

Technical Writing: Experience Sharing

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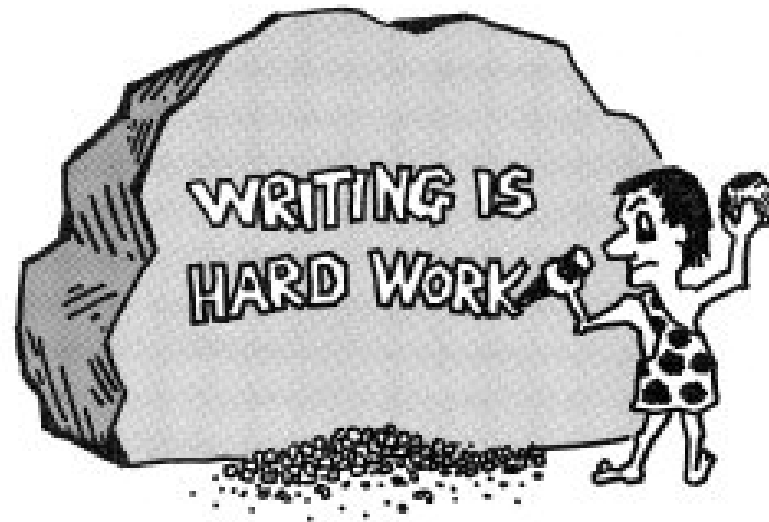
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Technical Communication

- Technical presentation
- Technical writing
 - Scientific paper
 - Patent
 - Research proposal
 - User manual

Huh?



How to Get Paper Rejected

- **Easy!**
 - Have a bad presentation, despite fine work

Culture Boundaries

- Writing styles vary among different research communities
 - EDA
 - System synthesis, logic synthesis, physical design, verification, testing
 - IC
 - Analog, digital
- Common principles
 - Precise, concise, rigor, comprehensible

My Learning Path to Technical Writing

- First technical writing for undergrad project report
 - Suffered from language problems
 - Imitated others' writings
 - Luckily got rejected in first submission
 - Finally got paper accepted to elsewhere
- Lessons learned
 - Publication process
 - Importance of technical writing
 - Significance of research

My Learning Path to Technical Writing (cont'd)

- **Second technical writing for MS project**
 - Luckily participated in tutored technical writing study group
 - Still needed substantial revision from advisor
 - Published a paper
- **Experience**
 - TOEFL helps
 - Especially grammar
 - Technical writing courses are extremely beneficial

My Learning Path to Technical Writing (cont'd)

- **Third technical writing during military service**
 - Applied technical writing advices and TOEFL grammar rules
 - Published a paper with my own writing
- **Experience**
 - Knew some of my potential limitations
 - Research tastes changed and attracted to theoretical work

My Learning Path to Technical Writing (cont'd)

- Further technical writings during grad study in the US
 - Got closer to mathematical writing
- Experience
 - Learned rigorous writing style common in formal verification community
 - Knew several good writers' styles

My Learning Path to Technical Writing (cont'd)

- **Keep polishing my writing technique**

What Benefits Me Always

Swales, J. M. and Freak, C. B. 1994.
*Academic Writing for Graduate Students,
A Course for Nonnative Speakers of
English*, University of Michigan Press.

- Below we review some elements of this book

Unit 1: An Approach to Academic Writing

- Audience
- Purpose and strategy
- Organization
- Style
- Flow
- Presentation

Audience

- Understand audience's expectations and prior knowledge
 1. The subject of thermal systems is a very broad field involving many separate fields of engineering
 2. The subject of thermal systems is an interdisciplinary field which involves the traditional disciplines of thermodynamics, heat transfer, fluid mechanics, mass transfer, and chemical kinetics

Purpose and Strategy

- Demonstrate (audience knows more than writer) vs. teach (audience knows less than writer)
 1. A consonant is a speech sound produced by either closing or constricting the vocal tract
 2. A speech sound produced by either closing or constricting the vocal tract is called a consonant

Organization

- Regular, predictable patterns
- E.g.
 1. situation description
 2. problem identification
 3. solution description
 4. solution evaluation

Style

- Consistent and proper
- Formal vs. informal
 - Verbs
 - Single verb better than verb + preposition
 1. Informal: Researchers *looked at* the way strain *builds up* around a fault.
 2. Formal: Researchers *observed* the way strain *accumulates* around a fault.
 - Nouns and others
 - Pick formal and precise one to use

Style (cont'd)

- Formal vs. informal (cont'd)
 - Grammar
 - Avoid contractions
 - “won’t” → “will not”
 - Use more appropriate formal negative forms
 - “not ... any” → “no”; “not ... much” → “little”; “not ... many” → “few”
 - Limit the use of “run on” expressions, such as “and so forth” and “etc.”
 1. ... can be used in robots, CD players, etc.
 2. ... can be used in robots, CD players, and other electronic devices
 - Avoid addressing the reader as “you”
 - Limit the use of direct questions
 - Place adverbs within the verb
 - “Then the solution can be discarded.” → “The solution can then be discarded.”
 - “The blood is withdrawn slowly.” → “The blood is slowly withdrawn.”
 - ... are now published ...
 - ... have recently been produced ...
 - ... will be somewhat underrepresented ...

Flow

- Moving from one statement in a text to the next
- Establishing a clear connection of ideas helps readers follow the text

Flow (cont'd)

1. Lasers have found widespread application in medicine. Lasers play an important role in the treatment of eye disease and the prevention of blindness. The eye is ideally suited for laser surgery. Most of the eye tissue is transparent. The frequency and focus of the laser beam can be adjusted according to the absorption of the tissue ...
2. Lasers have found widespread application in medicine. **For example**, they play an important role in the treatment of eye disease and the prevention of blindness. The eye is ideally suited for laser surgery **because** most of the eye tissue is transparent. **Because of this transparency**, the frequency and focus of the laser beam can be adjusted according to the absorption of the tissue ...

Flow (cont'd)

- Linking words and phrases

	Subordinators	Sentence connectors	Phrase linkers
Addition		furthermore, in addition, moreover	in addition to
Adversative	although, even though, despite the fact that	however, nevertheless	despite, in spite of
Cause and effect	because, since	therefore, as a result, consequently, hence, thus	because of, due to, as a result of
Clarification		in other words, that is, i.e.	
Contrast	while, whereas	in contrast, however, on the other hand, conversely	unlike
Illustration		for example, for instance	
Intensification		on the contrary, as a matter of fact, in fact	

Flow (cont'd)

- Punctuation
 - Comma “,”
 - Semicolon “;”
 - Period“.”
- *This/these* + summary word
 - In recent years, the number of students applying to Ph.D. programs has increased steadily, while the number of places available has remained constant. *This situation* has resulted in intense competition for admission.

Presentation

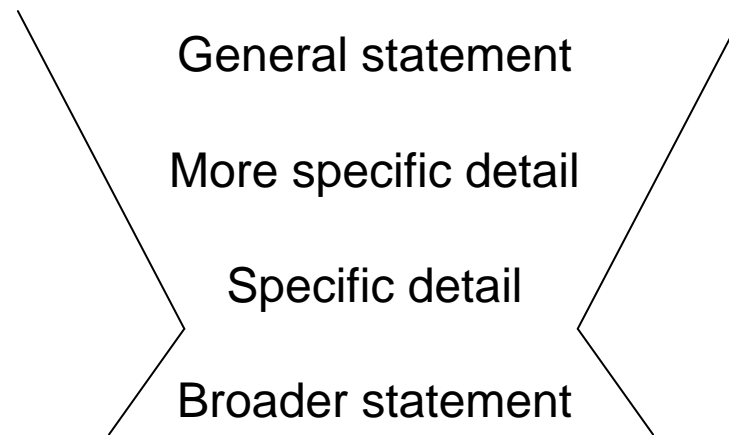
- Consider the overall format
- Check for misspelled words
 - Use computer spell-check routine
 - Check for incorrect homophone (e.g. too/to/two)
- Proofread for careless grammar mistakes
 - Check for mistakes in article or preposition usage
 - Check for common misuse
 - “in the following” or “as follows”
 - “equal” or “be equal to”

Recap

- Audience
- Purpose and strategy
- Organization
- Style
- Flow
- Presentation

Unit 2: Writing General-Specific Texts

- Move from broad statements to narrower ones, and widen out again in the final sentence
- General-to-specific movement is useful in writing introductions or producing data commentaries



General-specific movement

- Introduction
- Abstract vs. conclusions

Unit 3: Problem, Process, and Solution

- Problem-to-solution movement is useful in writing introductions or critiques
 - General-specific:
descriptive and expository
 - Problem-solution:
argumentative and evaluative

Structure of Problem-Solution Text

- Situation
- Problem
- Solution
- Evaluation

Formulating Questions

- Indirect questions (standard word order)
 - Direct: What time is it?
 - Indirect: He asked what time it is/was.

Verbs and Agents in Process Descriptions

- Passive voice often plays an important role in process descriptions (especially for human agents)

- E.g.

Consider the following notes:

specimen – analyzed in the lab

results – recorded

report form – completed and sent to physician

Turn the notes into instructions:

Analyze the specimen.

Record the results.

Complete a report form and send it to the physician.

Verbs and Agents in Process Descriptions (cont'd)

- The specimen is analyzed in the lab. The results are recorded. A report form is completed and then sent to the physician.
 - Show *how the system works* in 3 stages (analysis, results, reporting)
- Technician A analyzes the specimen in the lab. Technician B records the results. Technician C completes a report and then sends it to the physician.
 - Emphasize the agents, rather than the stages

Verbs and Agents in Process Descriptions (cont'd)

- Active voice is often used for change of state verbs (e.g., expand, rise, cool, form)
 - The Sun *rises* in the east and *sets* in the west.
 - Most metals *expand* and *contract* with variations in temperature.
 - When demand *increases*, prices are likely to rise.

Causes and Effects

- Cause-and-effect statements are useful in writing problem-solution texts
 - An increase in demand is likely to cause a rise in prices.
 - Increases in demand usually lead to price increases.
 - Demand increases; as a result, prices tend to rise.
 - Increases in price are often caused by increases in demand.

Causes and Effects (cont'd)

- Cause-and-effect statements can be expressed using 1) sentence connectors, 2) when, 3) v-ing, or 4) verbs such as cause, lead, form
 - When the cold air from the Pacific Ocean's Humboldt current mixes with the warm coastal air, a thick, wet fog, called *camanchaca* by the Andes Indians, forms along with clouds.
 - The cold air from the Pacific Ocean's Humboldt current mixes with the warm coastal air, *resulting in* the formation of clouds and a thick, wet fog, called *camanchaca* by the Andes Indians.
- Note that v-ing must share the same subject in the main clause. Also "thus" and "thereby" can be placed before v-ing
 - The magma flows into the pores of the rocks; as a result, the rocks rupture.
 - The magma flows into the pores of the rocks, *thereby causing* them to rupture.

Unit 4: Data Commentary

- Comment on data displayed in tables, figures, and other kind of illustrations
- Find the right *strength of claim*
 - Not simply repeat in words describing what data has expressed in nonverbal form
 - Not too much into the data and draw unjustified conclusions
- Order statements in an appropriate way
 - E.g., from more significant to less significant, from general to specific

Structure of Data Commentary

- Data commentaries usually have the following elements (in order):
 1. Location elements and/or summary statements
E.g., Table 1 shows (provides, gives, ...) the most common modes of computer virus infection for US businesses.
 2. Highlighting statements
E.g., As can be seen, in the majority of cases, the source of viral infection can be detected ...
 3. Discussions of implications, problems, exceptions, etc.
E.g., While it may be possible to eliminate home-to-workplace infection ..., businesses are still vulnerable to major data loss, especially from unidentifiable sources of infection.

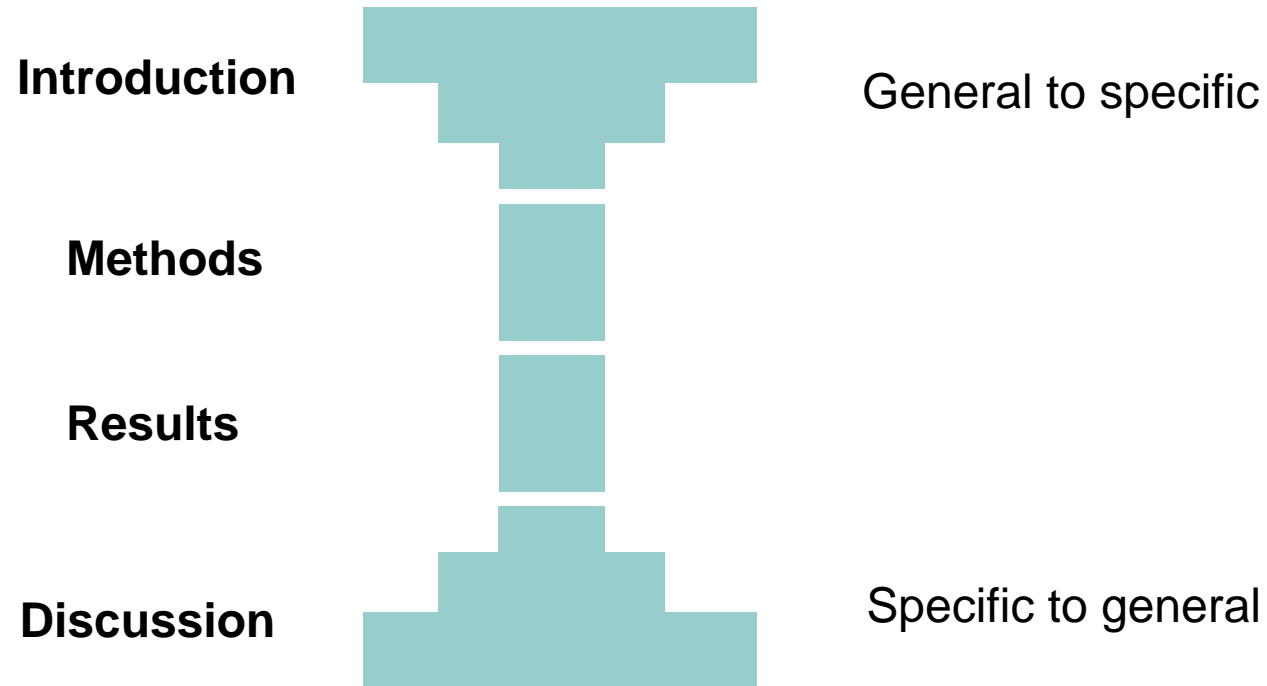
Highlighting Statements

- Highlighting statements are generalizations that can be drawn from the details of the data display.
 - Spot trends or regularities in the data
 - Separate more important findings from less important ones
 - Make claims of appropriate strength

Unit 5: Constructing a Research Paper

- Parts of research paper
 - Title
 - Abstract
 - Summary writing
 - Introduction
 - General-specific, problem-solution, critiques
 - Methods
 - Process descriptions
 - Results
 - Data commentaries
 - Discussion
 - Explanations
 - Literature comparisons
 - Acknowledgments
 - References

Shape of a Research Paper



Basic Tenses

tense	modal	aspect	
		perfect	progressive
-∅ (non-past) -ed (past)	∅ (none) will (future)	∅ (none) have -en (perfect)	-∅ (none) -ing (progressive)

Suggested:

“Experimental Results”: use past tense

“Conclusions”: use perfect aspect

“Future Work”: use future modal

Useful Tools

- **Dictionaries**
 - The BBI dictionary of English word combinations
- **Internet**
 - Google
 - Wikipedia

Good References

- Swales, J. M. and Freak, C. B. 1994. *Academic Writing for Graduate Students, A Course for Nonnative Speakers of English*, University of Michigan Press.
- Strunk, W., Jr., White, E. B., and Angell R. (4th edition) 1999. *The Elements of Style*, Longman.
- Knuth, D. E., Larrabee, T., and Roberts P. M. 1996. *Mathematical Writing*, the Mathematical Association of America.

Thank You
