

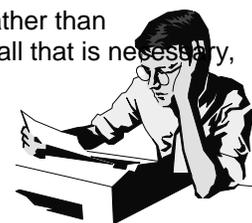
SCIENCE RESEARCH REPORT FORMAT

INTRODUCTION

Scientific research involves designing a study, collecting samples, measuring variables, analyzing data, and presenting the results in a formal report. The writing process makes the author think more deeply about the study. Accurate, clear, and concise writing is essential to effective communication among researchers, teachers, and students. A scientific report provides a writing experience different from a library term paper because it is based on your own data and personal involvement in the investigation.

BEFORE YOU BEGIN: HINTS ON SCIENTIFIC WRITING: The following general guidelines should be used:

1. **Wherever possible, use the first person** ("I" or "we") instead of awkward indirect statements ("this author..." "these researchers").
2. **Avoid long, involved sentences and overuse of polysyllabic words.** Long, run-on sentences often obscure your meaning. Check for excessive use of commas and conjunctions ("and," "but," "or"). These often connect clauses that can be more clearly separated into two or more sentences.
3. **Use the active voice instead of the passive voice.** For example, "I measured the water temperature" is preferable to "The water temperature was measured by the author," as it uses fewer words and is unambiguous (i.e., it is clear who measured the temperature). And "I measured 44 trees" is better than "44 trees were measured," because the latter statement does not tell us who performed the measurement.
4. **Avoid excessive use of nouns as adjectives.** "Temperature stratification" or "tree height" is acceptable, but the trend can be over-used: "morning lake water temperature profile record sheet format."
5. **Be positive in your writing.** Don't hide your findings in noncommittal statements. For example, "the data could possibly suggest" implies that the data actually may show nothing; simply say "the data show."
6. **Avoid noninformative abbreviations** such as "etc." and phrases such as "and so on" or "and the like."
7. **Keep specialized jargon to a minimum.** If (but only if) vernacular terminology is just as accurate, use it. Similarly, excessive use of Latin should be avoided. If acceptable common names exist for organisms, introduce them together with the Latin names, and thereafter use the former. Otherwise, identify the Latin names. Whenever Latin genus or species names are written, they are to be either italicized or underscored, higher taxonomic ranks-e.g., family, order, class, phylum-are not italicized or underlined.
8. **Keep technical abbreviations and acronyms to a minimum.** A statement like this may be difficult for the non-expert to comprehend: "The results of the ASTM procedure for BOD were correlated with measurements of DO and JTU and compared to EPA standards." *Define abbreviations and acronyms the first time they appear in the paper.*
9. **Avoid repeating facts and thoughts.** Decide in which portion of the report different statements are best placed, and do not repeat them elsewhere.
10. **Be concise and succinct.** Avoid verbosity in writing. For example, say "many species" rather than "a large number of species," and say "because" rather than "due to the fact that." Include all that is necessary, but don't pad the report with data irrelevant to the purpose or conclusions of the study.



WRITING THE REPORT

GENERAL PRESENTATION & FORMAT

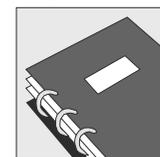
1. ALL reports *must* be typed or computer-generated and neatly printed with a clean ribbon.
2. ALL reports should have a neat, clean cover. Bindings should be 3-hole, not "slip-on" style.
3. The main report *must* be double-spaced but graphs and tables may be single-spaced for easier reading.
4. Mixing pen and typing within a report is unacceptable.
5. Page numbers should be centered at the **BOTTOM** of each page, beginning with "Introduction."
6. **BE CAREFUL** in following the format - make sure ALL sections are included, in order and properly labeled.

MAJOR SECTIONS OF THE REPORT, IN ORDER

I. **TITLE PAGE** (see handout, repeat format)

II. **ABSTRACT (ONLY ONE PAGE)**

- A. The abstract should give the reader an idea of what your report contains and gives them a picture of what will follow. A good introduction to the whole body of work. *Writing a clear, concise abstract is an art!*
- B. A BRIEF summary of your report, *including the nutshell of your results and conclusions*. This is *not* an ad to explain why you did your project!



- C. Make sure to include the dates and location of your project data collection.
- D. Write the abstract *last*, after all your results and analysis are finished. The abstract does *not* get a page number!

III. TABLE OF CONTENTS (see handout, repeat format)

IV. INTRODUCTION

- A. In the introduction of the paper, state the nature of the problem to be addressed, the objectives of the study, and any hypotheses to be tested. Also, give a brief background for the study, which would typically include a brief review of the literature. Relate the problem and its significance to the general discipline of study. This part of the paper presents the background, justification, and relevance of your study.
- B. *At least 4 different sources must be used, only one of which may be an encyclopedia.*
- C. All the information you learned from someone else needs to be "cited" in the Introduction - like writing footnotes. Citations are mandatory in a research report! (*see the handout: Citing Scientific References*)

V. MATERIALS AND METHODS: (third person, impersonal form - past tense)

Materials (*subheading*) - Describe EXACTLY what you used to do your research (binoculars, scope, boat, snorkeling gear, etc.) "Eyes," "pencils" are unnecessary.

Methods (*subheading*) - Procedures in research reports generally should be detailed enough for the reader to have an accurate idea of what was done in the study. Give a good enough description of materials, sampling dates, locations and methods used so that a reader could duplicate your investigation. Including a simple diagram or photographs of the setup, properly labeled. The details of standard and generally known procedures (such as how an item was weighed) should be kept to a minimum. In a field study, a general description of the study site is *required*, complete with site maps. If commercial computer software is used, cite its full name and indicate the version used. The type of statistics used to analyze your data should be included and cited.

VI. RESULTS

The results section is not just a data summarization or a collection of tables and figures; *it should contain an explanation and description of the data, including any qualitative observations you made during the study.* Tell the reader exactly what you found, what patterns, trends, or relationships were observed. Illustrations in the results section may consist of graphs, photographs, or diagrams that visually depict your results. See the **additional handout** for proper data table and graph formatting.

VII. DISCUSSION

In the results section of the paper, the results are summarized and described. In the discussion section, they should be interpreted, critically evaluated, and compared to other reports. Whereas the results section presents the "news," the discussion section contains the "editorial." In the discussion, examine the amount and possible sources of variability in your data, including experimental error. Examine your results for bias and evaluate its effect in data interpretation. Develop arguments for and against your hypotheses and interpretations. *Do not make generalized statements that are not based on your data, known facts, or reason.* Be sure to relate your findings to other studies and cite those studies. Draw positive conclusions from your study whenever possible.

VIII. Conclusion (third person, impersonal OR personal form - present tense)

The end of your paper should contain a brief summary of your basic findings, followed by a set of clear statements that you believe explain your results. Was your hypothesis valid or invalid?

Poor example: (no specific information is given to the reader)

The food habits of various amphibians were studied in detail by the authors. The data were analyzed statistically and the findings were discussed at length. Certain similarities and differences were found between the species studied and the habitats in which they were found. Conclusions about feeding habits, habitat relationships, and niches were made for these species.

Good example:

The stomach contents of the red eft, red-backed salamander, and dusky salamander living in the same area were identified. An analysis of the food eaten shows that the feeding habits of the red eft and the red-backed salamander were different. These two salamanders showed "niche segregation." These two salamanders ate similar food when living in different areas but fed on different food when the two species lived in the same area. Our hypothesis was valid.

IX. Literature Cited: (*the references you used and referred to in your paper*)

No comprehensive literature survey is required for a class research report; however, you may be expected to use some sources other than a textbook (such as technical journals and reference works). These sources should be cited in the body of your report. It is up to you to select the most useful references. All references given in your paper must appear in the *literature cited* section. See the **additional handout** for proper style.

X. Appendices (any additional pictures and/or material you wish to include)

- A. Make sure any appendices *are listed in the table of contents* (with page numbers).
- B. DON'T stuff this section unnecessarily - it will not win you points...



SOME COMMON PROBLEMS

1. **Use, evaluate, and interpret your data.** Failure to do so is the most common problem students have in report writing. Many will calculate their results and make figures and tables, thereafter leaving these data to sit idly in the paper without any explanation or elaboration.
2. **Do not ignore results** because they differ from textbook generalizations. Your data are not incorrect just because they do not agree with some general principle or a conclusion in another report.
3. **Use reference material only if pertinent to your data.** Often, much irrelevant information is brought into reports.
4. **Be careful about making small differences seem important.** Different values are not necessarily significantly different. If you have not used statistical testing, you should at least consider in your subjective evaluation the amount of variability in your data.
5. **Do not discard data because of variability and biases.** There are some errors in nearly all scientific data. If recognized and accounted for in interpretation of results, errors of reasonable size need not discredit your data.
6. **Round off final quantitative results to no more digits than can be reasonably justified.** What sense does it make to compare two numbers such as 17.289761 and 19.82946? Do the last several digits have any special meaning? Reporting 17.3 and 19.8 may suffice in your case.
7. **Label figures and tables properly and thoroughly and cite them in your text.** Too often figures and tables are inserted in a report without identifying their contents or explaining their purpose to the reader. And, surprisingly (and non-informatively), often the units of measurement are not clearly indicated.
8. **Number figures consecutively and in the sequence in which they appear in the text.** Do the same with tables. Place each figure or table after, and close to, the first place it is referred to in the text.
9. **Play around with your data before preparing the final figures and tables.** Work over the data to seek patterns and trends. Organize the data in various ways, as different presentations may elucidate patterns or trends. *But be careful not to force a preconceived conclusion on the data.*
10. **Do not select or reject data to make desired results apparent.** Any "fudging" of data is dishonest and unacceptable; it is considered scientific misconduct.
11. **Do not perform calculations on data just for the sake of calculating.** Have a reason for and draw conclusions from the calculations performed. *Padding your report with excessive though honest numbers serves no useful function.*
12. **Document ideas, conclusions, and hypotheses with data,** facts from the literature, and sound reasoning. Do not leave your ideas up in the air without support or they will fall with the instructor's or editor's red pencil.
13. **Tell the reader what you found.** Graphs, drawings, and tables can enhance this discussion but cannot substitute for it.
14. **Don't present data** in figures or tables **if this would simply duplicate what is in other figures or tables** or in the text.
15. **Relate your results and conclusions to accepted principles and concepts.** Explain any discrepancies.