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Comment

ROAD MAPS FOR THE 21ST-CENTURY RESEARCH IN SCIENCE COMMUNICATION

From analogue to digital scholarship: implications for science communication researchers

Richard Holliman

ABSTRACT: Digital media have transformed the social practices of science communication. They have extended the number of channels that scientists, media professionals, other stakeholders and citizens use to communicate scientific information. Social media provide opportunities to communicate in more immediate and informal ways, while digital technologies have the potential to make the various processes of research more visible in the public sphere. Some digital media also offer, on occasion, opportunities for interaction and engagement. Similarly, ideas about public engagement are shifting and extending social practices, partially influencing governance strategies, and science communication policies and practices. In this paper I explore this developing context via a personal journey from an analogue to a digital scholar. In so doing, I discuss some of the demands that a globalised digital landscape introduces for science communication researchers and document some of the skills and competencies required to be a digital scholar of science communication.

Introducing science communication and public engagement

I started my PhD research in the autumn of 1996, exploring UK national newspaper reporting and television news media coverage of the sciences.[1] This followed the recent publication in the UK of the Wolfendale Report,[2] which reviewed the 10 years of public understanding of science initiatives that had been spawned by the publication of the Bodmer Report in 1985.[3] Popular science books were enjoying something akin to a 'golden age' in terms of sales, basking in the success of the 'Hawking phenomenon' that followed the publication of the best-selling book—*A brief history of time*—that "everybody bought, but nobody read".[4] In other sectors of the science communication economy plans were taking shape for a number of new science and discovery centres and museums in the UK, with their openings planned to coincide with the turn of the millennium.[5]

In terms of research publications Dorothy Nelkin had recently published the second revised edition of her book *Selling Science*,[6] and Brian Wynne and Alan Irwin were celebrating the publication of their edited collection *Misunderstanding science*.[7] These two generative texts explore research themes that remain important for contemporary science communication researchers. Respectively, they examine aspects of mediated science communication produced for consumption in the public sphere by mass audiences, and what has become known as (upstream) public engagement with science and technology. These two themes remain important today for anyone interested in researching science communication and public engagement, which is why colleagues and I decided to feature them in the recent edited collections that we produced.[8,9]

Researching science communication to inform scientific governance, policies and practices

The generative texts produced by Nelkin[6] and Irwin and Wynne,[7] respectively, supported by analogous research work, identified and critiqued the limited theoretical conceptualisation and related practical applications of the 'deficit model.' In particular, social researchers produced evidence of localised

'knowledges in context',[10] demonstrating how this could inform issues that had previously been considered the sole province of scientifically-informed solutions. In so doing social researchers, particularly those informed by science and technology studies (STS), were highly critical of Walter Bodmer *et al*'s now infamous report on the public understanding of science,[3] and the governance strategies, policies and practices that it informed.

The limitations of the 'deficit model' were laid bare in March 1996 following the admission by the UK government of the time that BSE (bovine spongiform encephalopathy, a cattle disease) and vCJD (variant Creutzfeldt-Jakob disease, which affects humans) were linked.[11,12] The official UK 'deficit-led' policy that informed a 'campaign of reassurance' was heavily criticised.[11] Other high-profile scientific issues generated debate in the public sphere around the turn of the millennium, raising further concerns about governance of the sciences.[12] Notably this involved debates about reproductive cloning following the announcement of Dolly the sheep,[1,13] which quickly become a global media story, and unease in the UK and Europe in particular about the relative safety of the commercialisation of genetically modified crops.[12] Concerns raised by a whole range of stakeholders and citizens about these and other science-based issues were made via news and current affairs media and other channels of communication. Combined with a growing body of research evidence that reinforced the idea that citizens could bring useful and relevant knowledge to bear on issues of scientific governance, the corridors of political and scientific power in the UK began to adapt their practices of science communication and scientific governance. This more sophisticated approach, encapsulated in the concept of a 'dialogic turn',[14] is enshrined in the mantra of 'openness and transparency' combined with some level of acknowledgement that different forms of knowledge can usefully inform science policies and scientific governance. This sort of approach informed consultations in the UK about reproductive and therapeutic cloning[15] and GM crops[16], for example, as well as more recent public engagement work exploring aspects of nanotechnology[12,17] and synthetic biology.[18]

The shift towards a 'dialogic turn' in the UK and the associated calls for openness and transparency are often attributed in research and policy literature to the publication of a House of Lords Select Committee Report in 2000,[19] a process to which STS scholars and communication researchers gave evidence. However, the emphasis on the importance of this single report oversimplifies the evolutionary and long-term nature of this shift,[20] and the resistance to it,[21] at least some of which is ongoing. Neither can claims be made that the 'dialogic turn' has been universally welcomed or comprehensively enacted.[21,22,23] Nevertheless, a gradual shift away from simplistic conceptualisations of 'the public' as empty vessels awaiting authoritative knowledge from scientists and scientific institutions, towards a more sophisticated conceptualisation based on ideas about distributed expertise and mutual respect, can be identified over the past 25 years in at least some policy documents, institutional rhetoric, funding initiatives, and practical applications.[24]

What is not in doubt is the significant role that research produced by STS scholars and researchers of science communication played in reconceptualising the relationship between scientists and scientific institutions, politicians and officials, media professionals and other stakeholders and members of the public. In effect, findings from social research made a vital contribution to the ways that the UK science communication community, scientific institutions and policy makers organised their science communication strategies and approaches to scientific governance.[25]

The contributions from social researchers to the 'dialogic turn' has been a defining feature of the stabilisation of science communication as a discipline in its own right, building on the work of earlier scholars. This is a discipline that is currently researching a mixed economy of 'deficit' and 'dialogue' informed approaches.[26] These are communicated via a range of face-to-face events (e.g. in science centres and museums,[5] and at festivals, dialogic and deliberative activities[14,15,16,17,18]) and through 'traditional' (e.g. print and analogue forms)[1,4,13] and digital media.[8,9,23] As science communicators we clearly have a role to play in helping to embed the practices of public engagement among scientists and scientific institutions, media professionals, politicians and officials, media professionals, other stakeholders, and citizens.[9] Similarly, we face challenges as lecturers and trainers when teaching and training various actors about what is, effectively, a new social contract between the sciences and their publics.[27] But we also face challenges as science communication researchers. What are the significant areas of study, the important research questions that we should attempt to address to effectively explore the emerging practices of public engagement and digital science communication? How are existing and emerging social practices influencing the ways that science communication research is conducted? And what skills might be needed to research science communication in the information age? To provide some initial illustrative answers to these questions I will document my journey from an analogue to a digital scholar.

Researching science news: from analogue to digital scholarship

Back in the autumn of 1996 I began the data collection phase of my PhD. Initially I looked at newspaper reporting of a Martian meteorite and whether it contained evidence of extra-terrestrial life.[1] The story broke in August 1996, the 'silly season', so I was collecting data for this story retrospectively.[28] I decided to explore national newspaper reporting and television news coverage in the UK. I selected eight newspapers, categorising their daily and Sunday equivalents as 'red-top' tabloids, 'mid-market' tabloids and broadsheets, and news bulletins from the four analogue channels broadcasting at that time.[1] In the late 1990s these categorisations of newspapers worked effectively. The naming convention of tabloids and broadsheets delineated newspapers most obviously in terms of their size in printed form,[29] but more importantly for science communication researchers in terms of their core readership, editorial policies, employment of specialist science journalists, and so on. Today this conceptualisation is more problematic, principally because some UK broadsheets have adapted their printed publication format to become tabloid ('compact') size, whilst others follow a 'Berliner' format. In effect, changes to the ways that newspapers are produced have resulted in science communication researchers reconsidering how they conceptualise these forms.[30]

Other changes have also influenced how science news is researched. In 1996 I was analysing printed copies of these newspapers.[31] Although I had to contend with data collection challenges relating to different editions, and incomplete archives of hard copies in libraries, the printed form was the only one available. This phase of my data collection initially involved trips to libraries in Milton Keynes and London, working via printed card indexes and with face-to-face with librarians to track down missing printed editions. At first I mainly trawled the recovered newspaper pages by hand, sometimes using microfiche; then came the advent of CD-based collections, and finally online collections available at the click of a mouse.[32]

This shift to online collections has been apparent in many areas of scholarly activity, facilitating searches of, and speedy retrieval from, large digitally stored archives.[32] For science communication researchers these changes introduce new opportunities, but also challenges. For example, faced with desktop access to large digital collections of newspaper articles I found that I often lost the typography of the printed pages. Sometimes page numbers were not listed, and photographs and captions were rarely included.[33] In short, some of the data that I required were missing. In the end I decided to use the electronic searches as a starting point, then collecting printed copies to ensure that I collected equivalent data. To this end I was confident that, with time, I could compile a comprehensive archive of the reporting of my chosen case studies in the selected newspapers.

Data collection of news media reporting became more complicated when several national newspapers decided to launch online editions to coincide with the 1997 UK general election campaign.[34] The publicly available web was effectively a 'click and download' version at that time,[35] but it still provided an effective and increasingly popular platform for publishing news free of charge, speedily, and often in advance of printed editions. This development, which was matched by broadcasters, signalled the birth of the 24/7 multi-platform newsroom and dramatically changed how science news is promoted to newsrooms, and sourced and produced by journalists.[36,37]

As digital forms were added to online news platforms, media professionals were required to extend their skills and competencies in how online news was produced, both within the newsroom and in media relations teams working for various institutions.[36,38,39] Similarly, readers, listeners and viewers were required to learn new media literacy skills in accessing, assessing, analysing and, in some instances at least, responding to digital forms.[40] Significantly, science communication researchers also needed to revise their thinking in the light of these changes, both in terms of the types of research questions they asked, and related to these questions, what types of data they needed to address them, and how these data were systematically collected. In short, the whole idea of a sample of news media became more complicated with the introduction of online news.

Within this developing digital context, the related concepts of a newspaper and broadcast (television and radio) news have been, and continue to be, redefined. In this converged landscape, online news (and other genres) has moved beyond printed and broadcast formats, although these forms continue to exist. Newsrooms now produce 24/7, 'rolling', 'glocal' news in an increasing number of forms, including online text, podcasts, web video, simulations, live chat, blogs (at least some of which allow, indeed encourage, user-generated comments and feedback).[41] In a similar vein, television companies and corporations are involved in a 'digital switchover' in the UK, facilitating the production of online text to

complement on-demand audio and video content, red-button television, and so on.[42] But public service broadcasting and commercial news outlets are only part of this developing context. Scientific institutions, governmental agencies, non-governmental activists and other stakeholders also use the web to produce content in a wide range of forms.[43] And user-generated content can be produced, and depending on the form, commented on, by anyone with access to a networked computer and the software and skills to produce it.[35]

This vast increase in the amount and types of digital content places additional demands on science communication researchers who study these forms, not least on how research questions are conceptualised and which media and genres are studied. There is a danger, for example, that science communication researchers focus their efforts on emerging forms of communication, largely overlooking existing forms and historical examples. Even the most cursory glance at recent scholarly work that explores aspects of the history of science communication and 'traditional' forms illustrates the folly of such an artificial limitation.[44,45,46] Second, there is a danger that science communication researchers fetishise digital content and online forms as 'new' without detailed consideration of them.[47] Rather, there is a need to study the social practices associated with *all* forms of science communication; how are they used, by who, requiring what skills, when, where, on which devices, to what ends, to what effects (if any), and increasingly to what response?

Conclusion: re-skilling the digital scholar

The shift from analogue towards digital media means that science communication researchers have been required to extend and regularly revisit their research skills and competencies. As a result, information literacy skills are more central to training programmes for researchers.[48,49] All stages of the research process are affected by this move towards digital scholarship.[50] This influences data collection and analysis, and the ways that research questions are conceptualised. But researchers are also: registering for automated and personalised updates from possible funders; searching for, and communicating online with, international collaborators; blogging and social networking about research processes; using networked computers to source literature, and analyse and archive data;[35,51] in some instances, checking for existing patents and contributing to new applications;[52] in others, responding to requests made under Freedom of Information legislation;[51] and producing a wider range of outputs from research projects, including podcasts and web video.[53] This is extending the concept of 'publication'.[51] Final reports are still required, but they can now be published online in the form of 'grey literature',[23,40] perhaps in open repositories.[54] Peer reviewed publications, which can be published via pre-print servers,[55] still hold currency, but are now increasingly published in open access journals and via open review.[32,56] Moreover, researchers are now expected to upload papers and grants for review via digital interfaces for academic journals and research funders, respectively. The fact that papers and grant applications can be submitted via web portals means that additional information, such as raw data in the case of research papers,[51] and project reports in the case of grant applications, can also be submitted. As a result reviewers are being to asked work online to review more documents than was previously the case. In short, digital scholarship has changed the ways that we research science communication. This process is ongoing. It requires that researchers continually re-skill to keep up with developments. None of us are 'future proof' in the digital age.

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