

Checklist for designing and executing an experiment

1. Preliminaries

- Read background material and decide on a subject area to investigate.
- Formulate a simple hypothesis to test.
It is preferable to have a clear answer to one question than to be uncertain about several questions
- Decide which dependent variable you are going to measure and how?
Is it relevant to the problem? Can you measure it accurately, precisely and without bias?
- Think about and plan the statistical analysis of your results.
Will this affect your design?

2. Designing

- Find out the limitations on your resources.
- Choose treatments which alter the minimum of confounding variables.
- Incorporate as many effective controls as possible.
- Keep the number of replicates as high as is feasible.
- Ensure that the same number of replicates is present in each treatment with random allocation to individual treatments.

3. Planning

- List all the materials you will need.
Order any chemicals and make up solutions; grow, collect or prepare the experimental material you require; check equipment is available.
- Organize space and/or time in which to do the experiment.
- Account for the time taken to apply treatments and record results.
Make out a timesheet if things will be hectic.

4. Carrying out the experiment

- Record the results and make careful notes of everything you do.
Make additional observations to those planned if interesting things happen.
- Repeat experiment if time and resources allow.
Many scientists recommend that all experiments are carried out three times in total.

5. Analyzing

- Graph data as soon as possible (during the experiment if you can). This will allow you to visualize what has happened and make adjustments to the design (e.g. timing of measurements).
- Carry out any planned statistical analysis.
- Jot down conclusions and new hypotheses arising from the experiment.

Experimental Design

Define the problem

Controlling the variables

Independent variable:

Dependent variable:

Constant variables (those being controlled to be the same through all experiments):

Devising procedure

Appropriate procedure (Step by Step)

Appropriate use of apparatus and materials (Think about the suitability of volume & accuracy)

Measures to ensure reliability of results (Procedures should be executed the same way between sets)

Measures to record and process data obtained

Considerations for safety