Search:
Search

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Menu
Search:
Search

- About Steve
- Moderation Policy
- Popular Posts
- Sitemap (blog contents)

How to write a scientific abstract in six easy steps

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Here's the abstract for a paper (that I haven't written) on how to write an abstract:

> **How to Write an Abstract**
>
> The first sentence of an abstract should clearly introduce the topic of the paper so that readers can relate it to other work they are familiar with. However, an analysis of abstracts across a range of fields show that few follow this advice, nor do they take the opportunity to summarize previous work in their second sentence. A central issue is the lack of structure in standard advice on abstract writing, so most authors don't realize the third sentence should point out the deficiencies of this existing research. To solve this problem, we describe a technique that structures the entire abstract around a set of six sentences, each of which has a specific role, so that by the end of the first four sentences you have introduced the idea fully. This structure then allows you to use the fifth sentence to elaborate a little on the research, explain how it works, and talk about the various ways that you have applied it, for example to teach generations of new graduate students how to write clearly. This technique is helpful because it clarifies your thinking and leads to a final sentence that summarizes why your research matters.

[I'm giving my talk on how to write a thesis to our grad students soon. Can you tell?]

Update 16 Oct 2011: This page gets lots of hits from people googling for "how to write an abstract". So I should offer a little more constructive help for anyone still puzzling what the above really means. It comes from my standard advice for planning a PhD thesis (but probably works just as well for scientific papers, essays, etc.).

The key trick is to plan your argument in six sentences, and then use these to structure the entire thesis/paper/essay. The six sentences are:

1. **Introduction. In one sentence, what's the topic?** Phrase it in a way that your reader will understand. If you're writing a PhD thesis, your readers are the examiners – assume they are familiar with the general field of research, so you need to tell them specifically what topic your thesis addresses. Same advice works for scientific papers – the readers are the peer reviewers, and eventually others in your field interested in your research, so again they know the background work, but want to know specifically what topic your paper covers.
2. **State the problem you tackle**. What's the key research question? Again, in one sentence. (Note: For a more general essay, I'd adjust this slightly to state the central question that you want to address) Remember, your first sentence introduced the overall topic, so now you can build on that, and focus on one key question within that topic. If you can't summarize your thesis/paper/essay in one key question, then you don't yet understand what you're trying to write about. Keep working at this step until you have a single, concise (and understandable) question.
3. **Summarize (in one sentence) why nobody else has adequately answered the research question yet**. For a PhD thesis, you'll have an entire chapter, covering what's been done previously in the literature. Here you have to boil that down to one sentence. But remember, the trick is *not* to try and cover all the various ways in which people have tried and failed; the trick is to explain that there's this one particular approach that nobody else tried yet (hint: it's the thing that your research does). But here you're phrasing it in such a way that it's clear it's a gap in the literature. So use a phrase such as "previous work has failed to address…". (if you're writing a more general essay, you still need to summarize the source material you're drawing on, so you can pull the same trick – explain in a few words what the general message in the source material is, but expressed in terms of what's missing)
4. **Explain, in one sentence, how you tackled the research question.** What's your big new idea? (Again for a more general essay, you might want to adapt this slightly: what's the new perspective you have adopted? or: What's your overall view on the question you introduced in step 2?)
5. **In one sentence, how did you go about doing the research that follows from your big idea**. Did you run experiments? Build a piece of software? Carry out case studies? This is likely to be the longest sentence, especially if it's a PhD thesis – after all you're probably covering several years worth of research. But don't overdo it – we're still looking for a sentence that you could read aloud without having to stop for breath. Remember, the word 'abstract' means a summary of the main ideas with most of the detail left out. So feel free to omit detail! (For those of you who got this far and are still insisting on writing an essay rather than signing up for a PhD, this sentence is really an elaboration of sentence 4 – explore the consequences of your new perspective).
6. **As a single sentence, what's the key impact of your research?** Here we're not looking for the outcome of an experiment. We're looking for a summary of the implications. What's it all mean? Why should other people care? What can they do with your research. (Essay folks: all the same questions apply: what conclusions did you draw, and why would anyone care about them?)

The abstract I started with summarizes my approach to abstract writing as an abstract. But I suspect I might have been trying to be too clever. So here's a simpler one:

(1) In widgetology, it's long been understood that you have to glomp the widgets before you can squiffle them. (2) But there is still no known general method to determine when they've been sufficiently glomped. (3) The literature describes several specialist techniques that measure how wizzled or how whomped the widgets have become during glomping, but all of these involve slowing down the glomping, and thus risking a fracturing of the widgets. (4) In this thesis, we introduce a new glomping technique, which we call googa-glomping, that allows direct measurement of whifflization, a superior metric for assessing squiffle-readiness. (5) We describe a series of experiments on each of the five major types of widget, and show that in each case, googa-glomping runs faster than competing techniques, and produces glomped widgets