



SCIENCE COLLEGE

Concordia University

SCOL 290, 391, 490

Requirements for the Reports for Students

This document is intended to be a guideline for the student. Students must meet with their supervisor before starting their research and establish how this document will apply to their research project.

The Science College curriculum requires three courses involving independent research: SCOL 290 (3 credits), SCOL 391 (6 credits), and SCOL 490 (6 credits). For SCOL 290, students are expected to spend a minimum of **120 hours** on this course. For SCOL 391, and SCOL 490 students are expected to spend a minimum of **240 hours** on each course. It is assumed that students will be given papers to read as part of their experience in these courses. The following are guidelines for the faculty directing these projects and the students taking the courses.

Deadlines

Check academic dates on your student hub for the appropriate term.

SCOL 290: Students must submit the final Research Report to their supervisor *by the last day of classes* at the end of the semester in which the student enrolled in the course. The student must submit via email the final Research Report and their Reflective Paper (and their supervisor must submit via email the grade evaluation) to the principal of the Science College *by the last day of exams*.

SCOL 391: Students must submit the final Research Report to their supervisor *by the last day of classes* at the end of the second semester in which the student first enrolled in the course. The student must submit via email the final Research Report and their Reflective Paper (and their supervisor must submit via email the grade evaluation) to the principal of the Science College *by the last day of exams*.

SCOL 490: Students must submit the final research report to their supervisor and to the principal of the Science College (via email) *by the last day of classes* at the end of the *second* semester from when the student first enrolled in the course. The supervisor must submit the grade evaluation via email to the principal of the Science College *by the last day of exams*.

Extensions: It is acknowledged that the nature of research is such that delays may occur outside the student's control. Students may request a one-semester extension to submit their papers. Requests must be made to the principal of the Science College in advance. When such an extension is granted, the deadline to submit is by the *last day of classes* of the next semester

The Nature of the Projects

SCOL 290 is intended to give students an introduction to the way a research group operates, as well as the factors that go into the design and execution of a research project. With this in mind, it should include the following:

The project should be chosen so as to give the student as much interaction as possible with the activities of the group. It may not be necessary that the research be completed, with a final well-defined goal, nor indeed need it be successful. What counts is that the student understands the long- term objectives and the part that their research will play.

For SCOL 391 and SCOL 490, projects should be designed with a clear end point in mind. We discourage projects that may drag on for more than two semesters.

There may be some temptation to use the students as unpaid technicians. It is essential that the student have some part of the research activities of the group that is identifiably theirs, and they should not be considered fair game for any odd jobs that need to be done.

N. B. Students must choose a project outside of the topic of their major for SCOL 290 and SCOL 391. This practice is in the spirit of the multidisciplinary objectives of Science College.

Reflective Papers

For SCOL 290 and SCOL 391, a Reflective Paper is required in addition to the Research Report. A Reflective Paper is not required for SCOL 490.

The Reflective Paper is a description of the student's learning experience in the lab. This paper of approximately **5 pages** should include aspects of techniques learned, and could include positive or negative aspects of the research process in that experience. This is an opportunity for the student to synthesize what they have learned from their research training and explain what they gained from the experience versus what their expectations were; particularly in regard to research outside their major.

The student is not graded on the Reflective Paper, but cannot receive credit for SCOL 290 nor SCOL 391 without submitting it to the principal of the College. Students do not need to submit the Reflective Paper to their research supervisor, only to the College principal.

Research Reports

SCOL 290

The research report relates to the research/experimentation experience. This portion (approximately **5 pages**) should follow introduction, method, results, and discussion plus references in the format of a discipline-specific key journal.

SCOL 391

The research report also mirrors the SCOL 290 research report, but should reflect the additional work associated with this elevated course. The typical report will be **10 pages** in length, and will follow a key journal in the discipline, including a brief introduction, method, data analysis, results, and discussion plus references. The SCOL 391 research report is considered like a small honours thesis.

SCOL 490

A SCOL 490 research report is expected to be the same quality and format as an honours thesis. Following the format of a key journal in the discipline, the paper of approximately **20 pages** will follow standard research format from abstract to discussion with references.

*Presentation of Research Findings

Each student is expected to present their research (either as a poster or a brief talk) either at the **Science College Research Day** in the fall or the **BOLD Science** conference in the spring, whichever one occurs next after paper submission.

*Students need to have the prior approval of their talk/poster by their research supervisor before presenting data. Data collected in any lab belongs to the lab P.I. (principal investigator, research supervisor). The P.I. should be involved in the preparation of a research poster or research talk and must approve it before it is presented.

Guidelines for Preparing a Research Report

N.B. These are guidelines only. They are to help the student structure their research reports. Students should follow the format of the research group in which they are conducting the research project. However, all papers must contain an Introduction, Method, Results, Discussion, and References. Students should learn to use a reference manager software (Concordia library offers training for one of these, [Zotero](#)).

See [here](#) for advice on science writing (e.g. the author's [thoughts on ChatGPT](#)). Also consult Concordia's [guidelines](#) on generative AI. Please also consult [workshop](#) by DataOne on data entry and management – these skills are increasingly in demand as data sharing and re-use are becoming more widely practiced.

Style, Format, and Content

The following are basic elements of formatting that typically apply to research manuscripts:

1. Specify standard letter size (8½ × 11 in, or 21½ × 28 cm) with all margins set to ¾ in, or 1.9 cm.
2. Number pages consecutively with Arabic numerals beginning with the first page of the introduction and proceeding through without omissions to the end of the last appendix. Pages prior to the first page of the introduction are numbered with lowercase Roman numerals. All page numbers appear within the document header at the right page margin. Suppress the page number for the title page.
3. The font size is 12 point and should use a standard, sans-serif font (e.g. the font of this document is 12- point Ariel). Use standard character spacing, that is, do not apply condensed spacing or use a condensed font.
4. Use continuous double spacing throughout the main body of the text of the report, which includes the abstract, introduction, method, results, and discussion. Do not insert extra space between paragraphs. That is, use double line spacing both within and between paragraphs.
5. The text must be left aligned (i.e.,) so that the right hand edge of each paragraph is uneven. Use a single space after each period, question mark, comma, colon, or semi- colon.

Title Page

Center the title within the same left-right margins used for the rest of the document; also center the whole page within the top-bottom margins. Use title case, and do not set the title in boldface. Also do not include a running head on the title page. Include your research supervisor's name and lab location. **See the example at the end of this document.**

Abstract

Use "Abstract" as the heading, and do not set this heading in boldface. Center your name below the heading, and then center the project title below your name, all with continuous

double spacing between lines. The text of the abstract should not exceed 150 words. Include an explicit statement of the purpose of the research, a concise description of the subjects and procedure, and a statement of the major findings and their interpretation. An abstract that mentions the results only in passing at the end with the empty phrase, "The findings and implications of this study are discussed," and gives no further detail is incomplete. The Abstract is often written last and is a good exercise in practicing summarizing your project.

Acknowledgments

You must acknowledge your supervisor's contribution, other technical assistance or help in recruiting or supplying participants or subjects, and any granting agency (e.g., NSERC, CIHR) that supported the costs of your research. You also may acknowledge any other person whom you feel contributed to your research project. Put your name and the month and year at the end of the acknowledgements as you would see it in the preface to a book.

Introduction

Your supervisor will have suggested papers to read as a background. They are commonly cited in your introduction. The main purpose of your introduction is to convince the reader that your experiment is important research. You need to logically justify your predictions (i.e., hypotheses) by explaining the theoretical basis for them. Remember that any idea that is not your own should have a reference citation following it. Also, never cite a source that you have not actually read yourself. No-one is impressed by long reference lists. Focus on a few key papers and read them in depth to make sure you understand their work.

Your predictions should be logically derived from past theories and research. Therefore, you should summarize previous research and make your main research question clear. Although it is important that some relevant experiments be reviewed in detail, make sure that your introduction does not simply read like a sequence of short summaries. It is vital that the links between the past research you have reviewed, and your hypotheses are straightforward and logical. When describing past research, be sure to address any important theoretical controversies in the literature. You might also comment on the strengths and weaknesses of the past research. At the end of the introduction, you should explicitly state your hypotheses.

Method

Subsections needed in the methods section depend on the study. Some possibilities with instructions for subsection content are considered next, but the goal for the whole method section is to give instructions for someone to replicate each and every aspect of the study.

Participants/Subjects. Characteristics of the participants in human studies or subjects in animal studies must be described in full detail in this section. Specifically, do not wait until the results section to describe participants or subjects as their characteristics are not generally considered part of study results. Also needed is a statement about how the study was conducted in accordance with ethical and/or environmental standards.

Apparatus. This subsection is needed for studies in which special equipment is used to control experimental conditions or record data, among other possibilities essential for carrying out the study. Give enough information about a physical apparatus, such as the brand and model number for a device purchased from a commercial supplier, to permit replication. If an apparatus is bespoke (custom-made), then consider including an illustration, drawing, photograph, or whatever is necessary to allow replication.

Procedure. Give details about how each step of the investigation was carried out. These details should include information about specific experimental manipulations, randomization, replication, controls and all features of the experimental design.

Data Analysis. This subsection typically describes and justifies the statistical analysis used to evaluate the data. Data analysis will be progressively more sophisticated in the later courses. There is no need to describe general characteristics of standard statistical techniques. If there is something special about the application of these techniques that readers must know in order to understand the results, however, then provide those details. More and more, programming with languages such as Python or R are used for data analysis.

Results

Besides reporting about the substantive analyses, the results section of every report should address other issues. Interpretation of the results should not go beyond what the sample warrants.

Data Integrity. A complete research report offers reassurance to readers that the results are trustworthy. Specifically, this means that any special complication, protocol violation, or other unexpected problem in data collection must be mentioned. A frequent complication is missing data due to participant dropout, failure of some participants to complete questionnaire items, or equipment failure, among other possibilities. Clearly inform readers about both the extent of missing data and how this problem was dealt with in the analysis. Also describe evidence that statistical assumptions, such as normality, were met and also about any corrective steps taken, such as transformations or deletion of extreme scores (i.e., outliers). In

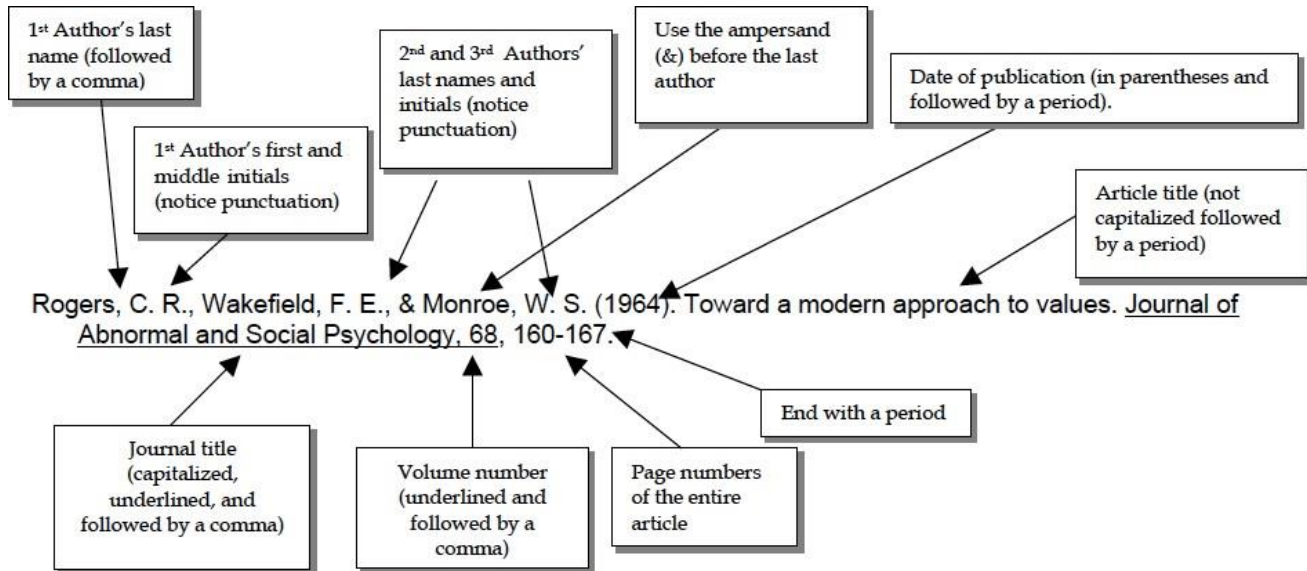
regression analyses, describe the distributional characteristics of the residuals, which should be uniform across the whole range of the criterion (homoscedastic) and approximately normally in shape.

Discussion

The discussion section should accomplish 3 major goals: (1) Close the circle of the report that began in the introduction. This statement means to interpret the results in relation to previous work in the area. If necessary, attempt to explain inconsistencies among the results of the report and those of previous studies. Just as in the results section, use cautious, careful language that sticks close to the data when interpreting the findings. (2) Outline possible limitations to the generalizability, credibility, or robustness of the results. Common limitations include the nature of the sample (e.g., relatively small, unrepresentative), an unforeseen confound, and missing data, among other possibilities. The good scientific writer openly acknowledges possible shortcomings and tries to explain how they may have affected the results. (3) Do not conclude the discussion section with a variation on the typically banal, clichéd call for future research on the topic.

References

Some scientific societies (e.g. American Psychological Association; APA) and every scientific journal has their own rules about how to cite a reference. **You should follow the style used by the field of your supervisor.** Here is but one example:



Sample title page:

“The title of your paper goes about here”

Your Name
Your Student ID#

A research report submitted in fulfillment of the requirements for SCOL 290 /391/ or 490

Conducted in the lab of

Research Supervisor's Name
Supervisor's Lab location, e.g. Dept. Chemistry, Concordia University

Date
Concordia University

**Science College
Supervisor's Research Project Evaluation Form**

Student Name:
Supervisor Name:
Department:
Project type: 290 / 391 / 490
Term registered:

Please give a letter grade that reflects your overall evaluation of the student's work relative to others at the same level. When completed, return the form to admin.scol@concordia.ca and principal.scol@concordia.ca

I Lab work

Was the student motivated, reliable, conscientious? Please comment on the student's aptitude for research.

/50

II Report

Is the report clear, demonstrating good understanding of the project? Please comment on the student's analytical thinking and science writing skills.

/50

Total: /100 Letter grade: