ENGAGING THE PUBLIC WITH SCIENCE IN THE BASQUE COUNTRY: ON SCIENTISTS' EXPERIENCES AND PERSPECTIVES

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Science, Scientists and Society

The rocky relationship between science and society has been an enduring concern over the last few decades. There has recently been an unparalleled encouragement for scientists to open up their disciplines and engage with new audiences. In the nineties society had to become knowledgeable in science and technology, and scientists contributed to this end by filling the existing knowledge vacuum with information. The current approach goes beyond that to promote public participation in the development of science and technology. The current focus on Responsible research and innovation (RRI) seeks to enable a robust relationship between science and society, and to encourage scientists to be active in considering the implications of their work, and hence in facilitating collaborative deliberation with the public and stakeholders .

Scientists' perspectives about the public and the communication process are central to visions of RRI, which have a renewed focus on the responsiveness of science, scientists and policy makers, moving beyond the longstanding debate about the capability of the public to understand and engage in science. Following this line of investigation, the recent RRI discussions open up the question of how scientists think about their responsibility and agency within public communication and engagement; as well as how actively they engage in it.

Key points

- ***Public participation in the development of science and technology is key in modern societies, and scientists' understanding of their responsibility and agency within this practice is still underexplored.***
- ***Face-to-face forms of science communication are the most commonly reported.***
- ***Scientists see science communication as a social responsibility, and they feel responsible to carry it out well.***
- ***Scientists describe successful science communication as that which, primarily, brings something positive to its audiences.***
- ***Learning about the audience, communicating science-in-the-making, and collaborating with other disciplines (i.e. artists), are seen as the most critical factors for successful science communication.***

Talking to Scientists

The remainder of this document reflects on these issues of responsibility and agency towards public engagement by presenting findings from a study of scientists from the Basic and Excellence Research Centres (BERC) network, and the University of the Basque Country (UPV-EHU). The study consisted of an initial survey to explore the overall degree to which scientists are familiar with, and had participated in science communication activities; and follow up focus groups which explored their views of it in detail. Table 1 offers an overview of the study:

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		The Online Survey	The Focus Groups
Type of Data		Demographics: *Discipline, years of research experience, and institution.* Familiarity with science communication activities: *Frequency and type of engagement, reasons for engagement, willingness for future engagement, and quality of past experiences.*	Participants' positive and negative personal experiences of science communication. Discussion of best practice. Ideal forms of science communication.
Sample	**Size**	80 Complete responses	25 Participants
	Gender Balance	56% (M) - 43% (F)	50% (M) - 50% (F)
	Institution	University of the Basque Country (41%)	University of the Basque Country (20%)
		Basic and Excellence Research Centres (BERC) network (30%)	Basque Centre for Climate Change (40%) Basque Centre for Neuroscience (20%) Basque Centre for Macromolecular Design and Engineering (20%)
	Disciplines	Climate and Earth sciences* (40%) Ecology (16%) Chemistry (14%) Neuroscience (10%) Mathematics (10%) Physics (5%) Engineering (3%) Medicine (2%)	Climate and Earth sciences* (48%) Chemistry (24%) Neuroscience (20%) Physics (8%)

Table 1: Type of data and sampling considerations by data collection method.
* This group also includes social scientists (e.g. economists) that at the time of the study were working within climate change.

Face-to-face: the most commonly reported form of science communication

The survey included a list of activities which participants could choose from in reporting their involvement. This included traditional media, such as appearances on radio, TV and newspapers; digital media, such as interacting in online forums; and face-to-face encounters, such as events at schools or universities, science cafes, museums, science festivals and public talks. Live and face-to-face forms of science communication received the most positive responses, since the most reported activities were: 'give a public talk or lecture' (79%) and 'participate in a dialogue event or workshop' (59%). Response data from this question is found in Figure 1.

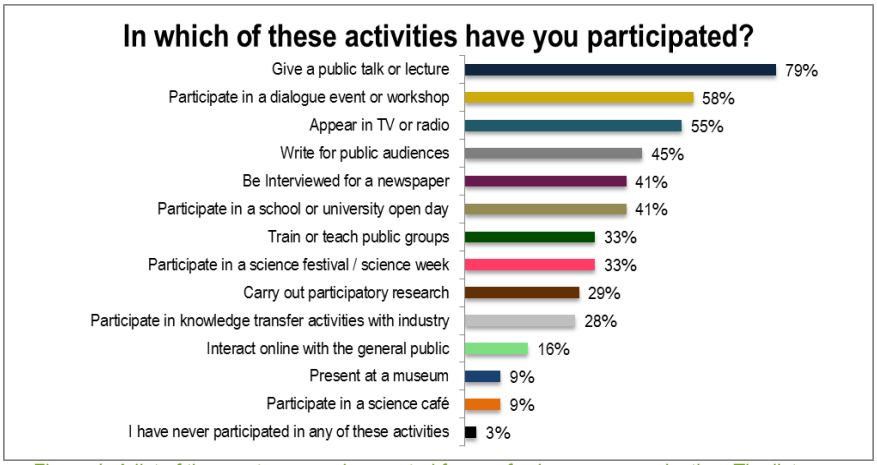

Figure 1: A list of the most commonly reported forms of science communication. The list was based on that found in Davies (2013), which was in turn developed in collaboration with the UK's

Scientists claim responsibility and agency

Scientists in this study did not view science communication as something self-indulgent, or oriented to their own needs, rather they saw science communication as a social responsibility, as their duty. Success in face-to-face science communication, the most commonly reported form, was defined as the extent to which the audience benefited from a given encounter. That is, to the extent to which it contributed to increasing the scientific and technological knowledge, personal fulfilment, or enjoyment of the audience. This is illustrated in the following episode, which indicates how success is tied to the 'pride' felt by an audience member:

> *...there was a guy that was a mechanic in a laboratory, so he was in a scientific environment, but he didn't know for what they were producing the things they were producing, and after my talk he understood, and he was so proud to know how he participated, and he told his grandchildren*

Though the definition of success was primarily tied to the fulfilment of the audience, scientists also acknowledged that these communication activities had positive impacts in their professional careers. They saw these activities as an opportunity to improve their communication skills, and sometimes also as a source of enjoyment. Participants explained that while they could learn from mistakes and uncomfortable experiences and grow into better communicators, any sense of pleasure or satisfaction would only come from positive audience outcomes. The following case illustrates a scientist who experiences a feeling of 'happiness' as a result of an engaged, interested, and learning audience:

> *...they were learning stuff and asking a lot of questions... and that for me was really successful... I felt happy!*

This interpretation of the sense of responsibility is supported by the data from the survey. One of the questions asked respondents why they had participated in science communication in the past. As can be seen in the Figure 2, a sense of 'duty' or 'social responsibility' is the main motivation for scientists to engage in such activities. Similarly, the survey showed that 83% reported having had positive experiences, while 17% reported having had bad experiences or good ones only sometimes. However, when asked about their willingness to participate in science communication in the future, 93% said yes, which shows that some of those scientists who do not always find it enjoyable are also committed to public communication.

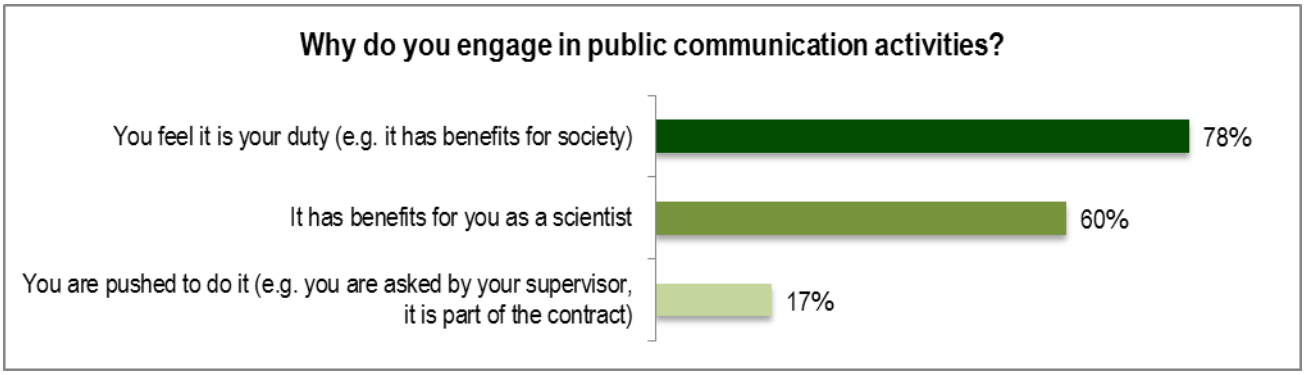

Figure 2: Reported reasons for engaging in science communication activities

In the focus groups participants were also encouraged to discuss factors that had, in their experiences, lead to success or failure. Some of these were more practical recommendations such as 'show real life applications of your research', while others dealt with attitudes and behaviours towards the encounter and the public such as 'be flexible, be ready to accommodate setbacks'. The great majority of these examples were things that the scientists as interlocutors could control, things that if they implemented or avoided would bring positive outcomes. In the discussion it became clear that participants saw themselves, not the audience or any other external factor, as responsible for the outcome, that is, for providing a good experience for the audience and for themselves.

Table 2 shows the controllable and uncontrollable sources of success and failure discussed by the participants. Strikingly, there are only afew references to those things which are out of the participant's hands.

SOURCES					
UNCONTROLLABLE SOURCES		**CONTROLLABLE** SOURCES			
		ATTITUDES and **BEHAVIOURS**		**MEASURES** and **INSTRUMENTS**	
SUCCESS	FAILURE	SUCCESS	FAILURE	SUCCESS	FAILURE
Audience attitude		**Setbacks**		**Message/Language**	
Positive attitude Willingness to participate	Presence of outliers or spoilers	Be flexible: Anticipate setbacks and straighten out	Be rigid: Unable to react to setbacks	Real life applications Language adapted to audience	Message too technical Too much content
		Degree of Involvement		**Activities / Materials**	
		Be enthusiastic: Express your love for the subject	Be too emotional: Don't take setbacks personally	Images and Videos Attractive materials Hands on experiments	Lack of objects to touch and play with
		Level of control		**Style**	
		Be confident: Prepare in advance, Talk about what you know	Be insecure: Weak knowledge of subject, Rambling	Find your own style Do what you are good at	Lack of own style Try to be somebody else
		Relational skills		**Planning / Organization**	
		Be empathic: Put yourself in the place of your audience		Follow the schedule Specific and clear roles	Lack of clear goals Bad logistics
				Scientists - Audience Relation	
				Be one of them Dress informally	Anything that promotes an elitist view of scientists
				Communication Model	
				Promote socialization (beer, wine, pizza) Communication among all parts	Preach Give a speech and leave

Table 2: Controllable and uncontrollable sources of success and failure

The few instances in which a participant attributed the lack of success to the audience or other external and uncontrollable factors, were dismissed within the focus groups by appealing once again to the notion of responsibility. Participants suggested that the problem of an apparently disengaged audience could be overcome by modifying one's approach and delivery. An example follows:

I don't really think I could have done anything, they [the audience] came with that attitude, and you feel that they are not listening…

...there is no such a thing as a lack of interest of the audience, there is a lack of attitude of the speaker

Keys for better science communication

As well as discussing factors for success and failure, participants were also encouraged to describe their ideal public communication activity, as well as to synthesize what they thought was most important when facing these activities.

When scientists were asked to give free rein to their imagination, and to describe what their ideal science communication encounter would look like, they often responded with another question: 'For what audience?' Participants made clear that 'the public' is not an homogeneous and uniformly ignorant group of people, but that rather it is composed by smaller publics who possess different types and degrees of knowledge. They subscribed to the idea that everything – arguments, explanations, dynamics, materials – needs to be rethought and adapted to who your interlocutors will be. As an example, they discussed the fact that is not the same to communicate to adults and 'children', since both these publics have different characteristics and consequently different needs. They also mentioned the need to carefully rethink their communication style when dealing with those communities that are directly affected by their work – such as communities prone to flooding.

Alongside the deliberation about relevant communication, participants also discussed the idea of what should be communicated. They acknowledged the need to open up their disciplines and their workspaces and invite audiences to learn about and engage with science, not as a final product but in-the-making. They agreed that science should be presented as a complex process riddled with uncertainties; and that the public should be allowed to feel the struggles scientists face, as well as to grasp the questions scientists ask themselves when they make the science. This understanding of what the public should engage in is in line with what RRI proposes: collaborative deliberations with the public and stakeholders, not to present finished results but to reflect together on, for instance, ethical considerations of their work.

Finally, in considering ideal forms of science communication participants manifested their willingness to collaborate with other disciplines (i.e. artists or communication professionals). They spoke, for instance, of projects developed with those with skills in theatre, videography, art, or communication studies itself. The fact that they used the term 'collaboration' implies two things. First, although scientists assume responsibility to provide successful public communication, they don't overestimate their capacities, and they acknowledge that other professionals have valuable insights to better carry out this task. And second, scientists don't shirk responsibility by delegating the task of science communication to other professionals, rather they assume an active role in it.

Conclusions

Scientists in this study have engaged in many forms of science communication activities, the most popular of which is face-to-face. Their accounts of the quality of the experiences are positive and they show willingness for future interaction. Although participants acknowledge benefiting from public communication, they primarily carry it out for the sake of the public, they see it as their duty, as a social responsibility. Moreover, they construct success as dependent on public audiences having a good experience of it. Similarly, scientists subscribe to the idea that they are in charge of the communication process and that a positive or a negative outcome is largely in their hands. They discuss, for instance, preparing in advance, having a positive attitude, and exploring who their audience will be.

In this population of scientists, then, calls for RRI seem somewhat redundant: RRI sets the focus of public engagement in science and scientists, and predicates that they need to be responsible and active in reflecting on their work and its implications; but in the context of this research, it seems that scientists are already actively engaged in taking responsibility for public communication.

In closing, it is important to reflect on the context of the study and on how it might be influencing the results. First, scientists in this study were encouraged to talk about ideal forms of public engagement and to think creatively, ignoring all real-world constraints such as money, time and resources. Second, the sheltered space of a focus group setting might have encouraged scientists to take a surfeit of responsibilities: they assume responsibility to carry out science communication, and to carry it out well. But in the real word, scientists already feel overwhelmed and push public communication activities aside ; and no one has total control over such encounters: audiences will bring their own knowledge and experiences, and organizers and moderators can intervene in unexpected ways. The aim of this last reflection is not to downplay the results of this study, or belittle the sense of responsibility and agency of the scientists involved, but to indicate that further research is needed to explore how these notions coexist with the way in which contemporary techno-scientific work is structured.

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