New Frontiers in Science Communication: Researchers' Experiences of Coming Out of the Lab

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Abstract. *Researchers are increasingly playing a key role in the public communication of science. This makes understanding researchers' motivations, and the benefits and barriers they perceive, an important step to ensuring successful direct interactions between scientists and publics. Through the synthesis of the evaluation findings, this paper explores the impacts on the researchers who took part in four public engagement projects in the field of robotics. In general, the impacts have been positive and of a practical, personal and professional nature. However, only a small number of the researchers' comments indicate a change in attitude to public engagement.*

Keywords. impacts, roboticists, scientist

1. Introduction

For some time, the UK funding bodies for research have encouraged their funded researchers to become involved in public engagement. In 2001 Pearson(1: p124) reviewed schemes run by the five UK scientific Research Councils and identified a number of wider benefits achieved through scientists' participation in what were then termed 'PUS' (Public Understanding of Science) activities. These included "long-term improvement in scientific awareness that allows public participation in debate"; "ensure that the UK remains scientifically and industrially competitive"; "raise awareness of issues"; and "better understanding of the research process". The benefits were therefore at both the individual and societal level.

From the perspective of public audiences, a recent Eurobarometer study(2: p91) found that "close to two out of three Europeans believe scientists are the best qualified to explain the impact of science". It therefore follows that researchers could potentially play a key role in the public communication of science. Understanding researchers' motivations for undertaking such activities, and the benefits and barriers they perceive, is thus an important step to ensuring successful direct interactions between scientists and publics.

A number of studies have investigated researchers' experiences of taking part in such activities. In 2000, the Wellcome Trust commissioned a survey to explore *The Role of Scientists in Public Debate*(3). This survey reported that a "vast majority of scientists believe it is their duty to communicate their research and its social and ethical implications to policy makers, and to the non-specialist public"(p21). Of the 1540 scientists interviewed, 86% could see personal benefits to taking part in public engagement, including helping with their career (32%), attracting possible funding (29%), satisfaction/enjoyment (22%), advancing the role of science (15%) and increased experience in communicating (11%).

A more recent UK study by Poliakoff and Webb(4) suggests four factors which predict scientists' intentions to take part in public engagement activities: the extent of past public engagement activity, whether the scientist regards participating as positive, whether the scientist feels able to take part and how much the scientist perceives that their colleagues are taking part.

A follow-up to the Wellcome Trust study was conducted by the Royal Society, which performed a *Survey of Factors Affecting Science communication by scientists and engineers*(5). This study found an 18% increase in the number of scientists or engineers taking part in a public engagement activity in the six year period between the two publications. The study also explored barriers to taking part: the most common answers concerned the need to spend time on other activities such as research, seeking funding, administration and teaching. In the

same survey, 20% of respondents indicated that "scientists who engage are less well regarded by other scientists"(p10). During subsequent qualitative interviews, several researchers commented that public engagement was "seen by peers as bad for their career"(p11) or that "public engagement was done by those who were 'not good enough' for an academic career"(p10). Similar negative repercussions for career progression were highlighted in a study by Martin-Sempere et al.(6) which studied 167 research practitioners at the Spanish Council for Scientific Research who participated in the Madrid Science Fair 2001 – 2004. They found that "certain colleagues consider that those who take part in this type of PCST [Public Communication of Science and Technology] event 'have nothing better to do' or 'aren't good enough for more important activities'"(p358). The study also cites the potential to "trivialise science to some degree"(p357) as a possible negative impact.

More recent evidence challenges these negative perceptions: Jensen et al.(7) analysed data on the outreach, industrial collaborations and teaching of several thousand CNRS (Centre National de la Recherche Scientifique) scientists and found that scientists active in dissemination are also more active academically.

2. The case studies

In late 2006, the UK's Engineering and Physical Sciences Research Council funded *Walking with Robots*, a nation-wide network which provided focus and support for robotics researchers, enthusiasts and representatives from industry to engage public audiences with their work. A variety of flagship projects and events developed out of this network, often with very different approaches and outcomes, but each, at the core, about direct contact between those at the cutting edge of robotics technology and various public audiences.

Robotics technology was specifically chosen as the focus for investigation since robots are frequently perceived as exciting and intrinsically compelling(8), and therefore provides an easy 'hook' for communicating with public audiences.

This paper reviews evaluation findings from the *Walking with Robots* programme and three of its associated projects to explore what happens when researchers come out of the lab and engage with public audiences. The projects cover a range of activities from hands-on building workshops to demonstrations using state-of-the-art components from robotics research or industry. Some events have also included consideration of the social and ethical questions that arise from robotics research.

2.1. Walking With Robots

Walking with Robots initially consisted of researchers in intelligent robotics from eight robotics research laboratories in the UK, as well as experts in engaging public audiences with science and engineering. During its implementation, the network grew considerably to encompass individuals from more than 15 research laboratories and seven industrial partners.

The programme organised and supported some 170 separate events throughout the UK between September 2006 and January 2010. A broad range of event types and target audiences were included, with the programme overall reaching more than 60,000 people.

An external evaluation(9) of the programme was conducted by Laura Grant Associates. This evaluation looked at both the impact of the individual activities on the target audience(s) and the impact of the project on the robotics research groups involved. Impact on the network members was evaluated through an electronic survey and structured discussion sessions with four of the member research groups.

2.2. Public engagement training for roboticists

In February 2008, *Walking with Robots* ran a three-day residential workshop for researchers in robotics and related disciplines to enhance their public engagement skills. Thirty-seven researchers attended the workshop

During the 12 months after the workshop, support was provided for participants to deliver activities at seven science festivals and other public engagement events in the UK.

An independent evaluation(10) of the project was conducted by Jenesys Associates. The evaluation used a mixture of quantitative and qualitative approaches to identify the project's impacts. Methods included observation during the first and last days of the three-day workshop, entry and exit questionnaires, interviews with the researchers, audience feedback via informal interviews and audience questionnaires.

2.3. Heart Robot

Heart Robot used a semi-autonomous puppet to engage public audiences in the issues

surrounding research into emotionally expressive machines. Using experts from within the robotics, animatronics, and performance communities, as well as undergraduate volunteers, the project reached over 10,170 members of the public via 14 walk-about 'performances' of the puppet at street festivals and science festivals in the South West of the UK during summer 2008.

An independent evaluation(11) of the project was conducted by Jenesys Associates. Feedback from the project team was gathered during a discussion event towards the end of the project. A more comprehensive summary of the evaluation can be found in Rocks et al. (12)

Figure 1: *Heart Robot* engages audiences at Cheltenham (UK) Science Festival 2008

2.4. Robotic Visions

Robotic Visions was a project providing a two-way dialogue between young people and current robotics researchers at the forefront of development. The programme involved a series of five separate Vision Conferences in the UK during 2009/10. Vision Conferences are "designed for a large group of participants with the purpose of creating visions for the future about a specific theme."(13:p385)

Robotic Visions was planned to give young adults the opportunity to work with researchers to explore current and future robotics research. In total, 13 senior roboticists and 127 students aged between 13and 18 were involved across the five conferences.

An internal evaluation(14) to investigate the impacts on the young people and the roboticists was conducted by the project team. Feedback from the roboticists was obtained via telephone interviews and email.

3. Results

Across all four case studies, it was noticeable that audiences reacted very positively to the fact that those delivering the activities were researchers or scientists. On many occasions this aspect was identified as the 'best part' of an event or activity. The over-arching *Walking with Robots* evaluation specifically noted particular communication skills on the part of the roboticists which assisted in these interactions:

"From the unstructured interviews, it appeared a success factor was the face-to-face interaction with roboticists who could tailor their explanations to individual visitors." (*Walking with Robots* evaluation)

"When the roboticists were talking [about] what they did and when we got to ask them questions and stuff - that was the best bit because it was really informative and interesting." (Participant, *Robotic Visions*)

From a public perspective therefore, these findings would appear to support the Eurobarometer(2) data, in that the involvement of active researchers in science communication is crucial to successful engagement. Similar findings arose within a recent study, by Wilkinson et al.(8), into participants' reactions to 11 different public engagement events.

From the researchers' perspective, a wide variety of impacts was identified. For ease of comprehension these are here grouped into four main categories: practical; personal; professional/institutional; and those that impact on the relationship between researchers and publics.

3.1. Practical learning

The greatest number of identified discrete impacts relate to lessons the researchers learned 'on the day', in particular relating to the practical elements of delivering a public engagement project or event: learning about the new approaches, equipment, venues and logistics required for public events:

"Researchers were observed thinking about the wider aspects of the different events, in particular event signage, advertising and floor plans or room layouts" (Public engagement training for roboticists Evaluation)

"First time I've done a [science] cafe. I really enjoyed it and found the relaxed atmosphere good" (researcher, *Walking with Robots* event)

"The project demonstrated what can be achieved using mechanisms that are novel to public engagement in the science communication context, but commonplace amongst artistic performers." (*Heart Robot* Evaluation)

"It illustrated to me how group facilitation can allow members of the public to approach complex issues in a specialist field" (researcher, *Robotic Visions*)

Many of those taking part in engagement activities were doing so in addition to their 'day job'. This made it difficult to find the time for significant internal reflection, and may explain why the majority of learning is about logistics and process and not affective.

The highest number of negative impacts was also identified in this category, the most notable being the distraction of taking part in public engagement activities which reduced the time available for other purposes:

"*...there was a lot to organise at the same time. Some of the demonstrators at the event had very little sleep the previous night!*" (*Walking with Robots* Evaluation)

"*The puppeteer was also the project manager, designer and puppet-builder which resulted in excessive and unrealistic demands on one individual's time*" (*Heart Robot* Evaluation)

It is notable that in both of these examples the researchers involved had under- estimated how much time it would take to prepare for an event or manage a project. These findings align with the barriers to public engagement expressed in the Royal Society study(5). Researchers also referred to the time-consuming nature of responding to media requests in addition to live engagement with audiences.

3.2. Personal impacts

Researchers cited a variety of personal impacts, including enjoyment or a sense of having done something worthwhile.

"...performing to a public audience was absolutely fantastic" (researcher, Public engagement training for roboticists)

"The experience of seeing people enjoy themselves made the hard work worthwhile" (researcher, *Walking with Robots* event)

This concurs with many previous studies. For example, Wilkinson et al.(8) found that researchers talked about "'fun' elements and being motivated to provide something beneficial to the audience" (p11) and that some researchers taking part in public engagement activities had increased career satisfaction.

The opportunity to learn new skills, make contacts, network and meet people with similar interests also arose. For example:

"It developed my skills – I can now talk confidently to a wide range of people" (researcher, *Heart Robot*)

"*I came across people with different ideas and got new networks and friends in the same field/with similar interests. Above all, as a non-native speaker of English, I have significantly developed my communication skills in talking, listening and responding*" (researcher, Public engagement training for roboticists)

In some cases the skills learned were taken back to the academic 'day job':

"It changed my way of preparing for my tutoring. I modified my presentation style to be more illustrative in order to bring over messages to my students" (researcher, Public engagement training for roboticists)

For some researchers, taking part in the activity meant they were able to further explore personal motivations for public engagement:

"...having the confidence to be flexible [within and activity] and to say no if an activity doesn't tie in with your vision of public engagement" (researcher, *Walking with Robots*)

3.3. Professional/Institutional Impacts

A variety of impacts were identified from an institutional perspective including a high level of media coverage and potential increases in recruitment through exposure to prospective students.

"The profile of the group was raised through the media coverage gained" (researcher, *Walking with Robots*)

"Increased exposure of either an outreach initiative or research project was seen as a key impact of the project" (*Walking with Robots* Evaluation)

"...the University has benefitted from a good effect on recruiting able and motivated undergraduates to this area, because they know that interesting things are going on and that they can get involved" (researcher, *Heart Robot*)

This reflects the findings of Martin-Sempere et al.(6) who found that the "motivation for 'increasing the public's appreciation of the scientist's work'"(p356) and "a strong desire to

'make their center better known or more visible'"(p356) were expressed by their sample group.

The question of wider reactions of colleagues to their involvement in public engagement was investigated in more depth during the training course. Twenty-two researchers who took part in the public engagement training commented positively on the reaction of their colleagues or peers. Only three described a negative reaction and four said their colleagues were not aware of their efforts.

"My colleagues are pleased and surprised to see what I've been doing with Walking with Robots and some people even expressed their interest to do similar activities" (researcher, Public engagement training for roboticists

Although a small sample, this suggests that positivity towards public engagement events within the UK robotics community (itself a relatively small group). This may in some part be attributable to robotics research developing significant potential ethical and social impacts(15) and, in that context, a value perceived for public engagement activities. In some cases, researchers commented on the direct impact their participation in public engagement activities would have on their research:

"A number of roboticists felt that their experiences of watching the festival visitors interact with the robots would directly impact their research or their work" (*Walking with Robots* evaluation)

A positive perception of the value of public engagement activities may also reflect the drive by UK government to "strengthen the level of high quality engagement with the public on all major science issues"(16: p6) and by the UK research councils' impact agenda.(17)

4.4. Impact on the relationship between researchers and publics

Within all four case study projects researchers frequently referred to a change in how they perceive public audiences. This most often took the form of an increased understanding of certain audiences:

"The need to communicate on an individual level in response to the understanding and interest of individual audience members" (researcher, public engagement workshop)

"It is good to be aware of the differences among researchers and the public – need to deal with a more complex picture than 'the researchers' and 'the public'" (researcher, *Walking with Robots*)

"Roboticists felt they had discovered more about how much children know and what they can learn from public engagement" (*Walking with Robots* evaluation)

"It has made me consider the public's perception of my own research" (researcher, Public engagement training for roboticists)

This suggests researchers were able to gain a greater understanding of the affordances of different audiences. However there is limited evidence of a change in culture in terms of the relationship between the researchers and the public in line with the shift from deficit (where institutions believe their audiences will be more accepting of science if they know more(18)) to a 'contextual model' (19: p117) as experienced within the public engagement community. This is supported by the Wilkinson et al. study, which found some 'engagers' in robotic public engagement activities to have "low expectations of those they were interacting with."(8: p15)

Few negative impacts were articulated. Many – but not all – of the researchers involved in the projects were supportive of public engagement from the outset, and this is generally what drove them to take part. Even though the projects outlined here have drawn to a close, the majority of the researchers are still active in public engagement, indicating a sustained commitment and continuing positive attitude to the process. Furthermore, as previously discussed, time commitments may have limited the researchers' opportunity to reflect on the negative consequences of their activities, and therefore those aspects did not arise spontaneously within the evaluations. The potential inclusion of "recognition... where high quality research has contributed to the economy, society, public policy, culture, the environment, international development or quality of life" within the 2014 UK Research Excellence Framework (20) may also act as an incentive for researchers to claim positive impacts from their work (including public engagement).

6. Conclusion

In line with previous research, we have identified a number of impacts on researchers taking part in public engagement activities. Impacts have been of a practical, personal and professional nature, as well as related to the relationships researchers have with publics. In

general, the impacts have been positive and indicate a development in skills, contacts and profile. However only a small number of the researchers' comments indicate a change in attitude to public engagement.

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