Simulation Projects

Research

Many people will try to give you a formula for how to do 'good' research. A number of different things contribute to a 'good' research project:

Does it add to knowledge?

Were your experiments conducted correctly?

Did it produce significant results?

What do those results mean?

Research Reports

A research report should consist of at least the following:

- **What** you did
- **How** you did it

(and most importantly)

- **Why** you did it

Research Reports

The way that research is written up isn't necessarily the way that you arrived at the project and the way you did the research.

Research Reports

- Title
- Abstract
- Introduction
- Method
- Results
- Discussion
- Conclusions
- Bibliography

Introduction

Present the background to your research project and the topic your project addresses.

Often includes a review of previous work.

Should link into the existing literature or body of pre-existing knowledge.

Poses the question or issue that your project addresses.

Method

Describe how you approached the problem and conducted your experiments.

Should provide enough detail so that another scientist could reproduce your work.

Can assume some level of knowledge, give details unless it is widely assumed all your audience will understand.

Results

Be as quantitative as possible.

Highlight the details that you are using to justify your conclusions.

Data is often presented as tables, figures, plots, charts. May include analysis such as fitted lines/ curves.

Results

Important to include error bars or some other appropriate indication of error. Results that don't include uncertainty are severely limited.

Explain each exhibit – tell the user what they should see in the data. Remember that just because you are an expert on your experiments and what they show doesn't mean that all of your readers are.

Discussion

A chance to discuss your results, methods, approach etc. An opportunity to highlight unexpected findings, unusual results, possible weaknesses in your approach etc.

This can sometimes be combined together with the Conclusions.

Conclusions

Probably the most important section in the report. Draw together your project and lay out the actual outcomes, findings, conclusions from your work.

Should answer the questions laid out from the Introduction.

Negative conclusions are just as important as positive ones.

Future Work

This section is often attached to the end of the Conclusions section. An opportunity to describe to another scientist where you think the research should go next.

A useful way to put down in writing the ideas you've had for what to do next. Useful for other scientists wanting to take the project further.

Bibliography

Set of citations to the literature. Provide the reader with enough information to identify the article/book etc

These citations are the sources that your work builds upon. Important to show what previous work you've based your research on and points the way for any readers who wish to research the topic in more depth.

Appendices

Appendices can contain details that don't really belong in the main document.

For example – extra data, proofs, extra description of some sub-topic, source code, algorithms etc..

Style

Scientific work is written in this structured way to make it easy for other scientists to:

Follow or reproduce your work

Refer to and cite it easily

Read and understand it quickly

This method of writing is just as useful for commercial or industrial projects.

Style

This method of writing is just as useful for commercial or industrial projects. After a project has been completed, a report can explain:

What you did

How you did it

Why you did it that way

May write different parts of the report for different audiences – technical vs clients etc.

Writing Style

Write in a clear and concise way.

Avoid complex language and unnecessary jargon.

Takes some time to decide what level of knowledge to assume from your readers. Think about what you would want to know if you were starting the project from scratch.

Writing Style

In science, content is far more important than style. Nevertheless if your project was worth doing, it's worth taking the time to write it up clearly.

If your readers can't follow your writing, you might as well have not written the report.

159.732 Project

Assignment 4 is to:

- Conduct a small research project.
- Write up a report on your project.
- Give a short presentation to the rest of the class.