PAPER-WRITING: A Guide for Transportation Students

by

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In my experience, the paper-writing process should have the following broad steps:

    (i) Outlining
    (ii) Paragraphing
    (iii) "Sentencing."

1. OUTLINING

A paper should have an abstract, an introduction section, a technical body, a set of conclusions, a reference list, and appendices as needed.

The abstract should be written last. To start, you should just write one or two major objectives (goals) to be demonstrated by the paper. Thinking of an appropriate title can help you set the tone. Titles should be short and contain words that "searchers" would use. They should be descriptive, but they don't have to define every detail of the paper.

A coarse outline, detailing the sections and subsections of the paper, should also be prepared at this stage. Each subsection should be described by means of two or three paragraphs detailing the main ideas to be described. You can do this by hand or on a computer, but you should <u>print a hard copy to ponder things over</u>.

Look now at the output. You should decide on the best paper organization, with a sequence of ideas that builds toward the goals of the paper. To be avoided: including extraneous ideas unless they pertain to the paper's major thrust. If the ideas cannot be arranged into sections in a way that is logical, then the wrong ideas are being packaged into the paper. You should reconsider whether the goals of the paper are achievable, given what it is currently known. Iterate this process if necessary.

2. PARAGRAPHING

Once you have prepared a satisfactory 2- or 3-page outline, it is time to hang some meat on the skeleton. This is a critical part of the job.

Quickly, without paying any attention to grammar, write the paper in as few sittings as possible. Plan to have large time blocks together to work on it, so that while you write it you have a "feel" for the whole. Never mind the details: use wrong formulas if you have to, use wrong references, etc. Never stop the writing by some stupid detail. (If ideas come to you that do not fit in the part that you are currently writing, jot them down on a side paper).

The result of this process will be a coarse (VERY COARSE) draft that will turn out to be about 70% in length of the final product, and some side notes. Your draft may read awful... BUT THIS IS FINE! The most difficult part is over with.

If you prepared this draft with a word processor, then <u>on a hard copy</u> of the document, write on the side of each paragraph 3 or 4 words that describe its main idea. (<u>Do not do this on the computer</u>.)

Next, put together the jotted notes on the side paper with the notes on your document, and to try to reorganize the ideas. Do it on the hard copy first. You will find that certain things could have better been said somewhere else (relative to the thrust of each section and the accompanying ideas). Then move them around with the word processor to see if it works. Take your time playing with this (it is important) until you are satisfied.

For me, introductions are the most difficult sections to paragraph; they set the tone for the whole paper, and if they are not done right the reader will be unwilling (or even unable) to follow you. A good formula to follow in my experience is to:

(i) Opening paragraph to describe the setting for your paper (real world or mathematical) and a vague statement (explicit or implicit) of its main goal.

(ii) Paragraph to justify the importance of some specific issue connected with that goal and setting.

(iii) Literature review to establish that a particular aspect of the issue has not been explored.

(iv) State how your work fills the void. Include your most important findings.

(v) State next, briefly, how you did it. Relevant comments about your methodology (e.g., novelty) could be included. You must be brief though, because you want to get to the point quickly.

(vi) Finally, give the reader a "road-map" of your paper, describing each section by a sentence.

You can modify the above recipe on a case-by-case basis to fit the problem at hand.

The sections of the body of the paper should be logically linked and <u>complete</u> -- without undefined terms or symbols.

For the conclusion section you can include a paper summary, mentioning the main findings of each section. Make sure that the conclusions match the objectives stated in the introduction. The conclusion section is also the place for self-criticism (assumptions, etc.) and for suggesting further work.

Now write the abstract. Do not repeat the title of the paper. Do not repeat sentences from the introduction or conclusions.

Sometimes you will discover at this stage that the paper could be better (e.g. a void could be filled) if some additional work was done. Then do it; NOW IS THE TIME. Then integrate the result in the document. Once you are satisfied with the overall flow of ideas (IT IS AS IMPORTANT TO

EXCLUDE EXTRA IDEAS AS IT IS TO BE COMPLETE AND ORGANIZED), then you are ready for the final touches.

3. "SENTENCING"

This is where you want to work on your English, looking at paragraphs one or two at a time. This task is time consuming but not very technical; the result is your final draft. You may enlist the help of friends if you find some that are willing to provide it.

In general I recommend using sentences that are at most 1.5 lines long. If you are not a native speaker keep them below 1 line. Also, avoid repetition. Your goal should be minimizing the number of words you use subject to a "preservation of meaning" constraint. Short sentences and lack of repetition (efficient writing) keep your ideas close together. A reader can get a much better picture of the overall work with efficient writing, even if your style and grammar are not too good.

Read the paper one more time and decide whether another outlining/paragraphing iteration is necessary (i.e. whether some paragraphs or sentences can again be moved to improve the final product).

When satisfied, read the paper yet one more time. Now take each sentence individually and answer at each step: TRUE or FALSE? Do the same with all formulas. Are all the variables and terms defined? You are done, when there are no gaps and you answer "TRUE" to all your sentences.

Now you are ready to give it to your professor.

SUMMARY

I do not follow the above procedure exactly when I write, but with experience I have found the adaptation that works best for me. You should do the same.