

line, not just "introduction" or "results," etc. Be very careful not to use the labels "summary" or "conclusions" too early in a talk, as the audience will then expect you to end, and their concentration may lapse.

F. Know to whom you are speaking, and plan your talk to reach that audience. Most audiences include many people who are not familiar with your topic, approaches, methods, or context, or, indeed, the significance of your area. The success of a talk should be judged by its ability to engage and enlighten nonspecialists.

G. The most all-encompassing way to ensure clarity, which summarizes the detailed points made in section I, is to be sure that your train of thought is clear and that the audience can follow it. Your listeners should always know where they are in your argument. Many of the specific points aimed at clarity can be summarized in a single sentence: Map out an explicit train of thought and bring your audience stepwise along on that train of thought. Your listeners should never have to guess why you are presenting something or where you are in your argument.

II. Time

A. The message and support must be pared to fit the time limit. It is better to cover little material well rather than much information sketchily. Allow a buffer of time for the audience to settle down, the moderator to introduce you, and for questions.

B. Allow extra time for unforeseen problems with the projector, finding light switches, a late start, etc. If possible, explore the room and podium before your talk to find the light switches, pointer and other equipment.

C. Have an appropriate number of slides. Don't show so many slides that the audience can't absorb each one. Spend sufficient time on each slide, and point out the structure of graphs, tables, or diagrams as well as their content.

D. Give yourself enough time so that you don't have to rush and speak incomprehensibly fast. Allowing sufficient time will also permit you to repeat points that may puzzle some listeners.

III. Slides

Most formal ecological talks rely on slides. Overhead transparencies, especially those

without cardboard frames, are often difficult to manipulate and orient on the projector. There is frequently insufficient space near the projector to hold the two stacks of transparencies, and the resulting tangle of sheets is distracting and slows the talk. Overhead projection is likely to position the speaker in front of the screen, blocking the audience's view. In addition, the temptation to scribble overheads at the last minute leads to poor visual aids. For all these reasons, overheads are to be avoided. Mixing slides and overheads compounds problems. Prepare and use slides following the criteria below.

A to D. Each slide should make a single point and contain fewer than five lines of text. The text should be concise. Phrases are better than sentences because the audience will have to listen to you to get the message that the slide will reinforce. When you avoid sentences on the slide, the audience does not have to divide its attention between listening to you and reading the slide. Note that title slides are superfluous, as the moderator has already presented that information.

E. The text of each slide should be large so as to be readable in a large auditorium with suboptimal lighting. Clear slides with black lettering work well and are most forgiving of suboptimal lighting. Black text on clear slides also lights many rooms enough so that notes and the audience can be seen, interacting with the audience is critical (Janzen 1980). If you must use slides with a colored background, be sure the background contrasts with the text but allows the pointer to be seen against it.

F. Text and data slides should be prepared specifically for presentation, not pirated from a manuscript or paper. The density of information in tables and figures prepared for papers is too high to be absorbed readily in a talk. The audience should never be told to "ignore this part of the slide." Make a slide that contains only the relevant information.

G. Give yourself enough time before the talk to revise slides that don't work or to add missing links.

IV. Mechanics

A. Do not read the talk. Ideally, a talk can be given without notes, or, at worst, with minimal notes. Independence from notes allows speakers to engage their audience, to scan the audience to see whether points are getting

STRATEGY AND CHECKLIST FOR EFFECTIVE SCIENTIFIC TALKS

planning the talk, run through the checklist to map your presentation strategy. Once you have presented a practice version of the talk, check through the list again. It is a good idea to start the process well before you are scheduled to talk so that the mechanics and substance can be polished. The list can also be used by your friendly critics to help you refine the talk.

A talk is not a paper. The audience cannot go back and review what you have said at leisure. Therefore, you must develop a clear train of thought and do so slowly enough for the audience to follow. The purpose of talks is to communicate ideas, not simply data.

We have divided the checklist into five sections: I. Clear Communication, II. Time, III. Slides, IV. Mechanics, and V. Organization of the Talk. Each item is described in greater detail in the following paragraphs and then more briefly in the checklist. Additional justification and helpful advice are given by Janzen (1980), Cairns (1989), Bragg (1966), and Cook (1968).

I. Clear Communication

A to C. At the very beginning, state your guiding question or hypothesis, why it is important, and what the message of the talk is to be. These are the most important things you will do in your talk.

D and E. Speaking is different from writing. Much less detail can be absorbed from a talk than from a paper, and audiences don't have the chance to rumininate or go back to clarify a point. Give the outline at the beginning. Use mileposts to reinforce the outline and relate details to it. If you use text slides as mileposts, highlight the conceptual content of your out-

Through our teaching, seminars, and listening to talks and mumbings in the halls afterwards, we have collected a number of problems frequently encountered in scientific talks. This essay and checklist is a compilation of these items and some thoughts about how to correct them.

The items on this checklist are intended to help make a talk clear and intelligible to a general audience such as a departmental seminar or a session at a national meeting. The vast majority of audiences any speaker addresses are not likely to be specialists in the topic. Therefore, a speaker must help the audience through what will most likely be unfamiliar material. In addition, most people in an audience may be tired, preoccupied, and anxious to get on to other tasks. In large meetings with many talks scheduled during a day, these problems will be even more acute. The burden falls on the speaker to be considerate, compelling and clear. Of course, we assume that the science is worth hearing about!

When most people plan talks, they plan to rely on slides and assume that conditions will be perfect. The photographic processing will have been flawless. The slide projector will work, and the screen will be large and well positioned. The room can be darkened sufficiently to see colored slides, but still allow the speaker to read notes and interact with the audience. The room will be quiet and free from distractions for the audience. However, ideal conditions are rarely encountered. Many of the suggestions here result from experience with imperfections and are designed to maximize the chance of success in less than ideal rooms and situations.

To best use this checklist, make at least two copies for each talk you will give. Before

across, and to use the slides better than if they are tied to detailed notes (Janzen 1980).

B. Leaving the lights on to start with is a good strategy to involve the audience in the talk and remind you that you are ultimately involved in a dialogue with people, not slides. Leaving some lights on even while showing slides will allow you to "read" your audience and cue you to repeat or rephrase when necessary.

C. Practice the talk to refine its flow, message, and length. However, don't memorize the talk. An audience will be more engaged by a scientist who works through a problem with them than by an actor giving a slick performance.

D. Don't apologize for poor quality of visual aids. Rather, give yourself enough time between your first practice sessions and the formal talk to revise poor slides or to make missing ones.

E and F. Speak loudly enough to be heard throughout the room. Facing the audience at all times helps engage them and project your voice. If you add parenthetical comments, be aware that your voice will be softer, and may be hard to hear. Avoid them or speak loudly enough so that your parentheticals don't disappear.

G. Avoid conversational or informal language, yet also avoid undefined jargon and acronyms. Remember that almost all audiences include novices and nonspecialists. Jokes are fine, but don't let a talk degenerate to comedy (Bragg 1966).

H and I. Avoid distractions such as waving the pointer aimlessly, odd mannerisms or excessive needless movements. The pointer should be used as an incisive tool to guide your audience through your slides and to highlight, e.g., critical labels, pathways, trend lines, or values.

V. Organization of the Talk

A. An introduction gives background and motivation, as well as defining key terms. Here, the work is put into context and justified. Without such context, listeners lack a framework to help them grasp your message. A common flaw is to spend too much time on introduction. If in your practice session, you find that 4-5 min of a 15-min talk are introduction, that is too much. The introduction is critical, but it should not be too long. Audiences become

impatient with an apparently padded introduction.

B and C. Methods can be given in a condensed form. Most listeners don't need all the detail that a close colleague would. Rather, they need to know the basic design and only the procedures relevant to the results that will be shown. A good way to outline methods is by a matrix or flow chart. The methodological details that the few people who are doing similar work might want can be covered in a question or, better still, over lunch or in the hall after the session.

D. Results should be related to the guiding questions you stated at the outset. Results should be structured in a way to reinforce the initial message. Describe format of tables, figures and diagrams before describing their content. Tell what the axes are on graphs and the columns and rows on tables, what the units are, and then point out the trends or differences. Walking the audience through each slide ensures enough time for the audience to absorb the information. Go slowly, especially when there are nonnative speakers of English in your audience.

E and F. The conclusions should be stated explicitly at the end of the talk in a way that reinforces the message. They should be crisp and concise. It is a good idea in a talk to repeat important ideas in different ways during the talk (Cook 1976). The conclusion then becomes a summary, not a surprise.

G. If the talk is a long one, say, a departmental seminar, blend the sections by topic to reinforce the message. Don't segment the talk by Introduction, Methods, Results, Discussion, and Conclusion, among which are divided several specific topics. The longer the talk, the more important it is to keep the train of thought and message clear.

How to Use the Checklist

Use the checklist to plan your talk and prepare the visual aids you will use. Practice your talk, and review the checklist to assess your approach toward the ideal. Then prepare several copies for your friendly critics to use, and present your talk to them. The friendly audience should sit at the back of the room so they will be more sensitive to lapses in presentation. Have them look over the checklist beforehand and mark items during or after the talk, as appropriate. Talk with them and re-

view the checklist with them to see what matters of substance and presentation you must refine or correct. Perform the same favor for them when they are preparing a talk. Practice as much as you can, paying attention to the problematic areas you detect as well as those identified by your critics.

Literature Cited

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Speaker _____ Date _____

Title of Talk _____

Version _____ Time: Start _____ End _____ Total _____

Intended Audience _____

I. Clear Communication

- A. The guiding question is stated.
- B. The importance of the question is stated.
- C. The message of the talk is stated at the beginning.
- D. The whole talk is outlined early in the presentation.
- E. The outline is repeatedly referenced to provide mileposts.
- F. The talk is aimed at a specific audience.
- G. A clear train of thought is followed and involves the audience.

II. Time

- A. The talk fits the time limit.
- B. There is extra time to recover from unforeseen problems and to permit questions.
- C. Enough time is spent on each slide to allow the audience to absorb the information.
- D. The speaker talks slowly and repeats key ideas.

III. Slides

- A. The slides have large text, readable in a large auditorium with suboptimal lighting.
- B. Each slide makes only a single point.
- C. There are five or fewer lines of text on each slide.
- D. Text is concise, having only a phrase or a few words per line.
- E. Background of slides is light and contrasts with text and pointer.
- F. The axes of graphs can be read from the back of a large room.
- G. Slides have been prepared specifically for oral presentation.

IV. Mechanics

- A. The talk is *not* read.
- B. The speaker begins talking with the lights on to involve the audience.
- C. The talk has been practiced to refine the flow, message, and length.
- D. The speaker does *not* apologize for the talk or its components.
- E. The speaker's voice can be heard in a large hall over the noise of the crowd and projector.
- F. The speaker always faces the audience when speaking.
- G. Language is free from unexplained jargon and acronyms.
- H. The pointer is used as a precise, incisive tool.
- I. There are no unnecessary movements or distracting mannerisms.

V. Organization of the Talk

- A. The introduction is brief in proportion to the length of the talk.
- B. Methods are shown in an abbreviated form in only enough detail to support the results.
- C. If the methods are illustrated, a matrix, flow chart, or other diagram is used.
- D. The format of graphs should be described before focusing on the content.
- E. The conclusions are stated at the end in a form to reinforce the message.
- F. The conclusions are crisp and concise.
- G. Questions, methods, results, and interpretation are folded together to enhance the impact of the message.