

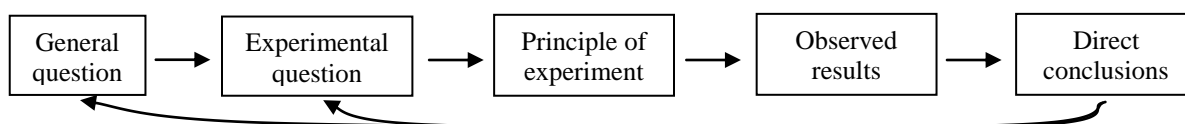
How to prepare a presentation on a research project¹

I. Purpose of a presentation

You are called upon to tell an audience of your peers a scientific story. The story begins with the evolution, through a series of logical steps, of a compelling question that you addressed through experiment. That question is the principle around which your presentation should be organized. The story ends when you have brought the issue to some resolution, not necessarily answering the question but showing how our insight into the question and related matters is enriched by the experiment you presented.

You will not have much time for your presentation. This requires that you construct a tight story, one that is a full consideration of a single question. It is unlikely that you can accomplish all set forth below unless you focus on a single experiment, even if it constitutes only a small portion of your work.

In the end, the audience should be able to see clearly the following:



II. Sections of a presentation

If you feel constrained by the structure presented below, then absorb its lessons and work out a structure that better captures the goals of your particular presentation. However, make sure that there *is* a structure and that the goals of the presentation (and your audience) *are* well served.

II.A. Introduction: What is the question you addressed and why did you address it?

The purpose of this section is to engage a general audience and to bring that audience to the specific question you intend to address. This question should be the climax of the section, and it should feel like a climax, the inevitable result of what has come before it. This is achieved by creating a hole that is fit exactly by the question you raise.

- Start from a vantage point available to everyone. Offer a general question whose importance is immediately obvious, like *What distinguishes a bacterium that causes disease from one that does not?* or *What strategies are used to form a complex organism from a simple cell?*
- Start with clear language, not jargon. If you choose to start your presentation with a title (and this is by no means required), make sure its words do not confuse and depress your audience. Don't think that the title is just a formality that the audience will not read (hence not be depressed by). If that's the case, then there's no point in giving a title.
- Have a goal. Derive from the general question a thread that leads through carefully selected prior results and arguments to the question that is central to your project.
- Underscore the question. When you ultimately reach the focus of your presentation – the question that was addressed by your experiment – make certain that its centrality is obvious to all. Set the question off from what has gone before, perhaps by a large font.

¹ If you detect in this document considerable overlap with *How to Write a Report on Your Project*, then consider both as chapters in a larger document, entitled *Audience-Centered Scientific Communication*.

II.B. Method: How did you address the question by experiment?

The purpose of this section is to present the logic of the experiment and the principles underlying the techniques used. Your purpose differs from the methods section of an article. There the purpose is to outline a procedure in sufficient detail that others may replicate their results. In a presentation, it is neither necessary nor desirable to give experimental details that do not aid in the audience's understanding of the principle behind an experiment.

- Start from a broad view. What *kind* of experiment is necessary to answer the question?
- Avoid black boxes. Explain the principle behind any technique essential to the understanding of the experiment.

II.C. Results: What observations came of the experiment?

The purpose of this section is to present the actual observations (not the conclusions) from the experiment you have described. It is essential that you tie every observation to an experiment so that your audience understands how it arose.

- Start from the question. Make sure that the question addressed by the experiment is at no time absent from the audience's consciousness.
- Set up the result. Present no result unless you set up an expectation in the mind of the audience. *If x were true, then you might expect this result, but if y were true, then this other result might arise instead.* It is often useful to make up hypothetical results to illustrate possible outcomes.
- Show actual data: *I found that my hypothesis was correct.* No you didn't. You made an observation about nature. The observation is true for all time. The hypothesis is open to negotiation and may fail later at the hands of a different observation.
- Explain the result: It is very easy to forget that a graph that you've spent so much time constructing is not as clear to everyone else as it is to you. Make sure that terms, units, axes, etc are all explored.

II.D. Synthesis and recapitulation: What have we learned from the journey?

The purpose of this section is to examine the observations within the context of the central question and the general issues that began your presentation. Doing so should evoke a satisfying sense of closure.

- End with an ending. If you feel compelled to say, *That's it!* then your ending was probably not strong enough.

III. Presentation strategies

III.A. Graphics

- Use them. You don't have a lot of time. Graphics make it easier for your audience to grasp relationships at a glance and understand new concepts.
- Steal shamelessly. Give credit where credit is due (in small text at the bottom of the graphic or the graphic) but have no compunction about using graphics where you can find them (so long as you use them solely for presentation in a nonpublic setting).

- Adapt, extract, and simplify: Especially when you present graphs or tables from the article, you will often need to edit a graphic. The audience doesn't have time to read a legend, so add **labels**. Neither can we readily see the region of a complex table that is pertinent to the presentation, so **eliminate** unnecessary information or **highlight** information you want us to focus on.
- Invent your own. In many, perhaps most cases, no premade graphic will serve your particular purposes. Be creative.

III.B. Text

- Use sparingly. Audiences can't read complex sentences and listen to you at the same time. Text should be used to summarize and underscore.
- Use words and phrases, not sentences. Sentences are too complicated (and also tempt you to read what's on the screen – certain death in presentations). If a single line in a big font is not enough to say what you want, you're trying to write too much.
- Present small chunks. When presenting a list, show one item at a time to focus the audience's attention. This can be achieved by what PowerPoint calls "animation" or by duplicating pages, for example showing item #1 on the first page, items #1 and #2 on the second, and so forth.

III.C. General

- Engage the audience. You can't shove insight into another's mind. It comes only when an active mind reaches for it. If audience members believe that they are magically controlling the flow of the presentation – questions that occur silently to them somehow elicit the screens that answer them – you will gain the cooperation necessary for any presentation to be successful. One technique is to ask rhetorical questions, e.g. *How is it that DNA integrases appear in pathogenic bacteria but not their nonpathogenic relatives?* However, overusing this device can be irritating. Find more subtle ways to achieve the same end.
- Make the structure of your presentation transparent to all. One way of engaging the audience is to let them know where they are heading and to indicate regular intervals where they are in the journey.
- Serve the forces of light, not darkness; do not export your confusion to your audience. If you were extending yourself, then no doubt you read articles that defied your attempts at understanding. There are many solutions to this problem, but undoubtedly the worst is to pass on to your audience without comment the source of your confusion. If you were unable to pierce the shroud after lengthy consideration, what hope is there for your audience to do better in the limited time available within a presentation? ***Never utter an unqualified word or phrase that you yourself do not understand.***

Alternatives:

- a. Is this confusing issue essential for the thread of your story? If not, throw it away.
- b. If it is essential, then do whatever is necessary to reach a level of understanding that enables you to help your audience past this spot, even if it means learning a bit of matrix algebra or invertebrate taxonomy.

Corollary: *Start early, allowing time for others to help you and for you to help yourself.*

Credo: *There is no thought that has sprung from a human mind that is more than several steps away from your own.*

- c. If all fails (i.e., if you run out of time), the last resort is to admit your ignorance (and perhaps invite suggestions). This approach at least does not crush the audience's spirit by implying that they should understand what you could not.
- Work out the Results section first. Choose an experiment and decide exactly what you will present. Doing this first lets you know what principles you need to introduce and how to direct the Introduction to point to the experiment.
- Consider outlining. As you work out your presentation, an outline can compress your work so that you can pinpoint holes in the narrative or material that is not well connected to the thread of the story.
- Underscore important points. Not everything in your talk is of equal weight. When you come to something that is of special importance, do something special. Some people can get red in the face and go pyrotechnic. The rest of us should consider more subtle solutions. Pause or repeat the point using different words. Use a bigger font. Use color.
- Avoid general headers. Headers like *Results* may help you organize your talk, but they're not very informative. Don't waste the most prominent area in your slide with empty words.
- Focus on your audience, not on yourself. The discomfort you may feel pales in significance to your obligation to help each member of your audience come to appreciate the view of the world seen through your work. If you know the people in your audience (as you do in this case), consider what particular problems each may have in grasping the message that's yours to give.