Writing it Up

STAT8801
Statistical Consulting

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April 26, 2010

Introduction

> The job's not finished until the paperwork is done.

You will need to write instructions, reports, and papers.
They need to be

- Well written.
- Comprehensive.
- Properly targeted.

Instructions

> Never underestimate the power of ignorance and stupidity.

You may provide instructions for experiments, data collection, analysis, etc.
These must be clear to the person who will follow them.

- Target your audience.
- Be complete. (Anticipate problems.)
- Be as concise as possible.
- Pilot test if possible.
- Program documentation.

Be careful. . .

Suppose you are providing a protocol for a baking experiment, with time, recipe, and temperature factors. Temperature is difficult to change, particularly slow to bring down.

1. Design?
2. Writing instructions for design protocol?
3. What can go wrong?

Sample instructions for performing tea-tasting experiment

Objective: To test whether an experienced tea taster can determine whether milk was added to cup before or after tea. In addition to the taster, the experiment will require one person to give her the tea and record her judgments, and one or preferably two more to prepare the test cups.

Materials:
- One ten-cup ceramic tea pot,
- One tea kettle with enough capacity to boil 12 cups of water,
- One unopened packet of Earl Grey loose leaf breakfast tea,
- One unopened container of fresh full-cream milk,
- One dry-measure teaspoon,
- One wet-measure teaspoon,
- Eight identical teacups,
- One tea strainer,
- One indelible marker,
- One roll adhesive tape.
- A large drinking glass full of cold water.

Procedure:
1. Number the cups 1 to 8 with an indelible marker. Place a piece of tape 1" long from the top of each cup downward, to mark a common fill level.
2. Open the tea and milk containers.
3. Using the dry-measure teaspoon, measure 12 teaspoons of tea into the tea pot.
4. Using the wet-measure teaspoon, put two teaspoons of milk into cups 1, 2, 4 and 7.
5. Fill the tea kettle with water and boil it.
6. Fill the tea pot to the top with boiling water.
7. Swirl the pot three times, and let it stand for two minutes.
8. Fill the 8 cups in order, filling them up to the bottom of the tape mark. Use the tea strainer to stop loose tea leaves falling in the cup. Remove the tapes.
9. Using the wet-measure teaspoon, add two teaspoons of milk to cups 3, 5, 6 and 8, and an additional two teaspoons of strained tea to cups 1, 2, 4 and 7.
10. Using the wet-measure teaspoon, stir each cup, taking the teaspoon through three full rotations at one rotation per second.
11. Present the cups to the taster in the order 7, 4, 1, 5, 6, 2, 3, 8. Allow her to use the glass of water to clear her palate between cups if she so chooses.
12. As she tastes each cup, record her judgment of whether milk or tea was poured first.

Precautions
- It is important not to give any cues to the taster. Thus the tea must be poured out of her sight, and that of the person presenting the tea for tasting and recording the result. Tell the taster that she will taste 8 cups, some with milk first and some with tea, but do not say how many of each there will be.
- As tea continues to brew in the pot, steps 8-10 must be carried out as quickly as possible.
- The taste also changes after pouring as the tea cools, so steps 11 and 12 should be done as quickly as the taster is comfortable with.
- You should perform one or two dry runs with a colleague playing the part of the taster so as to get the procedures running smoothly.

- Progress reports.
- Final reports.
- Reports to technical staff.
- Reports to marketing.
- Reports to management.
- Reports are not technical papers.
- Reports are not historical narratives.

Report Structure

However you structure a report, you at least have to do the following:

- Know your audience.
- Set the stage of what you're talking about.
- Describe the analysis.
- Show its relevance.
- State any assumptions.
- Give references.

Rigid Article Format in Sone Fields

1. Abstract
2. Introduction
3. Materials and Methods
4. Results
5. Conclusions and discussion
6. End matter: References, appendices

Internet is changing how writing is done; some journals allow/expect Web supplements.

Statistics journals are more relaxed.

Report/article Structure according to D. Hawkins

1. Front Matter: Title page, abstract
2. Background/Introduction/literature review.
3. Detailed results.
4. References.
5. Technical appendix.

Title Page

Use a title page. Give

- Project title.
- Authors.
- Date.
- Necessary identifiers, like copyright, report number, funder, sponsor, circulation notices, and the like.

Use an interesting title — "Project Final Report" is pretty useless.

> Date everything!

Abstract/Executive Summary/Main results

First section of report or scientific paper.
Should tell everything important.

- Short, to the point.
- Easy to read, little technical detail.
- Fully self-contained.
- Cover every major conclusion.
- Specifically state these conclusions.

Unless you are writing a play, poem or fiction, don't make readers wait for the punch line.

Background/Introduction

Sets the stage for the report:

- What is the problem?
- Why is it important?
- What is the context?

In a scientific paper, include a literature review.

Results

Report the actual findings.

Use an intermediate level of detail.

Go point by point through hypotheses, conclusions, etc. and how results are interpreted.

Include only minimum pertinent output, tables, graphics in this section.

Do not just dump output here (or in the appendix).

Literate Programming

The term literate programming was invented by Donald Knuth, who has also the author/inventor of TeX, among other things.
The basic idea is that

- Programs are useless without descriptions.
- Descriptions should be literate, not comments in code or typical reference manuals.
- The code in the descriptions should work. Thus it is necessary to extract the real working code from the literary description.

See `http://www.stat.umn.edu/~charlie/Sweave`

Conclusion

In a scientific paper, not usually a consulting report.

Evaluative discussion of what the work achieved and did not achieve.

Does not just duplicate the abstract.

Usually not technical.

References

Critical for a paper; may be useful for a report.

Only include those cited in report.

Use proper bibliographic style.

Omit section if no references.

Appendix

The appendix get details and archival material, e.g.

- Dense mathematics.
- Computer code.
- Computer output/tables/graphics.
- Data.

Don't just dump here.

Organize and annotate; don't make reader search.

Index

- Long documents need an index. A poor index can ruin a good book.

- LaTeX & Word indexing tools: Think about the index as you write

Style

Many styles of scientific writing.

Styles change over time and vary by discipline.

See, for example, Gopen and Swan (1990) reprinted in
www.amstat.org/publications/jcgs/sci.pdf

Always write to your audience.

We'll hit some of the highlights.

Beware of emulating the quirks of others!

Basics

- Spell correctly (keep a dictionary handy).
- Punctuate correctly.
- Sentences must make sense.
- Break material into sections.
- Organize ideas into paragraphs.
- Your unique style and copying the style of others.

Spell checkers

I've got this spelling checker;
It came with my PC.
It clearly marx for my revue
Miss steaks I dew not sea.
I've run this hole poem threw it
I'm sure your please too no
Its letter perfect in it's weigh
My checker tolled me sew.

Some details

- Use descriptive section headings.
- Use formatting (bullets, fonts, etc.) to indicate structure.
- Vary sentence length.
- Avoid one-sentence paragraphs.
- Vary words, use synonyms (take care with scientific terms).
- Avoid dull, everyday words.

Chatfield's Style Guidelines

1. Use simple, clear English.

2. Use a reference to get the right word.

3. Check spelling.

4. Use enough punctuation (commas, usually) to make each sentence clear.

5. Use underlining, bolding, or capitals on important words.

Chatfield On Writing

Just Start writing!
Try writing first draft as if talking to a friend; polish it later.

It's easier to revise a draft than write the first draft.

It may be easier to begin with middle sections.

Revise, revise again. Let someone else read it, then revise again. Set it aside for a couple of days, then reread and revise again.

Is the structure right? Is the writing clear and smooth? Repetitions? Omissions? Tables and graphs comprehensible? Can it be shortened? Double check numbers.

Evolving Style

17th century writing often was solicitous of the sponsors. (See John Graunt.)
19th century writing was more breathless with surprize.

> *I was performing the Kjeldahl test on the mashed plant leaves when I saw to my astonishment that ..."*

John Graunt (1662)

The Epistle Dedicatory.
TO THE
RIGHT HONOURABLE JOHN Lord ROBERTS,
Baron of Truro, Lord Privie-Seal,
and one of His Majestie's most Honourable Privie Council.

My Lord,
As the favours I have received from your Lordship oblige me to present you with some token of my gratitude: so the especial Honour I have for your Lordship hath made me sollicitous in the choice of the Present. For, if I could have given your Lordship any choice Excerptions out of the Greek, or Latine Learning, I should (according to our English Proverb) thereby but carry Coals to Newsastle, and but give your lordship Puddle-water, who, by your own eminent Knowledge in those learned Languages, can drink out of the very Fountains your self.

Contemporary Style

- No surprises. Work back from conclusion to make a logical trail from the start to the stop, even if you didn't know where you were going to end up when you started.
- Co-authors/committees
- No people involved, use passive voice:

    Next, the Kjeldahl test was performed on the mashed plant leaves.

- Never use "I", invent fake collaborators for first person:

    We ran the Kjeldahl procedure on the leaf homogenate.

Journal Articles

1. Write your paper.

2. Pick your journal. Follow their instructions for preparing a manuscript. Journal may also influence style of writing.

3. Submit paper. Editor to AE to referees, back to AE, then back to Editor. Reports, comments, and recommendations at every step.

Journal Articles

4. Standard decisions:
   - Unconditional acceptance (very rare).
   - Conditional acceptance.
   - Conditional rejection (initial fate of almost all articles eventually published in statistics journals).
   - Unconditional rejection.

5. Top journals reject 80–90% of papers submitted. Many of those are rejected before they ever go to referees.

Journal Articles

Authors almost never know who the referees are.

Some journals now do double blind refereeing.

OK, your article was rejected; now what do you do?

Revise it and submit it to another journal.

Journal Articles

Congratulations, your article received Conditional accept or conditional reject; now what do you do?

Revise and resubmit. Often there are two revision rounds after the initial submission. Each round takes a few months.

The revision must deal with every point the referees make. Either follow the suggestion or provide a good reason why you didn't.

Along with the revision, you send a letter with detailed responses, listing every referee comment and your action.

PhD Dissertations

A statistics dissertation usually has two papers in it. Could be more or fewer.

Your first task as a new PhD in an academic position is to publish papers from your dissertation.

Then move on to other areas/ideas.

Summary

- Write to your audience
- Organize correctly
- Write clearly and correctly
- Use an engaging style
- Publish or perish