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PARTICIPATORY SCIENCE COMMUNICATION FOR TRANSFORMATION

Participatory science communication for transformation

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Abstract

Participatory science communication featured in several sessions and individual papers at the 2021 online conference of the Public Communication of Science and Technology (PCST) Network. This coverage recognises the drive away from linear communication to more participatory forms of science communication. In this special edition we present practice insights, papers and essays that explore participatory science communication. These contributions explore definitions, processes and describe case-studies of participatory science communication which involve a variety of publics, from young school students to Indigenous groups to farmers. In this introductory editorial we reflect on the papers, describe the growth of a participatory approach as part of the continuing evolution of science communication; explore a definition for participatory science communication; and consider some of the key concepts and issues that emerged.

Keywords

Participation and science governance; Public engagement with science and technology; Science communication: theory and models

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Public Communication of Science and Technology (PCST) 2020+1 conference inspires special edition

Participatory science communication happens when scientists and publics directly collaborate. The aim of this collaboration may be to deliberate about an issue, define a problem, collect and analyse data, and/or to co-create new knowledge [Metcalfe, 2019]. The last two decades have seen calls for science communication to become more participatory in nature and to move away from linear engagement of publics.

Communicating Science. A Global Perspective [Gascoigne et al., 2020] illustrates the strength of the move away from a linear mode. The book explores the way science communication has developed in 39 countries, and chapter after chapter uses the terms 'participation' and 'participatory' and explains the reasons a more participatory approach is being adopted. For example:

> "The benefits of citizen participation are seen in increased interest and trust in science and improved legitimacy of decisions about science policy. This may be seen as just another strategy to create 'acceptance' for science and technology. But [it] also emphasises the role of civil society in shaping science and technology policy, and points to the large potential for citizens' knowledge to be utilised in citizen science projects and by crowd-sourcing". [Hans Peter Peters, Lehmkuhl and Fähnrich, 2020, p. 333]

Participation is seen by many authors in this book as a more effective approach to science communication. For example, the chapter on African health says that where there is diminished public participation, there is "much less likelihood that sustained long-term solutions to health problems will be introduced" [Kaseje and Okeyo, 2020, p. 56]. Likewise, Colombia talks about how new science communication strategies take "into consideration citizen participation, public opinion and the interests and needs of society" [Sandra Daza-Caicedo et al., 2020, p. 235]. In a different example, Aotearoa New Zealand saw participatory research as a way of integrating *matuaranga* (indigenous knowledge) with traditional Western science [Fleming et al., 2020].

The participatory turn appears to be gathering strength. In 2011, the European Commission's concept of responsible research and innovation "developed and adopted a concept of RRI [Responsible Research and Innovation] that built upon the earlier ideas around public participation and dialogue, but with the aim of involving all actors (not just citizens or experts) throughout the process of innovation such that science could be more firmly rooted in society and society's needs and ambitions … This heralded a move from 'science in society' to 'science with and for society'" [Smallman, Lock and Miller, 2020, p. 946]. Smallman and her colleagues argue that RRI has had significant implications for science communicators involved in public participation:

> "The concept has arguably shifted the role of the science communicator from one who explains science to the public, to one who helps scientists and technology developers understand society. Arguably the objective of helping science to succeed remains, but it is achieved by helping science do more socially acceptable research" [Smallman, Lock and Miller, 2020, p. 947].

With science communication researchers and practitioners increasingly considering participatory science communication, it is not surprising that several sessions at the online PCST2020+1 conference in May 2021 focused specifically on this topic. The theme of the conference was time, technology and transformation. The participatory science communication papers at the conference particularly examined the transformation potential of participation in science or science communication. Such transformation can be driven by the perceived need to change the way we tell stories; participate in citizen science activities; provide spaces for trusted relationships to develop; engage with young people; or enable and enact inclusive participation.

This special edition of JCOM takes the conference's exploration further through a set of 14 papers that look at research, theories and practical case studies of participatory science communication.

The first two papers nicely link with the previous 2018 PCST conference where the central theme was storytelling [Joubert, Davis and Metcalfe, 2019]. In an inspiring essay, New Zealand filmmaker and storyteller Gianna Savoie discusses how she worked with Pacific Indigenous peoples to transform the way stories of the ocean are told to gain shared ownership. Anne Leitch follows this up with a practical and personal insight: "Stories for transformation are not just stories that translate and communicate science. They are stories that blend a range of different types and forms of knowledge…" [Leitch, 2022, p. 7].

Hannah Little and her co-authors examine the effectiveness of expanding a typical deficit-style of communication — lectures — to include local participatory activities. This initiative faced significant shortcomings, and practice insights provided by Matteo Merzagora and his co-authors and Christina Standerfer provide some clues as to why this happened. These papers point to the importance of valuing and understanding the knowledge of various publics and of assessing their readiness to be involved in participatory activities. Graham Walker talks about the importance of considering the wider context of participants' circumstances when training them to provide more participatory opportunities in science centres and schools.

Franzisca Weder [2022] highlights the value of informal, open participatory conversations to stimulate engagement with scientific facts and mobilise action for environmental change. Luisa Barbosa provides an example of citizens planning and implementing citizen science projects to promote solar clean energy. She makes the important observation that "participatory processes are time-consuming and probably more challenging due to the very diverse expectations and interest of the stakeholders" [Barbosa-Gómez, del Cañizo and Revuelta, 2022, p. 6].

Marima Hvass-Faivre d'Arcier and Rita Campos focus their papers on participatory processes for involving and including children in science. They describe the part 'collective intelligence' plays as a form of participatory science: "A group of very different people, with very different skills, is more efficient to enjoy and acquire lasting scientific knowledge. In comparison, the high-school curriculum based essentially on the deficit model, doesn't keep the flame of enthusiasm alight after students finish school. Even worse, the young people feel discouraged and think that science isn't for them. Scientific words, which are not understandable, aren't science, although it's all that remains for many people after they left school! That's why I decided to stop teaching at high school in 1989". [Hvass-Faivre d'Arcier, 2022, p. 4]

In contrast, papers led by Chi-I Lin [2022], Jennifer Manyweathers [Manyweathers et al., 2022] and Jennifer Metcalfe [2022] provide case studies where farmers participate with scientists and others to improve their knowledge and practices, and in the process have a significant impact on the practices of the professional scientists involved in the projects.

The paper by Virginia Thomas and Angela Cassidy raises the important issue of how participatory practices can be encouraged during a pandemic where there are far less opportunities for face-to-face interactions, especially those informal interactions that build relationships of trust.

Towards a definition of participatory science communication

To reach a shared definition of participatory science communication, it is useful to look at the multimodal approaches to science communication theory presented by scholars where participatory science communication is largely situated within a science in society model. Bauer, Allum and Miller [2007] argued that the three dominant models they presented (science literacy, public understanding of science, and science in society) powerfully informed science communication research. These three models informed further scholarly development of science communication models to form what are commonly now known as the deficit, dialogue and participatory science communication models [Metcalfe, 2019].

The science literacy or deficit model assumes that publics need to be knowledgeable about science. It is the role of scientists to provide information to fill a deficit of knowledge by publics [Callon, 1999; Irwin, 2006; Nisbet and Scheufele, 2009]. The second and alternative model (public understanding of science or dialogue model) promotes dialogue between scientists and publics so that publics can better understand the science, with a two-way conversation between scientists and publics [Dudo, 2012; Powell and Colin, 2009; Trench, 2008; Wynne, 2006]. Scientists seek to understand the perceptions, concerns and needs of publics, and recognise that these publics may have knowledge useful to the scientific process.

In the early 2000s, a new participatory model of science communication gained traction in the scholarly literature, reflecting the notion of 'science in society'. The participatory model appealed to scholars who theorised the democratisation of science as a solution to engaging publics in jointly tackling societal issues of concern [Brossard and Lewenstein, 2009; Bubela et al., 2009; Joly and Kaufmann, 2008; Miller, Fahy and the ESConet Team, 2009]. For controversial scientific issues, like climate change, public participation was argued to be beneficial and even essential for critically reviewing research, solving problems or supporting behaviour and policy changes [Few, Brown and Tompkins, 2007; Höppner, 2009; Marquart-Pyatt et al., 2011]. To go even further, some scholars have called for the public to have more influence over what science has a social licence and the funding to proceed [Rogers-Hayden and Pidgeon, 2008; Wilsdon and Willis, 2004]. Others have theorised that such participatory models need to move 'upstream' beyond just consultation and participation to co-creation of science and technologies [Rogers-Hayden and Pidgeon, 2008].

So, what does this mean for defining 'participatory science communication'? And is citizen science the same as participatory science communication?

In our call for papers, we defined participatory science communication: 'participatory forms of science communication appear to be different to popularisation, science literacy and dialogue in that they recognise and acknowledge various publics as being equal in terms of the power and knowledge they hold when compared with scientists and policy makers. Participatory science communication differs from the common definition of citizen science projects where citizens collect data separately to any deliberation or analysis by scientists. But citizen science is a broad field, and in its more extended form can involve publics in problem definition, collection and data analysis'.

Some of the authors in this special edition explicitly or implicitly provided a definition of 'participatory science communication'. For example, in explaining how citizen science can be participatory, Luisa Barbosa-Gómez, del Cañizo and Revuelta [2022, p. 2] said citizen science: "can be categorized into three practices: contributory, collaborative or co-created. Co-creative citizen science initiatives are the most participatory of the three models, in which citizens not only collect data, but also may help refine the research design, analyse data or disseminate findings."

A few authors thought it best not to tightly define participatory science communication. Anne Leitch [2022, pp. 5–6] said it was important to avoid "prescriptive definitions, recognising that the rationale and process of participation is context-specific and should be tailored and revised throughout". The fluid nature of participation is also recognised by Ch-I Lin [2022, p. 3] who said: "The unique dynamic of engaging the local members in the on-site farming practices stimulates a constant dialogue, exchange of knowledge and negotiation".

Virginia Thomas and Angela Cassidy discuss participatory science communication as 'engaged research' and quote Holliman et al. [2015, p. 3] when they describe this as an approach where "researchers meaningfully interact with various stakeholders over any or all stages of a research process, from issue formulation through the production or co-production of new knowledge, to knowledge evaluation and dissemination".

Other authors described participatory science communication as acknowledging and valuing the knowledge of participants. Christine Standerfer, Loker and Lochmann [2022, p. 2] says participatory science communication is "a discursive space that recognizes and values participants' lived experiences and community knowledge". This is echoed by Rita Campos [2022, p. 4] who talks about "giving the same weight to both scientific and local or indigenous knowledge". The point "the same weight" is crucial.

The Colombian experience is different. They have formalised a framework to set out the participatory process as part of the social appropriation of science and technology. "The differential factor of *Ideas for Change* is challenging researchers and scientists to work as a team with community organizations to solve local problems, through building a relationship that is based on collective well-being. In this scheme, relationships are based on respect between peers; academic titles do not grant authority but trust". [Ayure-Urrego and González, 2022, p. 5].

Considering the above, we would like to offer our revised definition for participatory science communication: 'Participatory science communication happens when scientists and/or science communicators interact with various publics in a dynamic process where different forms of knowledge and experiences are acknowledged, shared, valued and negotiated, and where power relations are levelled.' We consider that such participatory processes can lead to more inclusive and democratic perspectives of collective knowledge sharing and appropriation.

This definition deliberately leaves out the purposes for participatory science communication, which can range from generating interest and excitement about science to the deliberative co-creation of solutions to intractable problems.

Changing power relationships with participation

In participatory science communication, scientists do not necessarily drive the participative process, and publics may initiate and direct the engagement. This contrasts with deficit and dialogue models of science communication, which are always initiated by scientists or science communicators. In practice most participatory science communication activities appear to be initiated by those directly involved with science. The papers in this special edition reflect on examples of practice that are all driven in this way. This is not surprising given that those associated with science have more resources at their disposal than groups of various publics. However, what is more interesting about participatory science communication is that there is a deliberative shift in power from 'science' to 'publics'.

Trench [2008] sees participatory science communication as being as much about the process of engagement as about the outcomes, and that it "takes place between diverse groups on the basis that all can contribute, and that all have a stake in the outcome of the deliberations and discussions" (p. 131). Such a change signals a more obvious shift in power from deficit and dialogue models — from the scientists to publics. Gianna Savoie [2022, p. 3] articulates this shift in power when she describes storytelling on the ocean voyage she participated in: "I wasn't there to 'tell' the story or 'craft' the story, but rather to listen, learn, experience and most importantly, relinquish the story".

If there isn't a genuine acceptance of power sharing, then full participation is less likely to be successful. This was recognised by Hannah Little and her co-authors: "A power imbalance was also evident as the young people did not lead the direction of the discussions and sometimes appeared reticent to argue against the facilitators or their teachers", [Little, Fogg-Rogers and Sardo, 2022, p. 12]. Graham Walker [2022, p. 5] also noted this when he identified that "the power balance between different actors is critical to the nature of subsequent interactions".

We would suggest there needs to be more research exploring the power relationships within participatory science communication. Do the scientists make all the big decisions in the end? How meaningful is the participation? Or are we just 'partici-washing' in a similar process to big companies covering up their activities through 'greenwashing'?

Increasing social inclusion with participation

One of the driving motivators for participatory science communication is the notion that 'social inclusion' in science is fundamentally good. For example, Matteo Mezagora and his co-authors [2022, p. 3] postulate that social inclusion is one of two objectives for participatory science communication to achieve "a socially inclusive knowledge society, able to offer opportunities to all the segments of society to use knowledge (and scientific knowledge in particular), as a power tool for change".

Virginia Thomas and Angela Kennedy [2022, p. 12] found that digital engagement during a pandemic can increase inclusivity by "removing barriers to participation e.g., it can increase accessibility for those with physical disabilities which make attending in person challenging, it can remove time and financial boundaries (including those associated with international boundaries and geographical

distance), and it can enable those with caring responsibilities to participate remotely".

Participatory science communication is, as noted by both Luisa Barbosa and Rita Campos, time consuming and challenging. We as communicators choose who we include and leave out. At best we have selected or bounded inclusion. Anne Leitch's paper [2022, p. 2] reflects on such inclusion, which again comes back to power relationships: "'Power' includes who decides who is invited (or not invited, or actively excluded) to participate and how that process unfolds. It also includes notions of what is counted as expertise, and thus is included or omitted in the process".

Inclusion is usually assumed as prima facie good, with little attention paid to the inevitable limits faced when being inclusive. As we see in the papers in this special edition, social inclusion is necessarily limited — exponents can't include everyone. As a community of scholars and practitioners, we would benefit from further reflection on what the relationship between science and society looks like when we think in terms of *bounded inclusion* rather than *idealised inclusion*. This might change what we consider best practice in participatory science communication, and good outcomes from such practice. Like the importance of changing power relations in participatory science, we can ask: How meaningful, relevant and considered is the inclusion? Or are we just 'inclusi-washing'?

Conclusion

Some of the papers in this special issue show us how powerful and enriching participatory science communication can be. Others highlight pitfalls and challenges. Some do both. Read together, they help define participatory science communication and paint a more coherent picture. They also flag areas where participation needs to be managed carefully, lest we treat it trivially (or worse still as mercenaries). Sensitive areas include measures to ensure a balance of power between participating groups and individuals; and recognition that the selection of participants can be a powerful way for the lead group to control discussions and exclude views it does not want represented. Seeking to change power relations and achieve broad social inclusion can transform the relationship between science and society, but such actions also run the risk of being misused. Participatory science communication is powerful but needs to be handled with care.

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