LAB REPORT WRITING WORKSHOP

University of Rochester,
ECE 111 LAB

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COLLEGE WRITING PROGRAM
1.1 The Functions of the Lab Report

• To shed light on previously unexplained phenomena
• To prove or disprove others' work on a subject
• To improve on the efficiency or precision of others' work
• To show others how to duplicate your work for verifying results
• To ponder the meaning of your results within the context of others' work
### 1.2 Structure of the Lab Report

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abstract</strong></td>
<td>An abbreviated form of the most important parts of the report. Usually the abstract addresses: purpose of the experiment, given facts and data, assumptions, measured data, and results or conclusions. Details are not included.</td>
</tr>
<tr>
<td><strong>Objective, Purpose, or Introduction</strong></td>
<td>Discusses what the experiment hoped to accomplish. Typical aims include: (1) To shed light on previously unexplained phenomena, (2) To prove or disprove others' work on a subject, (3) To improve on the efficiency or precision of others' work, (4) To show others how to duplicate your work for verifying results, (5) To ponder the meaning of your results within the context of others' work.</td>
</tr>
<tr>
<td><strong>Equipment and Apparatus</strong></td>
<td>A list of Apparatus used in the experiments is frequently included in student laboratory reports. However, descriptions are usually not included. Common lab equipment, like stopwatches and scales, are typically excluded from the list.</td>
</tr>
<tr>
<td><strong>Sample Calculations</strong></td>
<td>Calculations clearly present the equations used with the data. Each section is labeled for easy identification. Results are underlined and indicated with an arrow drawn from the right margin. Explanations are not included in these calculations since the steps are self-explanatory. References are included for uncommon equations.</td>
</tr>
<tr>
<td><strong>Laboratory Procedure</strong></td>
<td>This section discusses the operation that is performed rather than listing the steps for performing the operation.</td>
</tr>
<tr>
<td><strong>Data and Calculations</strong></td>
<td>Data often includes sketches to identify the symbols that are used. The tables include column headings with units. The data is presented in the same sequence that it was collected and each section is clearly identified. An original data sheet may be included in the Appendix.</td>
</tr>
<tr>
<td><strong>Discussion of Results</strong></td>
<td>The discussion often begins with a brief summary of the results. All results are clearly identified. The discussion then compares the results from the different methods of determination. It also discusses the possible causes of irregularities with the anticipated results.</td>
</tr>
<tr>
<td><strong>Conclusions</strong></td>
<td>This section discusses the results with respect to the objectives stated at the beginning of the report. Sometimes, suggestions for further study or improvements may be suggested.</td>
</tr>
<tr>
<td><strong>References</strong></td>
<td>Lists sources of material for further research by the reader. The citations are alphanumeric and may include page numbers after the name of the publisher.</td>
</tr>
</tbody>
</table>
Readers will often read non-linearly

1. Read the abstract, scan the references
2. Read the introduction and conclusion
3. Scan tables and/or figures
4. Read the discussion, methods and results last

Separable, specialized sections are essential!
Remember:

• Few people will closely read the entire lab report, but many will read the abstract.
Objective/Purpose

- statement about the importance or purpose of the study
- (perhaps brief comment on previous work in the field)
- the hypothesis
- benefits of the study should also be described
Establishing Your Niche

Enter into the conversation!!!

What’s been written before about your topic? With what do you agree/disagree?

What’s new about your own research and what does it add to the conversation?
2. LAB OBJECTIVE

PURPOSE
BREAK IT DOWN!
2.1 Lab Objective Outline

**Move 1**  
Establishing a Territory  
- Step 1: Claiming Centrality and/or  
- Step 2: Making Topic Generalization(s) and/or  
- Step 3: Reviewing Items of Previous Research

**Move 2**  
Establishing a Niche  
- Step 1A: Counter-claiming  
- Step 1B: Indicating a Gap  
- Step 1C: Question-raising  
- Step 1D: Continuing a Tradition

**Move 3**  
Occupying the Niche  
- Step 1A: Outlining Purposes and/or  
- Step 1B: Announcing Present Research  
- Step 2: Announcing Principal Findings
2.2 Task #2

Read the following introduction to a chemical engineering lab report. Try to label the three moves and then the various steps within each move. Remember not all steps may be used!
Task #2 - Answers

MOVE 1  1-7
STEP 1   1-2
STEP 2   3
STEP 3   4-7

MOVE 2  8-12
STEP 1B  8-12

MOVE 3 13-14
STEP 1B  13-14
3. RESULTS AND DATA COMMENTARIES
3.1 RESULTS AND DISCUSSION

- Provide sufficient background
- Introduce the table and locate it for the reader.
- Highlight the key results.
- Explain the significance and/or implications of those key results.
Look over Table 5, read the data commentary that follows, and then answer the questions.
1. Where does the data commentary actually start?
2. What are the purposes of sentences 1 and 2?
3. Which sentence contains the author’s key point?
4. The author has chosen to comment only on e-mail attachments. Why? Do you think this is enough? If not, what else should be discussed?
5. E-mail attachments constitute 87% of the total. In sentence 4, this is expressed as “nearly 9 out of 10.” What do you think about this and about the following alternatives?
   - about 90%
   - just under 90%
   - as much as 87% of all
   - nearly all
Structure of Data Commentary

Location + indicative summary  - Linking as-clause + highlight

(3) Table 5, above, shows the most common sources of infection for U.S. businesses. (4) As can be seen from the first row, in a great majority of cases, the entry point of the virus infection can be detected, with e-mail attachments being responsible for nearly 9 out of 10 viruses. (5) This very high percentage is increasingly alarming, especially since with a certain amount of caution such infections are largely preventable. (6) In consequence, e-mail users should be wary of all attachments, even those from trusted colleagues or known senders. (7) In addition, all computers used for e-mail need to have a current version of a good antivirus program whose virus definitions are updated regularly. (8) While it may be possible to lessen the likelihood of downloading an infected file, businesses are still vulnerable to computer virus problems because of human error and the threat of new, quickly spreading viruses that cannot be identified by antivirus software.

• Implications
# 3.3 Location Elements and Summaries

<table>
<thead>
<tr>
<th>Location Element</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Table 5 shows the points of entry of computer viruses for U.S. businesses.</td>
<td></td>
</tr>
<tr>
<td>b. Table 2 provides details of the fertilizer used.</td>
<td></td>
</tr>
<tr>
<td>c. Figure 2 plots the two series for the last five years.</td>
<td></td>
</tr>
<tr>
<td>d. Figure 4.2 gives the results of the second experiment.</td>
<td></td>
</tr>
</tbody>
</table>
The passive voice can also be used.

**Summary**

a. The most common modes of computer infection for U.S. businesses are shown in Table 5.

b. The details of the fertilizer used are provided in Table 2.

c. The two series for the last five years are plotted in Figure 2.

d. The results of the second experiment are given in Figure 4.2.
3.4 Data Commentary Task

Diagrams 6 and 7 provide some data related to electrical engineering. Individually, consider what data you might highlight and what your discussion will contain. Then, write one data commentary and compare with the other members of your group. Don’t forget to include a short background then a location + indicative summary at the beginning.
Write your own!

\[ I_R1 = I_3 - I_1 = 136.092 \, mA - 93.793 \, mA = 42.299 \, mA \]
\[ I_R2 = I_1 = 93.793 \, mA \]
\[ I_R3 = I_1 - I_2 = 93.793 \, mA - 77.241 \, mA = 16.552 \, mA \]
\[ I_R4 = I_3 - I_2 = 136.092 \, mA - 77.241 \, mA = 58.851 \, mA \]
\[ I_R5 = I_2 = 77.241 \, mA \]
Write your own!

\[ E_{R1} = I_{R1}R_1 = (42.299 \text{ mA})(150 \Omega) = 6.3448 \text{ V} \]
\[ E_{R2} = I_{R2}R_2 = (93.793 \text{ mA})(50 \Omega) = 4.6897 \text{ V} \]
\[ E_{R3} = I_{R3}R_3 = (16.552 \text{ mA})(100 \Omega) = 1.6552 \text{ V} \]
\[ E_{R4} = I_{R4}R_4 = (58.851 \text{ mA})(300 \Omega) = 17.6552 \text{ V} \]
\[ E_{R5} = I_{R5}R_5 = (77.241 \text{ mA})(250 \Omega) = 19.3103 \text{ V} \]
A. Background Information

This is a somewhat free-standing move that can occur at any point in the cycle. As its name implies, this move is employed by authors when they wish to strengthen their conclusion by recapitulating main points, by highlighting theoretical information, or by reminding the reader of technical information.
B. Restatement of Results

If there is a quasi-obligatory move in Discussion section, it is this one. Likewise, KEY results often at the start of the conclusion. Evidence suggests, as we might expect, that it is the starting point of a cycle - and is only likely to be preceded by brief background. Readers typically expect that the strongest results will be dealt with in the first paragraph and weaker results in later paragraphs.
C. (Un)expected Outcome

Here the writer comments on whether the result is unexpected or not.
D. Reference to Previous Research

After background and results, probably the most common move. There are two main sub-types or steps: reference for purposes of comparison with present research and references for purposes of providing support for present research.
This move is particularly common when the writer suggests reasons for the surprising result, or one at odds with those reported in the literature.
F. Exemplification

Examples are most often used to support an explanation (Hopkins and Dudley-Evans, 1988).
This move is used to make a claim (however qualified) about the generalizability of some or all of the reported results.
H. Recommendations

The writer advocates the need for further research or makes suggestions about possible lines of future investigation.
Task #4

Read the following Conclusion section of an ECE lab report and attempt to label each movement and its corresponding purpose. Pay close attention to the language used, and think of two changes that you would make to improve the writing of this section.
(1) In general, the experimental results agree reasonably well with the simulation predictions. (2) The gain of the hardware implementation was 0.5 dB higher than the predicted value of 46 dB. (3) This 0.5 dB deviation corresponds to a 6% error in the value of vout/vin. (4) The error could be caused by mis-matches between transistors Q1 and Q2 (changing the bias current), or by an imperfect SPICE model for transistor Q3. (5) The error is larger than would be expected from measurement error for the test equipment used. (6) While the lower 3-dB frequency of the implementation agreed closely with the simulation result, the upper cutoff frequency of 1.2 MHz was significantly larger than the value predicted by the simulation. (7) The upper cutoff frequency is determined by the parasitic capacitance of transistor Q3. (8) Apparently the values incorporated in SPICE model were larger than those of the device that was used in the implementation. (9) Since the amplifier input impedance Rin depends upon the $\beta$ of Q3, it is not surprising that the simulated and measured results differ from each other. (10) Both results (at 1 kHz) satisfy the prediction of (7), and are reasonable for the transistors used. (11) Some care should be taken in interpreting Figure 7 at other frequencies. (12) Simulation results show that the impedance is resistive only for frequencies in the range $300 \, \text{Hz} \leq f \leq 3 \, \text{kHz}$. (13) At frequencies below or above this band, the amplifier input impedance is primarily capacitive. (14) At high frequencies in particular, the impedance magnitude is much smaller than that predicted by (7).
(15) The design and implementation of a 46 dB, 1.2 MHz bandwidth amplifier has been presented. (16) Hardware tests verified the performance of the amplifier. (17) While the amplifier performed largely as predicted, some care is needed in interfacing to the amplifier. (18) The amplifier bandwidth is seen to be sensitive to small capacitive loads at the output (e.g., 13 pF scope probe). (19) Also, the amplifier input impedance varies over several orders of magnitude. (20) The measured 1.2 MHz bandwidth was achieved only after buffering the output signal and creating a low-impedance input source.

Questions:

• Do you think some of the first paragraph should actually appear in the Discussion section? Which sentences and why?
• Look at the average length of the sentences. Are they too long, too short, or just right?
• What two suggestions can you offer to improve this Conclusion?
4.3 Strength of Claim

Unsound policies of the International Monetary Fund (IMF) _____________ the financial crisis.

- _____________ a. contributed to
- _____________ b. caused
- _____________ c. may have contributed to
- _____________ d. were probably a major cause
- _____________ e. were one of the causes of
- _____________ f. might have been a small factor in
According to our results, impulsive buying is on the rise. Further, our survey data suggest that buying goods to improve one’s self-image is probably a motivation that plays some role in most buying behavior, but it might be particularly important when people make unplanned, or “spur of the moment” purchases. These unplanned purchases may well be regretted later and can lead to financial difficulty (Dittmar and Drury, 2000).
Currently, satellite launches cost approximately $10,000 for each pound lifted into space. However, this may soon change as a result of microelectrochemical systems (MEMS) devices, which could greatly reduce the size, weight, power requirements, complexity, and, eventually, the costs of space systems. For example, because of MEMS miniaturization it may be possible to construct a 1kg satellite that is highly resistant to radiation and vibration and therefore more reliable than a traditional satellite. Preliminary tests of MEMS subjected to accelerations over 20,000 times gravitational acceleration have shown promising results (Cass, 2001).
4.3.2 Qualifiers

A. Probability

Sleeping 7-9 hours each day *will* result in better academic performance.

Sleeping 7-9 hours each day *may* result in better academic performance.

Sleeping 7-9 hours each day *might/could* result in better academic performance.
Stronger

It is certain that ...
It is almost certain that ...
It very probable/highly likely that ...
It is probable/likely that ...
It is possible that ...
It is unlikely that ...
It is very/highly unlikely that ...

Weaker
Stronger

There is a **definite** possibility that ...
There is a **strong** possibility that ...
There is a **good** possibility that ...
There is a **slight** possibility that ...
There is **little** possibility that ...

Weaker
Strong claim

The factory *has benefited from* the recent technology upgrade.
The factory *seems to have benefited from* the recent technology upgrade.
The factory *appears to have benefited from* the recent technology upgrade.
*It seems that* the factory has benefited from the recent technology upgrade.
*It has been said that* the factory *seems to have benefited from* the recent technology upgrade.

Weak claim
C. Generalization

Children living in poverty have a history of health problems.

Children living in poverty *tend to* have a history of health problems.

*Many* children living in poverty have a history of health problems.

*A majority of* children living in poverty have a history of health problems.

*In most parts of the world* children living in poverty have a history of health problems.
Finally, claims can be reduced in strength by choosing a weaker verb. In the sentences below underline the verb making the *weaker* claim.
1. The results *indicate* / *establish* that there is a link between smoking and lung cancer.

2. Table 9 *suggests* / *shows* that the number of articles written and published by nonnative speakers will continue to increase.

3. The latest series of studies *question* / *challenge* the conclusions of much previous research.

4. The results given in Figure 4 *validate* / *support* the second hypothesis.

5. The quantities displayed in the table have been *assumed* / *shown to* be about 98% accurate.

6. The test results *create* / *suggest* a basis for product modification.

7. Changes in ambient temperature may have *influenced* / *distorted* the test results.

8. In their earlier work, they failed / *neglected* to take ambient temperature into account.

9. As shown in Table 3, the new tax laws have *encouraged* / *stimulated* industrial investment.

10. Figure 12 *depicts* / *clarifies* the relationship between these two systems.
5. LANGUAGE FOCUS: CONCISENESS
5.1 Avoiding Poetry

These beautiful bonds enable us to increase the concentrations of certain chemicals from their raw solutions.

These bonds increase the concentrations of certain chemicals from their raw solutions.

The results of the experiment demonstrated the soundness of his theory.

The results validate his theory.

The bad condition of the reactor is such that extensive repairs are required.

The reactor required extensive repairs.

The reason the missile was not launched was due to the fact that mice had eaten the cables.

The missile was not launched because mice had eaten the cables.

Since the amplifier input impedance Rin depends upon the $\beta$ of Q3, it is not surprising that the simulated and measured results differ from each other.
5.2 Stringy Sentences

STRINGY SENTENCE
Many students attend classes all morning, and then they work all afternoon, and they also have to study at night, so they are usually exhausted by the weekend.

CORRECTED
Many students attend classes all morning and work all afternoon. Since they also have to study at night, they are usually exhausted by the weekend.
6. Summary

1. Break it Down! Analyze Writings within the Genre; What is the function of each sentence?
2. Locate the Lab Objective within the Larger Issue
3. Data Commentary includes background, location of data, highlight, and interpretation
4. Conclusion relates KEY data to objective and offers some explanation or suggestions for improvement
5. Be concise!
Resources


Undergraduate writing tutors with walk-in hours:

**Mon – Thurs:** 7pm - 11pm

**Sunday:** 2pm - 10pm

in **Sue B** Gates 166 (next to Friel Lounge).

Graduate writing tutors who offer appointments **Mon-Fri**
in **Dewey Hall 4-219**.

To schedule an appointment:

http://writing.rochester.edu
Virtual Tutoring: Consult online with a UR tutor about your current writing projects via G-Chat.

SUN-THURS: 9-11pm

Send an email to URtutoring@gmail.com to START YOUR NEXT NEW WRITING ADVENTURE.
THANK YOU