

# Research Methods – Creating your Materials and Methods Section

Due April 15<sup>th</sup>

In the Materials and Methods section you explain clearly how you conducted your study in order to:

*(1) Enable readers to evaluate the work performed and (2) permit others to replicate your study.*

You must describe exactly what you did: what and how experiments were run, what, how much, how often, where, when, and why equipment and materials were used. The main consideration is to ensure that enough detail is provided to verify your findings and to enable the replication of the study.

You should maintain a balance between brevity (you cannot describe every technical issue) and completeness (you need to give adequate detail so that readers know what happened). This should be the easiest section to write.

Since each “journal” has different requirements, review the journal’s guidelines before beginning to write this section. The steps listed here are a general compilation of these requirements.

1. Order your procedures chronologically or by type of procedure and then chronologically within type of procedure using sub-headings, where appropriate, to clarify what you did. It is up to you to decide what order of presentation will make the most sense to your reader.
2. Use the past tense and the third person to describe what you did.  
For example: “The sample was incubated at 37°C for 3 days.” - NOT: “I incubate the sample at 37°C for 3 days.”
3. Describe your experimental design clearly, including the hypotheses you tested, variables measured, how many replicates you had, controls, treatments, etc.
4. Explain why each procedure was done. Reference may be made to a published paper as an alternative to describing a lengthy procedure.
5. Identify the source of any specific type of equipment, a specific enzyme, organism, or a culture from a particular supplier, which is critical to the success of the experiment.
6. Describe in detail any modifications to equipment or equipment constructed specifically for the study and, if pertinent, provide illustrations of the modifications.
7. Precisely quantify measurements (all metric) and include errors of measurement.

8. Describe the dates and the site where your field study was conducted including physical and biological characteristics of the site, if pertinent to the study's objectives.
9. Identify treatments using the variable or treatment name, rather than an ambiguous, generic name or number (e.g., use "healthy donors" rather than "group 1").
10. If required by the journal, mention the approval for the study by the relevant ethics committee(s) and the informed consent of the subjects.
11. Describe statistical tests and the comparisons made; ordinary statistical methods should be used without comment; advanced or unusual methods may require a literature citation.
12. Show your Materials and Methods section to a colleague and ask whether they would have difficulty in repeating your study

**Other points to consider when writing**

**the Materials and Methods:**

1. Don't mix results with procedures.
2. Omit all explanatory information and background - save it for the discussion.
3. Don't include information that is irrelevant to the reader, such as what color ice bucket you used, or which individual logged in the data.



Name \_\_\_\_\_

## Procedural Writing Checklist

The procedural writing provides the reader with instructions or directions for doing something. A 'How To' document is procedural writing.

Examples of procedural writing include:

- ~ recipes
- ~ experiments
- ~ directions to locations
- ~ how to documentation (how to build a snowman, play soccer, use a specific website, make a sand castle etc.)
- ~ provide instructions
- ~ give rules for board games, sports, home, school etc.
- ~ how to do something
- ~ how to make or play something
- ~ explains how to do something
- ~ gives step by step procedures to make something

Procedural Writing Needs To:

1. Clearly state a goal or objective.
2. Provide an overview or list of materials or resources needed.
3. Address any safety procedures that need to be followed.
4. Include all the steps for the procedure.
5. State instruction that are completely sequential in a step by step fashion, leaving nothing out. Use words like, first, next, then, finally....
6. The reader needs to be able to follow the procedural writing fully without having to make any assumptions.

**Methods & Materials Rubric:** In this section of a scientific report, you must explain how you TESTED your hypothesis. It should clearly demonstrate why this is a *valid* and *rigorous* procedure to see if you can potentially falsify your hypothesis. This section should also allow other scientists to use your methods in their own research.

	5 points	4 points	2 points	0 points	score
DESCRIBE YOUR EXPERIMENT	Includes all factors that may affect the experimental results, including independent variables, dependent variables, and control variables.	Includes most factors that may affect the results of the experiment.	Includes some factors that may affect the results of the experiment.	Lacks explanation of factors that affect results.	
PROCEDURES	All special details & steps are stated	All steps are stated	4. steps are listed	No steps are listed	
MATERIALS	All materials and equipment stated	All materials stated	Some materials listed	Incorrect or no materials listed	
DESCRIBE CONTROL GROUP	The control variable – kept the same in both groups - is identified, & described.	Control variable is identified but not fully described.	A control variable is identified.	Control variable is not identified or described.	
DESCRIBE EXPERIMENTAL GROUP	IDs the experimental group – the one composed of the independent variable	IDs experimental group, but does not fully explain the independent variable	ID experimental group, but incorrectly explains the independent variable	Lack of info on independent variable.	
DEMONSTRATE REPETITION	Fully describes & justifies either multiple trials or multiple experimental setups.	Does not fully describe & justify repetition.	Incorrectly describes repetition.	No account of repetition.	
DESCRIBE RELEVANT DATA TO BE COLLECTED	Fully describes & justifies data to be collected in the context of testing the hypothesis.	Describes data but does not fully justify.	Briefly describes data.	Does not explain data.	
DATA ANALYSIS	Fully describes & justifies how data will be analyzed to test Ho.	Partly describes & justifies how data will be analyzed.	Poorly describes & justifies how data will be analyzed.	No discussion of data analysis.	
VALIDITY OF METHOD FOR TESTING THE HYPOTHESIS	Clearly explains how this test will enable you to accept or reject your hypothesis.	Partly explains how this test will enable you to accept or reject your hypothesis	Illogically explains how this test will enable you to accept or reject your hypothesis	Does not explain how test leads you to accept or reject your hypothesis	
WRITING	Clearly written using correct grammar	Some ambiguity and some grammatical errors.	Poorly written and poor grammar.	Not intelligible.	
				TOTAL OUT OF 50:	