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Effective communication in integrative projects

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Abstract

Traditional scientific research training focuses on developing skills, knowledge and experience of the particular discipline in which the research is being undertaken. The move to inter- and transdisciplinary research means that further skills are required outwith the traditional disciplinary skill base. Central amongst those are improved communication skills. The ability to communicate effectively with a broad range of different people is often a key element in the success or otherwise of a research programme, but yet this ability is still relatively poorly covered in research-training programmes. In this chapter I outline why effective communication is becoming more important, and how communication can be improved, particularly in presentations.
Keywords: communication**;** presentation skills; research training; interdisciplinary; transdisciplinary

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Introduction

> *"The object of education lies not in communicating the values of the past, but in creating the values of the future" – John Dewey*

We live in times of rapid change and uncertainty about the future. This change and uncertainty has many facets, including political, social and environmental, and affects everyone individually and collectively. In this chapter I explore the implications of this situation for scientists, and in particular, scientists who find themselves in inter- or transdisciplinary projects.

Scientists traditionally conduct science within the confines of a particular scientific discipline. The training a scientist receives equips him/her to investigate problems within the discipline effectively and rigorously. However, that training frequently does little to equip scientists to interact effectively with other scientists, or other parts of society, particularly managers, policy makers and the media. This set of interactions is becoming increasingly important as the need for closer links between science, management and policy is recognized, and as more projects become overtly inter- or transdisciplinary.

I argue that a radical shift in the behaviour of scientists is called for, which would see scientists more actively engaged in communication activities on a wide front. I first explore the reasons why scientists need to communicate and whom they need to communicate with. I then discuss the additions to the scientist's 'tool kit' that are required to make successful communication possible, and point out that, because there is so much information available via all sorts of media today, information provided by scientists is only one small component of the total – and hence that information needs to be presented in an effective way if it is to stand a chance of being taken in. Attracting and reaching an audience is thus a vital part of the process, and I outline relevant ideas concerning communication and learning methods.

Why communicate? With whom?

If one stops to look at the calls for scientists to communicate more, a common reason for advocating this is that scientists need to inform people more about what they are doing and why it is important. Why inform people, though? Communication should be not about simply informing people but more about motivating them to change their actions or beliefs or simply to better understand them and their points of view.

There are a variety of different targets for communication by scientists, which can be summarized as follows:

Fellow scientists (same discipline)

While many scientific endeavours involve individual research, there is still a need to communicate with other scientists in the same field. This takes the form of writing scientific papers and reports, attending and presenting papers at scientific meetings, and the like. While university training provides scientists with the fundamentals needed to perform adequately in their chosen fields, it frequently fails to provide much, if any, guidance in how to write and speak effectively.

Scientific writing aims to communicate research methods and results in an unambiguous and clear manner, and there are simple guidelines available for achieving this (Lertzman 1995; Lindsay 1995; Magnusson 1996; Matthews, Bowen

and Matthews 1996). Unfortunately, many scientific authors and editors also appear to believe that something is adequately scientific only when it is also unremittingly boring. This need not be the case! While there is undoubtedly a need for clear writing and adherence to grammatical correctness, there is room for creativity and good prose. One needs only to observe the scientific writing styles prevalent earlier in this century to see how much we have removed the poetry and beauty from modern scientific writing. Essay writing is also a declining art, and yet well constructed essays are a powerful motivating and inspirational force.

Much the same can be said about scientific presentations at meetings. These need to be clear, well structured, well illustrated with uncluttered illustrations, and designed to fit within the allocated time slot. But they also need to be *interesting*. At the average scientific meeting there are usually dozens, if not hundreds, of presentations, often in concurrent sessions. Each presenter is therefore competing, first, for the audience's presence and attention, and second, for a place in their collective memory afterwards. Again, many scientists seem to consider that their subject matter is serious stuff, and that there is no room for humour, passion or originality in their presentation.

Certainly, not everyone can be an ace presenter, but there are clear guidelines on how presentations can be made as effective as possible. This is equally true of poster presentations. Given the enthusiasm with which most scientists approach their work, shouldn't this enthusiasm overflow into how they present it?

Other scientists (different disciplines)

Increasingly, the need for greater interactions between disciplines is being recognized, especially in relation to finding solutions to environmental problems. For instance, an ecologist will be expected to interact with many other scientists, including hydrologists, soil scientists, agronomists, geologists, atmospheric physicists, to name but a few. Beyond that, the need for closer interactions between the natural sciences and the social sciences is being recognized, and scientists may also have to communicate effectively with economists, planners, sociologists and others. Communication involves breaking down old disciplinary rivalries and barriers, achieving a common language, and recognizing the value of different approaches and the need to combine work to deal with the big issues confronting us today. This communication becomes particularly important where interdisciplinary teams come together to tackle particular problems. The success or failure of the team will in large part depend on how effective the communication between team members is.

Students

Many scientists are based in universities or other teaching institutions, where part of their duties involves teaching students. Here again, while most scientists have a sound training in their subject, they often do not have adequate training in teaching skills. University lecturers are often appointed on the basis of their research record or potential, and rarely on their teaching skills. How many dreadful lectures do you remember sitting through as a student? Such a situation is easily fixed by the adequate allocation of resources to training academic staff in elementary teaching techniques, as already happens at some institutions. More than simply learning new techniques, however, academic staff need to recognize the importance of educating students to think critically. This may be uncomfortable to some, since it entails providing the student with the skills to criticize the instructor. Nevertheless, it is an essential element in the development of science and societal change.

Scientists also have to communicate with students undertaking research degrees. Good communication between supervisor and student is essential to the successful completion of any PhD or Master's degree, and failure can often be traced back to the breakdown in that communication. Adequate communication requires that the supervisor not only acts as an academic mentor, but is also able to communicate with the student as one human to another. Again, the development in the student of the ability to think critically is an essential element.

Funding bodies

The search for research funding is becoming an increasingly large and time-consuming task, but few would view it as an exercise in communication. However, that is exactly what it is. The researcher is trying to convince the funding body, or the referees appointed by that body, that his/her idea for future research is worth funding. Here again, he/she is competing for the funder's attention and dollars with many others, and the merits of the proposed research will be more readily apparent if the proposal is well written and structured.

Policy makers / managers

If the scientist is content to 'do science' and not worry about whether it is used or applied, he/she may never need to talk to a manager or policy maker. However, the days when such ivory-tower behaviour was appropriate have gone, and it is becoming increasingly important that science flows through to management and policy. This demands meaningful interactions between scientists and 'user groups' or 'stakeholders'. These interactions are still apparently not as frequent as their importance would demand (Wilson and Barnes 1995). Cleaves (1994), discussing communication by forest scientists, suggests that "Society's changing values toward foresters and the billowing complexity of forestry issues have created the need for [a] new role – more visible, more exciting, and more dangerous than the traditional one. To play this part well, we will have to learn our lines, study the context, and develop new skills. The payoffs are great. And if we don't at least audition, the policy show will go on without us – and someone else, perhaps someone less qualified will get the part".

Increased interactions with policy makers and managers require the scientist to be able to communicate clearly and effectively without recourse to what Aldous Huxley has called "specialized meaninglessness", i.e. the jargon in which scientists often immerse themselves. It also requires that they are able to put their work and interests in the correct context and can indicate the relevance of it to those who wish to use it. Increasingly, too, managers need to be involved in the planning and implementation of the research, especially where this involves changes in land-use or management practices. The concept of adaptive management is relevant here. Communication with managers and planners during the planning of research projects can assist in assuring that the research is directed in ways that will be most useful, since managers can bring a useful perspective on what options are practically feasible and hence worth pursuing.

The public

We frequently hear calls for scientists to be more actively involved in communicating with the public, and engaging in public debate. Sir Michael Atiyah, a past-president of the Royal Society suggested that: "Scientists are too often thought of as a secretive élite, a sinister part of the establishment, part of 'them' not 'us'. The

only way to break down this suspicion and distrust is for scientists to speak out openly and freely". Current anti-science and anti-environmental trends can be in part explained by the failure of scientists to communicate effectively with the rest of the population.

Scientists potentially have a large role to play in public debate on many issues. However, the actual process of getting information to the public is often a bit of a mystery to many scientists. The main ways that it occurs are through scientists' contacts with interest groups, and via the media. All the same considerations apply as were discussed above in relation to communication with other groups. There are, of course, questions concerning scientists' willingness and/or ability to speak openly about contentious issues, and progress in this area will come only from a recognition by individuals and organizations that open debate is both desirable and necessary.

One set of members of the public who bear special attention are children. They represent the future, and it is our responsibility to ensure that we equip them as well as possible for that future. Communicating effectively with children is a difficult but very rewarding task, which not everyone has the knack or desire to try. Contact with children requires a clarification of ideas and concepts far beyond that usually required in scientific circles, and children have a knack of asking very piercing questions. Nevertheless, even if every scientist is not involved in direct contact with children, they could at least be involved in making information available to those who are.

The ecologist's tool box

The previous section illustrated that there are many reasons why the scientist should be involved in communication, and many different audiences to communicate with. The traditional tool box of an ecologist has therefore to be expanded to include a new set of skills involving communication (Figure 1). These skills thus need to be included in the training provided to ecologists, and scientists in general. Some scientists can pick them up 'on the run', but that is not a very efficient way of increasing the effectiveness of scientists in general.

There is currently an explosion in information supply due to advances in electronic media and communications, although the amount of that information which is consumed and applied is increasing at a much slower rate (Figure 2). This information covers all aspects of life including social, political, religious, cultural, sporting and many other issues. This means that the scientist has to compete effectively with an array of other 'information providers' to make the target audience listen and take notice. His/her communication activities must therefore aim to make the maximum impact possible. Part of the toolbox must therefore be effective communication methods. There is considerable information available on communication theories, learning styles and so on (see e.g. Knowles 1981; McQuail and Windahl 1993), which is directly relevant to this endeavour, but of which most scientists are totally unaware.

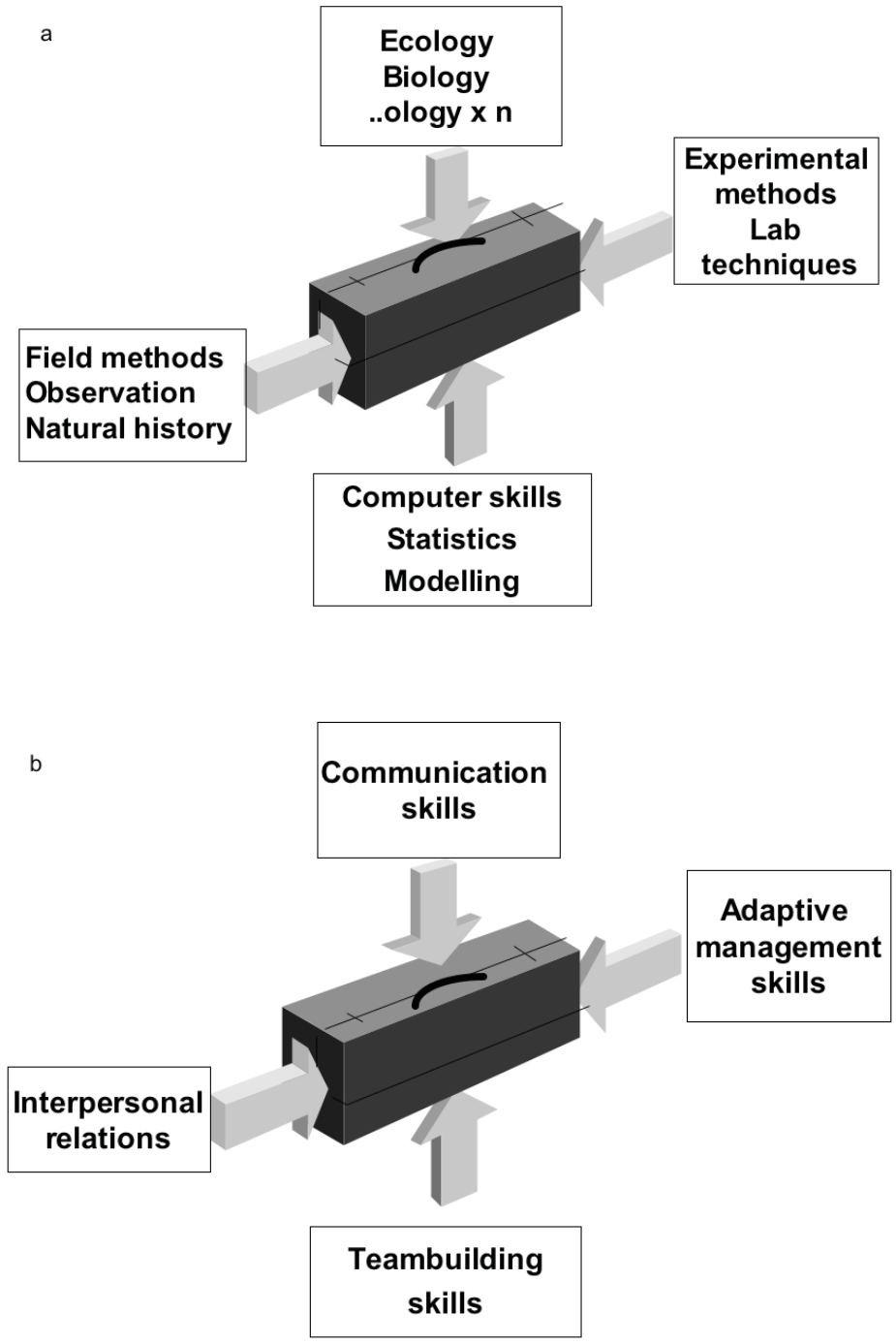

Figure 1. The traditional ecologist's tool box (a), and the additional components required in today's world (b) (Adapted from Kessler 1995)

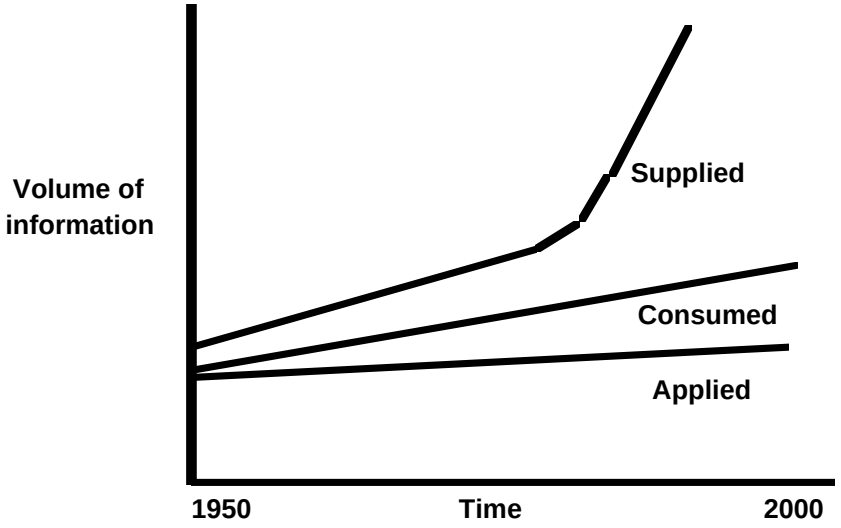

Figure 2. The amount of information supplied, consumed and used over the past 50 years (Redrawn from Van Cuilenburg 1987)

While this is not the place to go into detail, it is worth noting that several different styles of learning, or receiving and interpreting information, are recognized, and this can assist in developing communication methods which have the greatest chance of success. It is important to recognize that the people being communicated with come complete with a package of beliefs, values, cultures and levels of education. These may directly conflict with those of the communicator, or there may be conflicts between different members of the audience. It is always a mistake to believe that the people you are trying to communicate with think and feel the same way you do about particular issues or about life in general. Some recognition and acceptance of differences in opinion and viewpoint makes a much better base for successful communication. In addition to this, scientists face the problem that different people will interpret the same message in different ways, especially when the message is simplified or presented in non-technical language. Thus the message needs to be presented in a way which will change the way the audience thinks, without antagonizing them in the process.

In addition, different people respond to different stimuli. For instance, some people respond more to visual than to auditory information. Others take in numeric or quantitative data much more easily than qualitative information, and vice versa. Some need concrete data and examples, while others gain more from conceptual information. People respond to humour, gravity and passion in a variety of ways, depending on the situation. Further, some people like passive learning, while others need more active learning experiences. All of these considerations can be used to construct effective communication packages. These can be tailored to the type of audience, or they can be generalized to try to hit as many targets as possible. Frequently it is not the message itself, but how it is packaged, that makes the difference. Passion and enthusiasm are often the magic ingredients which will inspire response and achieve results – whether this is expanding a student's mind, influencing a policy maker or enlisting public support for a particular issue.

Successful communication

The important ingredients needed for the successful communication of issues in a forestry context were summarized by Cleaves (1993). I suggest that they have broader applicability to anyone interested in natural resources, and provide a useful framework for effective communication. I provide an abbreviated list of Cleaves' main points below. While these deal primarily with speaking to groups, the principles are more generally applicable to any form of communication.

1. Understand the issues – i.e. know what you're talking about so that you don't come over as a half-wit. Know your facts, make sure your data are correct, and be prepared for questions from the left field.
2. Realize how opinions are shaped – the points discussed earlier. Know how to influence people's opinions and perceptions.
3. Know your listeners – figure out what sort of audience you'll be dealing with and tailor your communication efforts accordingly.
4. Be specific – generalities are rife in science, but are not much use in real-life situations.
5. Have a clear purpose and strategy – know what you want to communicate and why.
6. Be calm – adequate preparation is always a prerequisite.
7. Don't blame – apportioning blame immediately puts a proportion of your audience off side. If blame is appropriate, let others figure it out for themselves.
8. Focus on the facts, but identify opinions and values – scientists are supposed to deal in facts, but it is important to give informed opinions too. It is also important to admit when you don't know the answer to something. Don't provide spurious certainty where uncertainty is appropriate.
9. Raise questions – 'experts' know better than anyone exactly how much we don't know. Point out unknowns and indicate where more research is appropriate (without sounding like an appeal for research funds).
10. Be brief – waffle and obfuscation lead to bored and disinterested audiences. In particular, don't exceed your allotted time – it annoys everyone and indicates an arrogant disregard for other people. Also, allow time for questions.
11. Practice – the only way to become good at anything is to practice. The more you do, the better you become.
12. Follow up – part of effective communication is persistence. Where appropriate, show your audience you're interested and concerned by continued contact.
13. Keep at it – things rarely change overnight. In fact, it often takes concerted effort over months or years to achieve anything.

Conclusion

Not all scientists agree that there is a need for enhanced communication between scientists and other parts of society. Communication has traditionally not been a skill in which scientists received much training or for which they received much reward. Indeed, effective communication requires skills that can be learned, but beyond that also demands enthusiasm and persistence. Communication of complex ideas and issues is often difficult and potentially fraught with problems, and is still seen by many as a risky business. Most scientists already have their plates full and are juggling numerous tasks and activities, so that communication seems simply to add more to an already full schedule.

Nevertheless, the changing nature of the world in which we live and work makes the need for better and more effective communication almost a prerequisite for survival. If it is important enough, scientists will find time and energy to do it. Better training, coupled with an increased recognition of the importance of all aspects of communication, can only improve science and how it is perceived by non-scientists. As Daie (1996) suggested, "The stakes are high. If not now, when? If not us, who? Clearly the responsibility is ours alone. If necessity is the mother of invention, and if scientists are unresponsive to professional evolution, then is it not time to invent a new species of scientist?". When the winds of change are blowing around us, we can elect to build either a shelter or a windmill. Effective communication can help us harness the forces affecting us rather than letting them blow us away. This is nowhere more true than in the arena of inter- and transdisciplinary projects.

Acknowledgements

This chapter is a modified version of material which originally appeared in Hobbs (1998). I sincerely thank Gunther and Bärbel Tress for the opportunity to participate in the PhD master class which led to the publication of this book, and for their undying patience in the face of my tardiness with writing.

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