Participatory science communication needs to consider power, place, pain and 'poisson': a practitioner insight

Anne Leitch

Abstract

The language of science communication has moved from deficit to dialogue and talk of a 'new social contract' with the public 'invited to participate'. This paper outlines a practitioner path that begins with storytelling and moves to a more participatory mode of practice of science communication for adaptation to climate change at the community scale. I outline personal practitioner reflections, specifically the need to consider issues of power, place, pain and the need to challenge assumptions. I propose the need to consider context, many forms of local knowledge and expertise, social learning, plus the pain of historical, contemporary or projected loss.

Introduction

Participatory science communication is complex and even more so if it aims to transform. Over recent decades, the language of science communication has moved from deficit to dialogue and has notions of a 'new social contract' [Gibbons, 1999] with the public 'invited to participate' [Stilgoe, Lock and Wilsdon, 2014]. Yet despite increasing rhetoric about its importance, participatory science communication remains rare in practice. Barriers to becoming more participatory lie in the requirements for a devolution of power from 'science' to 'a community' and a technology of humility [Jasanoff, 2003] that also challenges notions of 'expertise': furthermore, the benefits that arise from increasing participation are 'challenging and inconvenient' [Stilgoe, Lock and Wilsdon, 2014].

This practitioner insight charts theoretical and practical lessons from three decades of undertaking science communication to support sustainability and climate change adaptation at the community scale. Broadly, the approach taken has aimed to create and support dialogue about existing change as well as forecast transformational change and, in doing so, to identify community-specific,

evidence-based resources. These interactions influence how scientists approach science and, in turn, how this is viewed by society [Bremer and Meisch, 2017], as well as seeking ways to integrate local and scientific knowledge.

This paper takes a different approach to the usual patterns of describing theory and then project/s or case studies in which the theory was applied. Instead, it begins by outlining an evolution of thinking and theory that reflects and shapes my practice in participative science communication. It's not that the projects, their people and context are less important — I often reflect on our shared learning from past projects. Rather, that the lessons discussed here are the evolving understanding of my own theoretical lens. Inspired by the call to understand "how science communication really works" [Bucchi and Trench, 2021, p. 4], this paper aims to spark reflection and discussion for experienced science communication professionals as well as for those beginning their science communication career.

Drawing on experiences in working with a range of communities — from agricultural communities in transition, to indigenous communities adapting to climate change — I outline some theoretical and practical lessons that advance thinking in science communication. Specifically, I discuss the need to consider issues of place, power, pain and 'poisson', or the need to challenge assumptions. '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. 'Place' includes understanding context and connections as well as notions of local knowledge and expertise, plus social and collective learning. 'Pain' acknowledges that transformation or change is difficult and costly in various ways in terms of contemporary or projected loss. Considering pain also acknowledges that there can be deep roots of historical loss, particularly due to the trauma of colonization and its very long tail. And 'poisson', yes that's fish, but more about this later.

The practitioner path

The story arc

When I first put up my shingle as a 'science communicator' in the 1990s, I had an honors degree in science and some research experience in research agencies, a university and a private enterprise. I had journalism qualifications and a passion to help people to understand science through telling stories about it. My stint as a journalist, then editor, of an independent regional newspaper, meant I had the required 'nose for news' and an eye for a sharp headline. As a newly installed communication manager of a publicly funded research organization, I fervently 'worked with the willing' in terms of scientists and research teams to find, write and pitch science stories to the media. The framework I used was the 'five Ws and one H' — who, what, why, when, where and how — the same information-gathering tool that journalists had used for more than a century.

The stories I found and promoted were inspiring for a science word nerd like me. Too many of these stories were a 'begging story'. This was the term coined for an article about fascinating and potentially impactful research that was almost out of funds: if more funds weren't forthcoming, the research would end before its time accompanied by loss of innovation and research capacity. But this 'tale' was trying to wag the dog: and it definitely had fleas. I realized that stories, especially ones

like these, had little impact. What's more, we didn't articulate what impact we sought or evaluate to know if we achieved it.

So, I went on a quest for better theory and practice. Through a master's degree in communication, I learned about the theory of rhetoric for more persuasive writing, theories of management to apply to strategic communication planning for science. I learned about cultural studies and, as my own small social experiment, seeded my research workplace with the concept of 'semiotics', to make it part of our local lexicon, which also highlighted other interesting theories about the diffusion of ideas.

I also became more strategic by working with other like-minded science communicators — many who remain very influential in science communication theory and practice today. This involved applying stakeholder theory [Freeman, 2010] to develop strategic communication plans for science projects where we outlined who (and what) was a key stakeholder, their communication needs and preferences, and our key messages and media channels and markers of success.

I also learned about the top-down delivery of information mode of science communication that we were using — or just assuming — and how it doesn't work, should be mostly discarded, but somehow never was. Much has been written about the deficit model of science communication, but the advocated shift from deficit to dialogue models was often only a shift in language rather than practice [Trench, 2008; Peters, 2021]. I noted that in practice, the assumption of the deficit model meant that scientists didn't question a linear process of delivering their information in a form that was often didactic. The scientists set the place, mode and agenda and invited the usual suspects to listen to the project's key messages. Increased organizational pressure to 'get closer to industry' resulted in scientists seeking support to find dialogic opportunities as they sought and benefited from industry feedback.

I also realized that many challenges science communication aims to address are 'wicked problems', where the linear translation and communication of complex and conflicting ideas won't work [Head and Alford, 2013]. A wicked problem is a complex issue that thwarts a simple definition or a clear or testable solution and is beset by conflict, complexity and uncertainty: any solution is likely to generate further problems or tensions [Rittel and Webber, 1973]. A wicked problem involves many stakeholders with conflicting interests and diverse worldviews and opinions. Many contemporary issues can be classed as wicked problems: for example, addressing climate change [Leitch, 2017], sustainable tourism [Finkler and Higham, 2019], vaccination hesitancy [Greenberg, Dubé and Driedger, 2017], or antibiotic resistance [Nisbet, 2017]. The contested landscape of a wicked problem makes participation challenging. Yet communication, especially thoughtfully negotiated technical information and evidence, is important in working through a wicked problem because the range of perceptions and understanding influences what solutions are presented and how they are framed.

Science communication takes a 'communicative' turn

By the late 1990s, I had moved to work on natural resource management — which is beset by wicked problems — in a multidisciplinary research team including a

range of complementary disciplines such as geography, planning, economics, community engagement, and now, science communication. In natural resource management, science information is often overused, to define rather than manage natural resources in a regional context [Leitch, Bellamy et al., 2001]. For this research group, science communication was redefined from a traditional dialogic role of research, development and extension "to a more communicative model that has a diverse and multi-disciplinary role of interpreting scientific information for use by a particular group, building stakeholder capacity, and facilitating and managing negotiation between key stakeholder groups" [Leitch, Bellamy et al., 2001, p 1]. Thus, key differences between dialogic and a communicative and/or participatory mode was the recognition of diverse stakeholder groups that were enabled to deliberate expert knowledge and negotiate tradeoffs and outcomes.

This research group's thinking was also strongly influenced by planning theory. The discipline of planning has a history of a rationalist comprehensive style that is similar to the deficit model of science communication: both theoretical stances assume they have control over both process and outcomes and are dealing with a unitary public with shared goals. The planning discipline of planning — similar to science communication's shift to a 'dialogue' model [Trench, 2008] — took a 'communicative turn' by the end of last century to recognize that planning — whether for natural resources, physical spaces or public policy etc. — needs to accommodate social processes that include ways of thinking, valuing and acting that are actively constructed by participants [Healey, 1997]. This move from deficit, to dialogic, to participatory science communication modes was supported by frameworks such as the seminal Arnstein's ladder of citizen participation (Figure 1), which helped to influence thinking in both planning [Healey, 1997] and science communication [Weingart, Joubert and Connoway, 2021]. This framework considers the extent to which decision-making power is shared through a series of eight 'steps' on the ladder, grouped in three clusters from nonparticipation to tokenism to citizen power (see Figure 1).

By the mid-2000s, natural resource management was concerned with understanding climate change impacts on ecosystems, and their associated social and economic systems. The impacts of climate change occur locally and so adaptation needs to involve local actors [Hobson and Niemeyer, 2011]. Adaptation also needs to consider how climate science information is interpreted, used and trusted, but also how it is distrusted and rejected by local communities [Lorenzoni, Nicholson-Cole and Whitmarsh, 2007]. Municipal or local governments, as the tier of government closest to the community, are often expected to work with local communities to plan responses to climate change, although this comes with challenges inherent in working with scientific, social and political uncertainty [Leitch, 2017]. Local governments in Australia have a legislated requirement to consult their community, although the nature, extent and quality of this consultation vary considerably [Serrao-Neumann et al., 2014] — once again highlighting that rhetoric shifts long before practice changes.

Many local governments have adopted the International Association for Public Participation spectrum (IAP2 [2007], Figure 2), a framework that builds on Arnstein's ladder [Serrao-Neumann et al., 2014]. The IAP2 spectrum is intended for use by various institutions undertaking public consultation. It outlines five levels of participation, from 'inform' as a one-way delivery of information to 'empower'
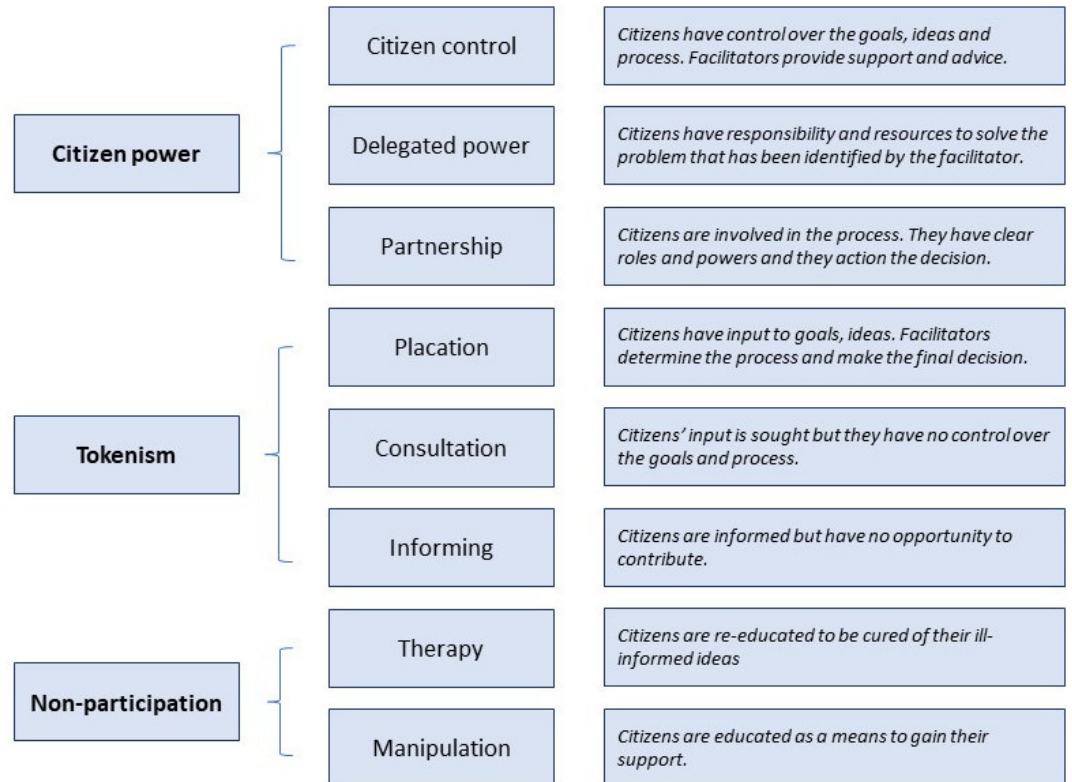
Figure 1. Arnstein's ladder of participation. Source: Arnstein 1969.

where the decision-making power is given to the public. Different levels are useful for different groups or circumstances. The important consideration is to match the stated intent with the level used, for example, if the intent is to consult, then there needs to be the capacity and resources to incorporate participants' views. The techniques associated with each level are a guide and so how they are applied determines how participative they are. For example, a workshop where the time, place, participants and agenda are determined by the research team is to 'involve', while a workshop where the research participants help decide the logistics and influence the workshop agenda would be to 'collaborate'.

The burgeoning research area of adaptation to climate change led me to explore concepts of community resilience: if communities were to adapt to a perturbation or shock induced by climate, then what would make a community more able to adapt and learn to deal with a range of impacts? Resilience is the capacity of a social ecological system — nature and the society it supports — to respond and absorb a disturbance, yet still retain its basic structure and function [Walker and Salt, 2012]. Resilience thinking acknowledges that things change over time — sometimes rapidly, sometimes incrementally — and by "understanding change we are better placed to build capacity to work with change, as opposed to being a victim of it" [Walker and Salt, 2012, p. 14].

Theoretical aspects of resilience thinking that have strong overlaps with science communication are participation [Leitch, Cundill et al., 2015] and social learning [Cundill et al., 2015]. In considering participation, the resilience literature avoids prescriptive definitions, recognizing that the rationale and process of participation

Participation levels				
Inform	*Consult*	*involve*	*Collaborate*	*Empower*
Public participation goal				
To provide balanced and objective information to assist understanding of topic, alternatives, opportunities and/or solutions	To obtain public feedback on analysis, alternatives and/or decisions	To work with the public throughout the process to ensure that concerns and aspirations are consistently understood and considered	To partner with the public in each aspect of the decision, including development of alternatives and identification of preferred solution	To place final decision-making in the hands of the public
Promise to the public				
We will keep you informed	We will keep you informed, listen to and acknowledge your concerns and aspirations and provide feedback on how input influenced the decision	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how input influenced the decision	We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent	We will implement what you decide
Techniques that could suit each level				
Fact sheet Website Advertisement Media release Newsletter Email lists Social media	Public comment Focus groups Surveys Stakeholder meetings Shopfronts Phone hotlines Briefings Feedback forms Social media	Workshops Deliberate polling Social media Advisory groups Discussion forums	Advisory groups Discussion forums	(Depends less on technique and more on relationship) Summits Deliberative democracy Deliberative forums Citizen juries

Figure 2. IAP2 Spectrum. Source: IAP2 2016.

is context-specific and should be tailored and revised throughout a cycle of adaptive management [Stringer et al., 2006]. Participative approaches can accommodate different types of knowledge and a transferal of power [Reed, 2008]. Participation benefits from project processes that create and maintain effective space for involvement, such as clear goals and expectations, facilitation and leadership, capacity building, resourcing and acknowledging and addressing power and differentials [Leitch, Cundill et al., 2015].

Social learning in resilience thinking includes continuous learning processes such as those encouraged by adaptive management and adaptive governance. This includes experimentation and monitoring, as well as collaboration and knowledge co-production: these processes enhance understanding and participation as well as governance and decision-making [Cundill et al., 2015]. Learning benefits from long term interactions and engagement, as well as diverse participation that reflects a range of knowledge and sufficient resources including funding and expertise of the project team.

Interestingly, working on community resilience to climate change brings me back to stories — back to where I began with science communication. But with a difference: it's no longer 5Ws and an H. It's telling stories that can be transformative. If our society is to be sustainable then we need to rethink society for a more cared-for planet: we need to move beyond minor, marginal or incremental change and make major fundamental changes: we need a societal

transformation [O'Brien, 2011]. To achieve that, we need stories for a better world. 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: stories where local voices and local knowledge are interwoven with western science knowledge and are not just told using words but also through other creative routes. Riedy [2020] captures this eloquently:

> "...stories have the power to warn that the path we are on is not sustainable, to offer a vision of a transformed future, and to show people the contribution they can make to achieving that vision. For those who want to facilitate and accelerate transformation towards a sustainable future, the ability to form and tell a compelling story is a key transformative practice.

What does participatory science communication need to consider?

Participatory science communication needs to consider 'participation', which is defined as the involvement of the individuals, groups, agencies or communities (or their representatives) that have an interest in the science product, process or application. The value of participation lies in the process (and outcome) of respectfully understanding and acknowledging different perspectives while working toward common understanding. Central to societal participation in science are broad assumptions that if science is familiar, then society is more likely to value and trust, and therefore support science funding. However, this is widely challenged in theory and practice [Jasanoff, 2010].

My experiences working in participatory science communication projects are as diverse as supporting regional resource use planning [Leitch, Bellamy et al., 2001], developing a coastal adaptation decision support tool [Leitch, Palutikof et al., 2019], and producing podcasts about two Indigenous communities' experience with climate change. There are numerous guides to science communication and participatory research and so I don't intend to reproduce these or any sort of comprehensive list or 'top tips' for science communicators. Rather, I discuss some broad concepts that I have found pertinent in my own practice. While I began my science career with a simple framework of 5Ws and an H, now I think about participatory frameworks and community resilience theories and the challenges of the 4Ps: power, place, pain and 'poisson'.

Power

In participatory science communication projects, it is easy to consider the obvious stakeholders and to organize meetings, agendas and processes that suit the project team and their projected outcomes. But for science communication to be participatory, there is a need to consider the many and varied underlying power structures.

There is the inherent power of the science communication project team. As the instigators and organizers of the science communication project, they tend to assume and retain control over the process and outcomes. This begins with who the team 'invites' to participate: i.e. who is actively included and who is excluded by intention or by omission or ignorance. For example, if seeking Indigenous participation, it is not sufficient to view them as 'just another stakeholder' to be

included in the process. Their participation needs to consider (and adjust for) Indigenous community practices, expectations and aspirations, which are affected by a history of colonization. How can you help to ensure they feel culturally safe?

Genuine participation requires relinquishing power. In the two participatory frameworks, Arnstein's ladder and the IAP2 spectrum, each step or level relinquishes more power over the process and the outcomes become increasingly shared between the project team and the project's 'community'. Relinquishing power is difficult and requires flexibility, which can be challenging personally as well as professionally. It also requires trust, which needs effective and sustained relationship-building: it takes time. For example, in a 'co-development' project creating a website for coastal adaptation in Australia, we had several advisory groups that we met with regularly for two years and who became partners in content development [Leitch, Palutikof et al., 2019]. The high resource commitment, in terms of time and travel costs, was needed to build trust and relationships and to share power in the creation of website content.

Relinquishing power also means a lack of predictability. This lack of control over process and predictability of outcomes can be challenging for the project team, and often is even more challenging for their managers and institutions and funders. Participants and their choices no longer fit neatly into a project timetable and projected outcomes. Plus, unpredictability tends to be costly in terms of resources, as participants go 'off-piste' while they deliberate, argue, make detours and investigate alternatives.

Associated with this is the power of expertise. Scientists are considered experts in science communication projects and so their knowledge is privileged: however, "for individuals and communities, meaning and significance emerge from embedded experience," [Jasanoff, 2010, p. 235]. This is important in climate change adaptation where scientists and local communities work together in the co-production of 'demonstrably usable' knowledge that is obtained through several rounds of interactive processes. Climate projections mean little unless they are translated to local conditions, and this occurs best through weaving science and local expertise. These interactions "influence how scientists pursue science and how stakeholders understand the possibilities and limits of science" [Bremer and Meisch, 2017, p. 2] as well as finding ways of integrating local and scientific knowledge.

Also important are the power structures that determine whether individuals, groups or communities have the capacity and the opportunity to participate. These can be overt or subtle barriers that need to be considered by project teams. Sometimes it is as simple as being more thoughtful about the timing and location of meetings. Or sometimes strategies need to be more sophisticated and focus on building the capacity of different sectors to support them to participate: for example, in a regional resource use planning project, the science communication role was working with each sector of the community to support their communication with their sector. This included diverse support: for example, one new sector was supported to establish a newsletter, another provided with media training, and another helped with strategic communication planning [Leitch, Bellamy et al., 2001].

Place

Participatory communication needs to consider 'place' by acknowledging both place attachment and a sense of place. This means taking account of individual and community identity and knowledge of, and care for, the social ecological system — the interconnectedness between people, nature and the functional aspects that make up daily life. Consideration of place can also extend to include local knowledge, social and community or collective learning. For science to be translated to have meaning and significance — and thus promote discussion and action — it needs to be interpreted for the local context, which highlights the need for local knowledge and for rethinking expertise [Foxwell-Norton, Walters and Leitch, 2019].

Many contemporary challenges are wicked problems that will not be addressed by science alone, but that require knowledge beyond that of 'experts' to include citizens' local knowledge that includes the understanding of place, context, and values as well as the mutual learning that comes from integrating many knowledge types. For example, in considering coastal adaptation to sea level rise, local knowledge plays an important role in perceptions of risk: local knowledge of the uncertainty of an eroding coastline played a role in purchasing coastal property with many locals choosing to "live well clear of affected areas", rather than have "sleepless nights listening to the roaring ocean and waiting to end up in it" [Leitch and Robinson, 2012, p. 123]. Community members can provide valuable contextual information about impacts and changes they are experiencing, that can supplement scientific observations or identify potential adaptive strategies [Leitch, 2017]. Or indigenous elders can identify seasonal shifts in bush tucker, due to increasing temperatures, that are undermining cultural knowledge as well as increasing reliance on less healthy foods [Foxwell-Norton and Leitch, 2019].

Pain

At a workshop for engagement and extension specialists for farmers, a quietly spoken rural counsellor challenged the audience with his presentation. It was the late-1990s and early days of Australia's Millennium Drought (1996–2010) and many farmers had missed or lost crops and were struggling financially. Despite being asset rich with vast properties and sheds of big machinery, these farmers were desperately cash poor and struggling with everyday living costs. "How can you expect farmers to adopt or even consider your technology when they are wondering if they can put food on the table or keep their kids at school?" asked the counsellor. A light went on for many in the room: while we knew we had to understand and consider our stakeholders' communication needs: clearly, we needed to consider so much more.

While we have recognized that participatory communication needs to understand stakeholders, it is also vital to consider that understanding of their needs considers their 'pain'. For drought-affected farmers, this is likely to be a cascading and complex web of impacts [reviewed by Vins et al., 2015]. Expecting them to get involved in field trials, take risks with new technology (even low risk or low-cost activities), can be a step too far given their current situation.

But pain also emerges across many different research domains. For example, the personal stress of being involved in projects and 'consultation fatigue' should not be discounted: Carter [2010] stresses the need for appropriate methods and expectations in working with Indigenous communities to overcome often unrealistic and uncoordinated demands on the time and resources of community leaders. Young et al. [2020] also detail the personal costs to volunteers resulting from their involvement and include direction stresses from the process (cost of participation, coping with frustration and conflict and the burden of representation). There is also mounting stress and sadness of working with projects experiencing environmental decline, changing social identity and sense of place [Young et al., 2020; Marshall et al., 2019].

Then there is the 'pain' experienced by Indigenous peoples as a result of the long tail of colonization. Indigenous peoples, in the country now called Australia, assert sovereign rights and interests to collective self-determination and control over their customary estates [Hill et al., 2012]. Since the arrival of Europeans in the late 1700s, Indigenous peoples, including Torres Strait Islanders, have experienced overlapping phases of invasion and colonization, 'protection', segregation, and assimilation: each of which has directly and indirectly attempted to erode Indigenous culture and knowledge. Central also, is the failure to understand contrasting relations to the land and the associated worldviews between Indigenous peoples and western approaches [Foxwell-Norton, Forde and Meadows, 2013; Veland et al., 2013]. The consequence of such experiences is the subjugation of traditional knowledge due to inherent differences with scientific knowledge [Foucault, 1980; Veland et al., 2013]. The research community across many research domains, but particularly with Indigenous peoples, has a history of inflicting distress through inappropriate research and framing of the research problem, methods and practices resulting in more pain, but also distrust of research institutions [Cochran et al., 2008]. The research community often accepts power and privilege as an invisible norm and unchallenged practice [Moreton-Robinson, 2021].

For science communication projects with aspirations to involve Indigenous communities, there is a need to acknowledge an intergenerational 'pain' from prolonged impacts of colonial processes of territorial acquisition and state formation. This pain will be evident, and the success of the project will be determined by the project team's abilities to negotiate the politics of Indigenous rights and the context of social disadvantage [Hill et al., 2012]. There are growing examples of how to conduct empowering and impactful research with Indigenous communities, led by researchers undertaking conservation and natural resources management [Hill et al., 2012; Robinson et al., 2021] and climate change adaptation [Veland et al., 2013]. Central to such research is the need for the project team's commitment to empower these communities and elevate their voices, while not co-opting their stories for project gain or tokenism. It is vital to ensure there is an ethical approach and cultural sensitivity to requests for, and representation of, Indigenous stories and ways of knowing.

Poisson (fish, French masculine noun)

> Proverb: give a man a fish and you feed him for a day.
> Teach him how to fish and you feed him for a lifetime.

This was a popular proverb in my early days in science communication when the deficit model was discussed as too limited and limiting: giving 'a man a fish' was a metaphor for giving him science we considered useful, while teaching him to fish through a more participatory model would be more enduring. My challenge to this proverb is: but does the man even like fish? Okay, calling this a 'P' is a stretch, but the challenge to the man-fish or 'poisson' proverb neatly captures my thinking about participatory science communication. This proverb highlights the propensity to follow practice norms and in doing so make assumptions about what a stakeholder needs and then plan accordingly. I argue that it is important to challenge these assumptions. Thus, we need to take a critical stance to practice and continually reflect on the values and assumptions we bring to our practice. We need to ask, just as a start: does the man like fish? Can he access a place to fish? Does he have a fishing rod? Is there enough fish for all? Will he deplete the fishing stocks? As well as telling transformation stories, we need to ask transformative questions.

We also need to critically examine our own values, motivations and practice in science communication to challenge what Cannella and Lincoln [2007, p. 316] describe as a "naïve acceptance of the notion of innocent scholarship" and neoliberalist framing of research and "commodification of knowledge":

> Whose knowledge is this? Why (as a researcher) do I choose to construct this problem? What assumptions are hidden within my research practices? How could this work produce exclusions? What do I do as I encounter those unexpected exclusions or oppressions that result from the work? What is my privilege (or power position) in this research? How am I subtly reinscribing my own universals and/or discrediting others?

Conclusion

These are my reflections of a career in science communication that has covered a diversity of projects, projects teams, organizational context and theoretical influences. What I have learned is how little I know and that requesting access and opportunity to other types knowledge is both humbling and rewarding. It is vital to actively seek to understand how underlying power structures are in operation, including our own. It is also vital to seek out other types of knowledge and to consider how, despite the challenges, they can be valued and integrated with scientific knowledge. Also, it is important to assume responsibility for educating yourself on the broader context — for example, on the pressures of agricultural life, the sadness of environmental loss, and the trauma of colonization — which means to be an ethical and reflective listener first and a science communicator second. It is vital to ensure that the wider project team has a similar understanding and commitment. It is also important to have supportive project structures, such as flexible project timing, that enables the building of relationships and trust. I hope my reflection prompts you to also reflect on your own thinking, assumptions and practices. And I hope you ask the man if he does actually like fish — and if the woman, elder, child do too. But also, ask them if they have any stories about fish and the future.

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Author

Anne Leitch is a science communicator practitioner and researcher in participatory research into community adaptation to climate change, particularly in coastal systems. She draws on her background in marine and coastal science, social science, media and working across research agencies, universities, industry and communities. Anne is an adjunct at Griffith University.

E-mail: Anne.Leitch@griffith.edu.au. https://orcid.org/0000-0002-7597-0007.