Project Guide

Introduction

Often, the most interesting part of a project is the student's motivation in choosing a particular project. The student may have extensive background knowledge or other personal reasons for a project choice. Do not be afraid to discuss this in detail in your introduction. I would prefer a less formal approach for this section, since you are not typically presenting technical material. The informality of the introduction, actually, sets the tone for the entire paper. Presenting the introductory material (and hence the entire paper) in first person, for instance, is acceptable.

Responses, Factors and the Design

Finding a suitable response can often be the hardest part in selecting a suitable topic for experimentation. You may have found an interesting measuring device for your response or you may have uncovered a simpler-to-measure surrogate quality characteristic. If you are particularly pleased with the way you have chosen to measure your response, be sure to discuss it.

Once a response is chosen, the factors and factor levels often fall into place. You should still devote discussion on what guided your choices, however, particularly for factor levels. This would also be a good time to discuss any hypotheses or predictions you may have on factor effects.

The choice of the design should be guided by practical considerations–don't run a fractional factorial experiment with blocking on day, for instance, if the experiment can be easily carried out in one day. I will not be grading you on the difficulty of your design; I am more interested in how well you follow principles of randomization, blocking and factorial design.

It would be ideal if a pilot study could be conducted to help decide whether or not replication is necessary. Given time constraints, though, a pilot study often is not practical. I do not need justification for a specific number of replicates, but I would like a justification for the presence or absence of replication.

Experiment

Discuss any difficulties you had in carrying out your design. It often turns out to be impossible to carry out the experiment as originally envisioned. If things do not work out, do not worry about it or try to cover it up–it is all part of the experimental process. If any changes in the design had to be made, please discuss them and their implications for experimental outcomes and analysis. Be sure to document your process with photos and figures. Most students do this intuitively now, but visualizations really help the reader to understand the process, and it does serve as confirmation of the experiment.

Analysis

By now, you are familiar with what constitutes an analysis of a factorial design–cube plots (and other data displays), probability plots and other forms of testing and interaction plots. If results are different from what you anticipated, please discuss any discrepancies. What would you do for a follow-up analysis–would some factors be studied in more detail and others discarded? Would more replicates be necessary?

Most importantly, discuss the implications of your experimental results. Do not simply point out that an effect is significant, but discuss the effect within your experimental context. What did you learn and how does it affect you and your behavior?

Presentation

I will typically point out patterns in mechanical problems (spelling, grammar, etc.) only if they seriously interfere with the presentation of your material. I also do not like to modify a student's "voice" too much–I may prefer to phrase something differently, but such decisions are more often personal than preferable. Do try to avoid stylistic problems–I am not a big fan of the passive voice and I know it can be hard to come up with transition elements, but make the attempt nonetheless. I would also like tables and graphs kept to a minimum–do not include output unless you refer to it in the text. It would be great if figures and tables were embedded in the text, but I know that is not always possible.