Guidelines for Preparing Research Report
Organization of the Research Report

Organization follows scientific reasoning. That is:

- the problem is defined
- a hypothesis is postulated
- experiments are devised to test the hypothesis
- experiments are conducted
- conclusions are drawn
Organization of the Research Report

- Common organizational scheme
  - Title
  - Abstract
  - Introduction – Problem Statement
  - Objectives
  - Theoretical Analysis and/or Experimental Design
  - Results - Discussion
  - Conclusions and Summary
  - Acknowledgements
  - References
Title and Title Page

- Reflect content and emphasis of project
- Succinct - Omit needless words
- Include essential key words
Abstract

- Briefly describe topic, scope, principal findings, and conclusions.
- Length may vary, but seldom exceeds 200 - 300 words.
Introduction

- Clear statement of the problem: Why is it important?
- Background information, previous work, objectives of the current project (with references)
- Relationship between the current project and the scope and limitations of earlier work
Theoretical Analysis and/or Experimental Design

- What was actually done
- Methodology: procedures, techniques, special precautions, instrumentation
- Sufficient detail on methods so that others can replicate the study
- Sufficient detail on theory or derivations so that calculations can be checked
Results

- Present data, observations,
- Make use of tables, charts, figures to present results clearly and concisely
- DO NOT include interpretations – “Just the facts, M’am.”
The crux of the report: What do the results mean? Do they resolve the problem?
- Statistical or theoretical analysis
- Limitations of the data or problems with the methodology
- Reflection on original hypotheses
Conclusions and Summary

- Succinct statement of principal conclusions
  - May use bulleted format
  - May include directions for future work
- NOTE: This and the abstract may be the only sections read!
Acknowledgements

Express thanks for
- Financial support
- Laboratory or field assistants who contribute significant knowledge/skills
- Manuscript reviewers
- Others who contribute ideas or provide substantive discussion
References

- Follow style of a key journal in the field
- When in doubt, cite
- Check all references – avoid secondary referencing
Preparing the Manuscript

- Proofread carefully; use spelling and grammar checks
- Crosscheck references
- Proofread again
- Seek reviews by mentors or colleagues
- Proofread again
Guidelines for Preparing Posters
Guidelines for Preparing Posters

- Increasingly popular presentation form at conferences

- Advantages
  - Gives audience time to study details of interest
  - Permits informal or extended exchange between author and audience
  - Provides feedback to author
Poster Space

- Varies widely at different venues - check meeting guidelines well in advance
- For REU Symposium
  - Single board, 4 feet high, 6 feet long; therefore your poster must not exceed 4’ x 6’
  - Tacks provided for mounting
  - Table space
Preparing the Poster

- Use eye-catching and attractive design
- Keep it simple
- Avoid clutter; make logical sequence obvious to audience
- Minimize amount of data and text presented
- Make everything bold and large
- Simplify concepts for those who do not hear your explanation
The Title

- Attractive, succinct, provocative
- Legible from 5 m -- bold, block letters at least 5 cm high
The Text

- Concise, legible, easily comprehended - minimum 16 point font
- Include:
  - Abstract
  - Brief introduction
    - problem statement
    - Aims of study
  - Results with minimal discussion
    - May present as figure captions
  - Conclusions
Figures and Photographs

- The larger the better
- Minimize the number: keep it simple
- High quality figures
  - Good color contrast
  - Bold, legible from 2 m
  - Clear labels, legible against background
- Clear sequencing
The Poster Session

- Stand by your posters during assigned time for discussion and questions
- In some cases, you may be invited to give oral overview
  - use as invitation to audience
  - present as abstract
    - State problem, methods, principal conclusions
Type of Poster (Banner or Cards)

- **Banner** -
  - Simplest to mount
  - Harder to transport
  - See example on last slide
  - For a PowerPoint version, browse:
    - [http://WaterREU.colostate.edu/PosterExampleHDs.ppt](http://WaterREU.colostate.edu/PosterExampleHDs.ppt)

- **“Cards” that fit in an oversized envelope**
  - More time, materials required for mounting
  - Easy to transport in briefcase
  - Readily accommodates “guides”, such as strings to connect related objects
Additional ideas

- Provide extra information
  - Hang envelopes from poster board for reprints, business cards, etc.

- Some venues permit electronics
  - Show videos or computer simulations
  - Make added information available on computer
The Evolution of Landscapes and Hillslopes
Jorge A. Ramirez, David Raff and Rahul Rajagopal
Research Experience for Undergraduates – Program in Water Research at Colorado State University

We present the mathematical and numerical development of a new hillslope hydrology model as well as sample applications. The new model involves a coupling of:
- Overland flow
- Structured grid
- Finite difference method
- Sediment detachment and transport
- Infiltration

The model is capable of capturing the interaction between overland flow, erosion and infiltration at very small scales and of modeling the evolution of hillslopes caused by spatially variable inputs due to small-scale variability of the hydraulic and soil properties. We also present simulations with respect to energy expenditure during hillslope evolution.

Finally, we show applications of the scaled-up model to describe watershe's response at basin scales.
Oral Presentations
Oral Communication is different from written communication

- Audience has one chance to hear you
  - Be brief and clear
  - If possible, permit questions during talk

- Two popular adages
  - Keep it simple
    - Restrict content to 1 - 3 main points
  - Repeat key insights
    - tell them what you're going to tell them (Forecast)
    - tell them (Explain)
    - tell them what you told them (Summarize).
Think about your audience

- Most audiences should be addressed in layers:
  - some are experts in your sub-area
  - some are experts in the general area
  - some know little or nothing
- Who is most important to you?
  - Why is the talk being given? For which audience?
- Can you still leave others with something?
  - Pitch to experts
  - Simplify introduction and conclusions
Consider rhetorical goals

- Two principal goals
  - leave your audience with a clear understanding of your contribution
  - make them want to read your paper.

- How?
  - Be sure importance of problem is clear
  - Be sure main conclusions are obvious
  - Present well - that suggests your paper will be equally well prepared
Presentation tips

- Must distill work to 15 - 20 minutes
- Slides must be simple, legible
  - Minimize the number of points per slide
  - Minimize text
    - Don’t write paragraphs
    - Don’t read slides
- Know your talk - practice!
A Generic Conference

Talk Outline

- Average 1-2 minutes per slide (excluding titles)
- Use about a dozen slides for a 15 minute talk
- Use two screens only if necessary
May include acknowledgements on separate slide
Forecast (1 slide)

- State problem and principal conclusion(s)
- This is the "abstract" of the talk
Outline (1 slide)

- Present talk structure
- Be brief - broad topics only
Background

- **Problem Statement (1 – 2 slides)**
  - Why should anyone care?
  - Don’t overestimate how much the audience knows about your problem

- **Related Work (0 – 1 slide)**
  - Cover superficially or omit
  - Refer to your paper or key citations

- **Methods (1 slide)**
  - Be brief; refer to your or key citations
Results (4-6 slides)

- Present key results and key insights
- Do not superficially cover all results; cover key result well
- Do not just present numbers; interpret them
- Do not show large tables of numbers
List bulleted conclusions
Future Work (0-1 slides)

- If appropriate,
  - State needed follow-up work
  - State new problems opened by your work
  - State your on-going or near future work
Backup Slides (0-3 slides)

- Optional: prepare slides for expected question
  - ideas glossed over
  - shortcomings of methods or results
  - future work
How to give a bad talk

- Ten Commandments
  - (With annotations from David A. Patterson Computer Science Division University of California-Berkeley)
I. Thou shall not be neat

- Why waste research time preparing slides? Ignore spelling, grammar and legibility. Who cares what 50 people think?
II. Thou shall not waste space

- Transparencies are expensive. If you can save five slides in each of four talks per year, you save $7.00/year!
Do you want to continue the stereotype that engineers can't write? Always use complete sentences, never just key words. If possible, use whole paragraphs and read every word.
IV. Thou shall cover thy naked slides

- You need the suspense! Overlays are too flashy.
V. Thou shall not write large

- Be humble -- use a small font. Important people sit in front. Who cares about the riff-raff?
VI. Thou shall not use color

- Flagrant use of color indicates careless research. It's also unfair to emphasize some words over others.
VII. Thou shall not illustrate

Confucius says “A picture = 10K words,” but Dijkstra says “Pictures are for weak minds.” Who are you going to believe? Wisdom from the ages or the person who first counted goto's?
VIII. Thou shall not make eye contact

- You should avert eyes to show respect. Blocking screen can also add mystery.
IX. Thou shall not skip slides in a long talk

- You prepared the slides; people came for your whole talk; so just talk faster. Skip your summary and conclusions if necessary.
X. Thou shall not practice

- Why waste research time practicing a talk? It could take several hours out of your two years of research. How can you appear spontaneous if you practice? If you do practice, argue with any suggestions you get and make sure your talk is longer than the time you have to present it. Commandment X is most important. Even if you break the other nine, this one can save you.
What next?

- Submit abstract on line (July 26)
- Submit final report on line (July 27)
- Submit poster on line (July 27)
- Mount poster (before 10 am, July 28)
- Complete post-experience questionnaire
Closing Symposium

- Opens 9 a.m., Student Lounge, Engineering Building
- Mount poster before 10 a.m.
- Prepare 3 - 5 minute oral presentation of poster
- Learn from your peers and mentors
- Enjoy refreshments
This presentation was developed based on on-line content prepared by Mark D. Hill Computer Sciences Department University of Wisconsin-Madison.

Kanare, Howard M. *Writing the Laboratory Notebook*; American Chemical Society: Washington, DC, 1985.

- This book describes among other things the reasons for note keeping, organizing and writing the notebook with examples, and provides photographs from laboratory notebooks of famous scientists.
- A excellent and well-written book, directed toward the student in engineering or the sciences. A web site also is available with on-line examples of various writing formats (http://www.me.vt.edu/writing/).


Acknowledgement. This document is based on guidelines provided by the American Chemical Society (Washington, D.C. 20036).

[1] This document is taken from a document created by Professor Stephen L. Morgan, Department of Chemistry & Biochemistry, The University of South Carolina, Columbia, SC 29208
http://www.chem.sc.edu/faculty/morgan/reports.html
Other Talks

Other talks should be prepared using the same principles of considering audience and rhetorical purpose. A presentation on a project in a graduate class, for example, seeks to reach the professor first and fellow students second. Its purpose is to get a good grade by impressing people that a quality project was done. Thus, methods should be described in much more detail than for a conference talk.
Academic Interview Talks

- The rhetorical goal for any interview talk is very different than a conference talk. The goal of a conference talk is to get people interested in your paper and your work. The goal of an interview talk is to get a job, for which interest in your work is one part.

- There are two key audiences for an academic interview talk, and you have to reach both.
  - One is the people in your sub-area, whom you must impress with the depth of your contribution.
  - The other is the rest of the department, whom you must get to understand your problem, why it is important, and a hand-wave at what you did.

- Both audiences will evaluate how well you speak as an approximation of how well you can teach.
An algorithm

- Take a 20-minute conference talk.
- Expand the 5 minute introduction to 20 minutes to drive home the problem, why it's important, and the gist of what you've done.
- Do the rest of the conference talk, minus the summary and future work.
- Add 10 minutes of deeper stuff from your thesis (to show your depth). It is okay lose people outside of your sub-area (as long as you get them back in the next bullet).
- Do the summary and future work from the conference talk in a manner accessible to all.
- Add 10 ten minutes to survey all the other stuff you have done (to show your breadth).
- Save 5 minutes for questions (to show that you are organized).