Third-Order Thinking in Science Communication

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Tom Wakeford

1. Introduction

Today, it is widely accepted in the UK and Europe that advances in science and technology are most likely to benefit society at large if the public has opportunities to participate in shaping their development[1].

Reflecting this view, participatory approaches have been developed in the science communication field over the past fifteen years. However, for many, the promise of this supposed new era of citizen involvement has not yet been realised.

To categorise the evolution of thinking about science communication, sociologist Alan Irwin of the Copenhagen Business School has suggested a threefold classification. In the least sophisticated, first-order thinking - often called the deficit model – a presumed public ignorance of science is blamed for any mismatch between scientific objectives and public concerns[2].

In the next stage, the more sophisticated second-order thinking, there is a general recognition of the need for two-way dialogue between the public, on the one hand, and scientists and policy makers on the other. This approach also embraces related approaches such as co-operative research and co-inquiry[3].

However, it is only third-order thinking that takes on board the full complexity and interconnectedness of the elements of knowledge being discussed, and tackles head-on issues such as scientific ignorance[4], the reality of diverse knowledges[5] and the political forces that lie behind science communication strategies[6].

Over recent decades, thinking in Europe has changed, and sometimes changed back, from first-order thinking to a mixture of first-, second- and third-order thinking. This paper explores some examples of each of the three modes, and offers some suggestions for how science communicators could apply third-order thinking to the highly complex dilemmas that face humanity in the coming decade.

2. First-order thinking

The UK's Royal Society launched a report on the Public Understanding of Science in 1985. In its report 'science' itself is constructed as unproblematic – the result of rigorous processes which generate facts that are assumed to be incontrovertible and which can then form the basis of 'evidence-based' policy. If citizens do not accept or recognise these facts, then the failure in transmission is blamed on unreliable science journalists, 'irrational' public beliefs, or both.[7] There was an apparent assumption of 'public ignorance' in matters of science and technology. Science itself is seen as having legitimate authority in democratic societies without the need for a dialogue with the public, who are merely required to be passive recipients of scientific facts.

PEALS Research Centre, Newcastle University, UK.
Contact: wakeford.tom@gmail.com

This style of science communication is an example of Irwin's first-order thinking. In discussing any issue with a perceived scientific dimension, Irwin's analysis suggests the following four elements of communication:

1. An authority claim is made using the language of certainty.
2. Science is presented as absolutely central to the whole issue.
3. The best interest of all citizens is decided without involving them.
4. Little if any account is taken of the diversity and knowledge possessed by citizens.

3. Second-order thinking

The growing recognition that great uncertainty surrounded many of the science-related issues of the day – including BSE, 'mad cow disease' and environmental contamination in the wake of Chernobyl – gradually helped to foster the emergence of a new approach to science communication centred on 'dialogue' with the public[8].

Influenced by figures such as Irwin and sociologist Brian Wynne of Lancaster University, the UK's House of Lords released a landmark report in 2000. It tackled the broad topic of 'Science and Society' by emphasising the 'new mood for dialogue' on science and technology[9]. It called for greater acknowledgement of doubt and uncertainty in scientific research and for a change in the culture of science communication and decision-making 'so that it becomes normal to bring science and the public into dialogue about new developments at an early stage'. A new consensus emerged in the early 2000s which suggested that science would gain legitimate authority only if citizens were given a voice.

Two dialogue methodologies - citizens' juries and consensus conferences - have now been held in some 16 nations. A conservative estimate would be that there have been one thousand citizens' juries in the UK alone, since the first one took place in 1994[10]. These interventions have been inspired by the notion that groups of 14 to 16 citizens , after scrutinising evidence of expert witnesses of their own choice, can bring important perspectives to bear on issues that may at first glance appear to turn solely on technical issues – such as stem cell research, genetically-modified foods and a host of environmental problems[11), 12)].

At the same time as attempts were being made to bring about dialogue-based science communication, social researchers including Irwin, Wynne and Michel Pimbert of the International Institute of Environment and Development were monitoring and analysing these processes of deliberative democracy[13].

Three key questions arose:

1)　Who is in control of the issues that are discussed?

During a debate on genetically modified (GM) crops sponsored by the UK government, it became clear that civil servants defined the task as clear-cut decision-making on a particular technical issue[14]. For many members of the public, however, the debate was connected to a wider-ranging set of questions about the power of transnational companies, globalisation, the future of British agriculture, and the comparative benefits of GM innovation to North

American industry and British consumers. Members of the public thus typically framed the underlying issues much more broadly than did government and industry. However, the official framing of the GM debate – cast as simply a matter of narrowly defined risk and benefits – inevitably sidelined the broader range of issues introduced by citizens, where were redefined as attempts to introduce bias into an essentially technically-driven assessment.

2)　Who decides what constitutes a scientifically valid – and relevant - fact?

At a meeting held at the UK Houses of Parliament on 18 March 2002, Anjamma, a smallholder from the Indian state of Andhra Pradesh, launched a report on the possible introduction of GM crops to her state. She presented a personal account of a participatory process called Prajateerpu (from the local Telegu language – meaning 'people's verdict')[15]. Anjamma stated that she and her fellow jurors had concluded that genetically modified (GM) crops would have little foreseeable impact on reducing malnutrition in Andhra Pradesh. The process – a hybrid between a citizens' jury and scenario workshop – had, she reported, enabled the jurors to assess information presented by a range of scientists, based on their own cross-examination of fourteen experts and stakeholder representatives. It had been facilitated in an open and transparent manner by a team based at the University of Hyderabad and the non-governmental organisation ActionAid India.

The jurors had reviewed the evidence, including that provided by those supporting the introduction of GM crops, but put forward their own evidence-based call for local self-sufficiency and endogenous development in farming and food.

Having observed the whole Prajateerpu process, Paul Ter Weel, a senior scientist working for a Netherlands Overseas Development Agency observed that:

> 'What was most interesting was the fact that farmers, on the basis of their knowledge, wisdom and feelings, rather quickly understood what they are dealing with. . . . What amazed me indeed was that they immediately knew whether what was being told to them was nonsense or propaganda or whether it had some meaning. And that of course gives hope that there is still this wisdom available amongst them to judge what is useful, what is genuine and what is not'[16].

Prajateerpu's conclusions have been reflected in many other processes involving farmers in Africa, Latin America and other Indian states, reflecting a growing global grassroots-led movement for food sovereignty, based on what Irwin calls 'citizen science'17). It reverses the conventional logic of dialogue exercises involving science and technology, under which citizens are confined to the role of uninformed student while experts are cast exclusively as the teachers. In Prajateerpu, on a wide range of issues relating to agriculture, it was the so-called experts whose facts were challenged and the lower-caste Indian smallholders and labourers who were shown to have a considerable degree of expertise and the ability to apply it to new ideas.

3)　If dialogue is about a conversation – implying that both sides will learn from it - what assurance do citizens have that politicians take on board citizens' insights and priorities?

An editorial in the UK's Times newspaper concerning the nationwide dialogues on GM, which were sponsored by the UK government, reflected a widespread perception that 'promising to consult the public is the perfect way to put off making a decision or to provide cover for an unpopular decision that has already been made'[18]. Recent evidence suggests that most public engagement exercises, even those commissioned by UK Research Councils, are in effect exercises in market research, providing content for subsequent 'public information' campaigns in keeping with first-order thinking[19],[20]. Over the subsequent years, UK citizens and some social researchers have questioned the lasting impact of such a process when 'the carnival leaves town'[21].

A wide range of research, undertaken in an attempt to monitor public dialogue, supports Irwin's conclusion that 'the shift to second-order thinking has been partial, fixed-term and patchy'[22].

To move towards second-order thinking, institutions need to:

- Review the language of authority that gives a misleading impression of certainty and of the inevitability of benefit from new technologies.
- Not only recognise uncertainty, scientific bias and shortcomings but also the validity of diverse perspectives. Recognise that scientific data alone is an insufficient determinant of decisions.
- Take seriously the diversity and knowledge possessed by citizens who have not traditionally been regarded as experts
- Take decisions only after systematic attempts to involve a range of stakeholders.

Institutions commissioning dialogue processes are often constrained by their prior commitments to policies and may be effectively immune to outside influences. UK and EU policy-makers are thus presented with a choice. They can retreat to first-order thinking, as they have on controversial issues such as nuclear power and more recently synthetic biology, reverting to the 'public understanding of science' approaches of the 1980s[23]. However, they can also move towards a third approach, which Irwin and others have begun to outline.

4. Steps towards third-order thinking

Third-order thinking, Irwin believes, will ask 'deeper questions, such as the relationship between scientific governance, political economy and innovation strategy…' By 'recognising the partiality of progress from first- to second-order thinking', Irwin suggests that the new approach needs to 'raise issues that take us to the core of social and scientific 'progress' in democratic societies'.

Such a move also necessitates a more thorough characterisation of the complex problems that science communication techniques are attempting to address. A classification of problem complexity, with consequences for how they should be tackled, has been developed in the field of organisational studies in recent years. It distinguishes between 'tame' problems at one end of a spectrum of complexity and so-called 'wicked' problems at the other[24].

Robin Holt of Liverpool University has suggested that emerging risk management

bureaucracies have tended to mis-classify problems as 'tame'. This fundamental error has led institutions to:

- analyse such problems within a simple hypothesis-testing paradigm, which is often followed by a process that gives the impression of being a two-way dialogue with citizens, but is largely an exercise of risk communication – transmitting information from technical analysts to citizens.
- promulgate a dogmatic belief that problems are solved by specialisation and a simple division between 'science' and 'society', rather than embracing an holistic view encompassing multiple perspectives.
- promote the belief that everyone will reach a rational consensus on what needs to be done on a particular issue and the right way of going about doing it, based on the purely technical based assessments of risks and benefits.

Yet Holt points to the growing realisation that most problems are far more complex, including five key aspects:

1. Problems usually have complex underlying social realities, requiring qualitative judgements and variable methods of mutual learning.
2. They emerge gradually from a variety of causal pathways.
3. Different people see the problem from divergent perspectives. These people may then set up strategies based on different mental models, potentially leading to the wrong problem being solved.
4. The problems often cause a loss of orientation, including the suspicion among some of the diverse actors that those committed to solutions different to their own must lack integrity, intellect or both.
5. The problems are not amenable to solution, but can only be contained, with acknowledgement that action may be necessary or that new events may, if harnessed correctly, make the problem easier.

The immense challenges the world now faces – climate change, an ongoing HIV/AIDS pandemic and famines across much of the globe - are all examples of these complex, so-called 'wicked' problems. Far from being an optional extra as some scientists still view it, third-order thinking about science communication is essential for humans to devise means of surviving the coming century. The fact that many of the leading organisations dealing with wicked problems are community-based, rather than scientific institutions, should perhaps give science communication professionals pause for thought[25].

The past thirty years of science communication is not a story of consistent development, with one way of thinking inevitably giving way to the next and then the next[26]. Instead, in most national and local contexts within the EU, these different 'orders' have been confused. The deficit model, with its first-order thinking, has co-existed with talk of dialogue, engagement and co-inquiry. But a growing number of people have recently begun to reflect upon the inherent limitations, contextualities and conditionalities of both deficit and dialogue approaches. It will be vital that such efforts are deepened and broadened in the coming decade, to provide a stronger counterweight to those forces that continue to promote a model of science communication in which the only role envisaged for citizens is to applaud scientists from the sidelines.

Notes

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