles of science reports are purely descriptive (e.g. The effects of pulsed ultraviolet light on pathogenic water-related microorganisms).

**Abstract**

This should be a summary of the whole report. It should be brief, but should also contain all the most pertinent information. It should say what you did, why you did it and what the outcome was. A reader should be able to read the abstract and understand which subject has been researched and what the results of the research were. The abstract is best written once the report has been completed.

**Introduction**

This is to introduce the reader to the context of your experiment and the theory behind it. Why did you do this experiment? What were you hoping to find out? How does this piece of work relate to what is already known about this subject?

**Methods and materials**

This is what you did, step by step. What were you measuring and how did you do it? Describe how you set-up the experiment. Give enough detail so that someone else would be able to reproduce it accurately. This can be a good place to start your report.

**Results**

What are your results? Again, the exact format will depend on the type of measurements you were making. Do not unnecessarily include large quantities of raw data. Sometimes one of the hardest aspects of doing research is deciding what to do with sizeable volumes of data. Use tables and graphs, which should also be summarised in words and made reference to in the main body of the report. Do not go into what your results mean at this stage; that is for the discussion section.

**Discussion**

This is where you describe what your results mean. If there is more than one interpretation, describe them all. However you interpret your results, you must explain your reasoning. You should also explain how your findings relate to what is already known about this subject and the extent to which your research confirms or contradicts that. Could you do anything to improve your research in future? What are your recommendations for future research leading on from what you have just done? What would you want to find out next?

**Conclusion**

Sum up your conclusions. You shouldn’t be introducing any new ideas at this point; simply sum up the results and briefly describe whether or not they corresponded with your expectations.

**References**

You must cite every reference you use. This is essential for all academic work.

**Graphs, charts and tables**

Throughout your report or in the appendices at the end, you will use graphs, charts and tables to present the data you gathered during your experiment in the clearest, most easily understandable way. All graphs and tables should be accurately labelled and referred to in the main body of your report. Here are some more tips on presenting graphs, charts and tables in your written work:

* Tables and figures should be numbered sequentially.
* The title of a table or figure should usually be placed above and should be brief but, at the same time, manage to fully describe the information it contains.
* Pay attention to font type and size.
* Headings and subheadings should be concise with columns and rows of data centred below them.
* Generally, the data presented in tables should not be repeated in figures.
* If your graph has a legend, it is often most practical to place this at the bottom of the figure if possible.
* Check with the style of plotting your lecturer prefers.

**4. Writing the report: the essential stages[[3]](#footnote-3)**

All reports need to be clear, concise and well structured. The key to writing an effective report is to allocate time for planning and preparation. With careful planning, the writing of a report will be made much easier. The essential stages of successful report writing are described below. Consider how long each stage is likely to take and divide the time before the deadline between the different stages. Be sure to leave time for final proof reading and checking.

**Stage One: Understanding the report brief**

This first stage is the most important. You need to be confident that you understand the purpose of your report as described in your report brief or instructions. Consider who the report is for and why it is being written. Check that you understand all the instructions or requirements, and ask your tutor if anything is unclear.

**Stage Two: Gathering and selecting information**

Once you are clear about the purpose of your report, you need to begin to gather relevant information. Your information may come from a variety of sources, but how much information you will need will depend on how much detail is required in the report. You may want to begin by reading relevant literature to widen your understanding of the topic or issue before you go on to look at other forms of information such as questionnaires, surveys etc. As you read and gather information you need to assess its relevance to your report and select accordingly. Keep referring to your report brief to help you decide what is relevant information.

**Stage Three: Organising your material**

Once you have gathered information you need to decide what will be included and in what sequence it should be presented. Begin by grouping together points that are related. These may form sections or chapters. Remember to keep referring to the report brief and be prepared to cut any information that is not directly relevant to the report. Choose an order for your material that is logical and easy to follow.

**Stage Four: Analysing your material**

Before you begin to write your first draft of the report, take time to consider and make notes on the points you will make using the facts and evidence you have gathered. What conclusions can be drawn from the material? What are the limitations or flaws in the evidence? Do certain pieces of evidence conflict with one another? It is not enough to simply present the information you have gathered; you must relate it to the problem or issue described in the report brief.

**Stage Five: Writing the report**

Having organised your material into appropriate sections and headings you can begin to write the first draft of your report. You may find it easier to write the summary and contents page at the end when you know exactly what will be included. Aim for a writing style that is direct and precise. Avoid waffle and make your points clearly and concisely. Chapters, sections and even individual paragraphs should be written with a clear structure. The structure described below can be adapted and applied to chapters, sections and even paragraphs.

* **Introduce** the main idea of the chapter/section/paragraph
* **Explain** and expand the idea, defining any key terms.
* **Present** relevant evidence to support your point(s).
* **Comment** on each piece of evidence showing how it relates to your point(s).
* **Conclude** your chapter/section/paragraph by either showing its
significance to the report as a whole or making a link to the next chapter/section/paragraph.

**Stage Six: Reviewing and redrafting**

Ideally, you should leave time to take a break before you review your first draft. Be prepared to rearrange or rewrite sections in the light of your review. Try to read the draft from the perspective of the reader. Is it easy to follow with a clear structure that makes sense? Are the points concisely but clearly explained and supported by relevant evidence? Writing on a word processor makes it easier to rewrite and rearrange sections or paragraphs in your first draft. If you write your first draft by hand, try writing each section on a separate piece of paper to make redrafting easier.

**Stage Seven: Presentation**

Once you are satisfied with the content and structure of your redrafted report, you can turn your attention to the presentation. Check that the wording of each chapter/section/subheading is clear and accurate. Check that you have adhered to the instructions in your report brief regarding format and presentation. Check for consistency in numbering of chapters, sections and appendices. Make sure that all your sources are acknowledged and correctly referenced. You will need to proof read your report for errors of spelling or grammar. If time allows, proof read more than once. Errors in presentation or expression create a poor impression and can make the report difficult to read.

**Feedback**

Any feedback from tutors on returned work can be used to create a checklist of key points to consider for your next report. Identify priority areas for attention and seek out further information and advice. Speak to your tutor or an adviser from the Learning Development. Used in this way, feedback from tutors can provide a useful tool for developing and improving your writing skills.

**5. Dissertations**

In the fourth year of your degree course, you will have to complete a dissertation, the result of which will have a considerable bearing on the class of degree you achieve. This final section will not go into great detail on dissertations, but will summarise each of the three main types in the field of science, which are:

* Lab-based project.
* Literature review.
* Enterprise project.

**Lab-based project**

If you choose to do a lab-based project, then you will spend a lot of your time in the lab performing experiments. You will have guidance from your supervisor and help from lab technicians and postgraduate students.

This is a large scientific report; it will be composed of the same sections detailed above, but, in this case, the introduction will be a literature review. For the literature review you will have to read books and journal articles about the research done in the same area you are investigating and write about the background of your subject area.

This is a good option if you wish to demonstrate your practical scientific knowledge and skills.

**Literature Project**

A literature project requires you to carry out extensive reading about your subject area, organise the knowledge and information you acquire and write about it in a series of chapters. You will use scientific books and articles in academic journals.

This is a good option if you wish to work in filed such as science communication when you graduate.

**Enterprise project**

Some universities offer enterprise projects to students who are interested in business and enterprise in science. These can be done in collaboration with a small group of students and a scientific company.

At the beginning of the academic year, you will have to attend an introductory course (possibly at another university) on these projects and have to do some group work with other students. You will then be allocated a group to work with and given a project. You will have to contribute to the work of the group and write a detailed enterprise dissertation, as specified by your department. You may be able to write up your project independently in addition to a group presentation. You will be supported by at least one supervisor at your university, one of whom who could be from the field of business studies.

**6. Useful links**

Have a look at the following university student learning service web pages for more information about academic writing:

[University of Edinburgh](http://www.ed.ac.uk/studying/undergraduate/student-life/academic/support)

[Edinburgh Napier University](http://www.napier.ac.uk/study-with-us/undergraduate/student-support)

[Heriot-Watt University](https://www.hw.ac.uk/is/skills-development/study-support.htm)

[Queen Margaret University](http://www.qmu.ac.uk/ELS/)

[University of Dundee](https://www.dundee.ac.uk/academic-skills/)

[Abertay University](https://www.abertay.ac.uk/student-life/support-and-services/learner-development/)

[University of St Andrews](https://www.st-andrews.ac.uk/students/advice/academic/)

[University of Stirling](https://www.stir.ac.uk/campus-life/learning-support/student-learning-services/)

1. <https://www2.le.ac.uk/offices/ld/resources/study-guides-pdfs/writing-skills-pdfs/writing-for-science-v1.0.pdf> [↑](#footnote-ref-1)
2. <https://www2.le.ac.uk/offices/ld/resources/writing/writing-resources/reports> [↑](#footnote-ref-2)
3. <https://www2.le.ac.uk/offices/ld/resources/writing/writing-resources/reports> [↑](#footnote-ref-3)