

STA2005S – EXPERIMENTAL DESIGN PROJECT – 2024

In pairs you should conduct an experiment from beginning to end, think of a good experiment, something you would like to investigate, design the experiment, analyse the data and write a short report. You have to decide on what you wish to do. Some examples of simple experiments are given below and also a checklist of considerations for completing the task.

Please note that your experimental units should not be human beings or animals since we do not want to have to worry about ethics approval.

A few points that you should consider:

- It must be a proper experiment, not an observational study.
- It should be feasible with respect to costs and time.
- Carefully choose the response variable, so that it is not unlikely that it will be normal, or easily transformed to a normal. For example, small counts and yes and no responses lead to Poisson and Binomial response, respectively, and will just cause you trouble here.

The due date for this assignment is **16 September 2024 at 12 noon**. 10 full % (5 marks) will be subtracted for every day, or part thereof, late.

A checklist for PLANNING experiments (from Dean and Voss, Design and Analysis of Experiments):

1. Define the objectives
2. Identify all sources of variation, including
 - (a) treatment factors and their levels
 - (b) experimental units
 - (c) blocking factors
3. Choose a rule for assigning the experimental units to the treatments.
4. Specify the measurements to be made, the experimental procedure, and the anticipated difficulties.
5. Run a pilot experiment. This is a mini-experiment based on only a few observations to test the experimental procedures, the feasibility of the design and can generate information needed for sample size calculations (which you will not have to do).
6. Specify the model.
7. Outline the analysis.
8. Calculate the number of observations needed. You will not have learnt how to do this, so skip this step.
9. Review above decisions and revise where necessary.

Some examples of simple experiments (don't use these, think of your own), from Dean and Voss, *Design and Analysis of Experiments*:

1. Does the boiling point of water differ with different concentrations of salt?
2. Compare breaking strengths of different brands of paper towels?
3. Do different makes of popcorn give different proportions of unpopped kernels?
4. Do different coloured candles burn at different speeds?

Some Guidelines for Experimental Design Project

Break-down of marks

Objectives and Originality	5
Experiment and Design	10
Randomization procedure	4
Pilot study	4
Data collection	5
Analysis and presentation of results	6
Conclusions and Interpretation	6
Overall impression and clarity	10
Total	50

Some more guidelines

1. Limit tables, computer output and graphs to what is truly informative.
2. The report must be typeset.
3. There is no need to put everything that you can find into an appendix. If you want to attach an appendix, limit this to what is really needed to understand your report.
4. Give the original data somewhere, either in the report or in the appendix.
5. Also give the original randomisation used.
6. Do not put computer output directly into the report, edit all tables, leaving in only the information necessary.
7. Graphs with poor resolution make a bad impression. (For MSWord, in R save graphs as .emf files).
8. Every graph should have a short caption which explains just enough to understand it without having to read in the main text. So should tables.
9. As a guideline, I would estimate that 10 pages should be (more than) enough space for the report, including appendices.