**Opening up science: what can public engagement efforts learn from the AccessLab project?**

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# Abstract

Considering the immense impacts that science and society have on each other, the relationship between science and ‘the public’ deserves a great deal of attention. Through exploring the power dynamics behind the dominant, pervasive deficit model of public engagement with science, I uncover why it is harmful for both citizens and scientists, focusing on how undemocratic decision making about the direction of scientific research widens societal inequalities.

Reflecting on these issues, I explore the questions:

1. what is responsive science, what are its benefits and what needs to be in place for it to occur?
2. how can public engagement practitioners facilitate dialogue, so that scientists can better understand citizen needs?

I use the AccessLab project to help answer these questions, combining extensive research with details about the format of the project and testimony from interviews I conducted with two scientist and two citizen participants in the workshops.

This analysis exposed several ways that the project challenged the concerning, out-dated assumptions underlying public engagement with science. Firstly, the pitching of science as a service to citizens stressed the importance of ensuring science is not only relevant but responsive to citizen needs. Secondly, the project demonstrated how to challenge transmission models of communication within current constraints, through disseminating research skills, emphasising the skills of scientists over their expertise, and theming citizen participant groups. Thirdly, through careful consideration about the makeup and size of groups as well as the format and environment of the workshops, AccessLabs displayed several ways of easing dialogue between citizens and scientists. Finally, AccessLabs demonstrates how essential it is to adopt experimental, open, and critical approaches to public engagement if practices are to move forward and become more useful for citizens.

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# Opening up science: what can public engagement efforts learn from the AccessLab project?

# Introduction

Since the concept of public engagement with science was first introduced, many efforts to engage citizens with science have operated under a deficit model, where scientists transmit information to citizens one-way, allowing scientists to retain control over the production of knowledge (Brossard & Lewenstein, 2009) (Dudo & Besley, 2016). The problem with this model is that much scientific research is disconnected from the citizens it claims to be in the interest of.

This deficit model has been recognised as a problem for decades and though there has been a general trend in public engagement towards more dialogical approaches, the deficit model still lingers in new and less obvious forms (Stilgoe, Lock & Wilsdon, 2014) and there is still a focus on ‘downstream’ engagement, where citizens are asked for input only after key decisions have been made (Wilsdon & Willis, 2004).

Through my reading on this subject I became convinced of the problems with existing models of public engagement and of the need for solutions. I wanted to know what was being done, and what could be done, to address these issues. The AccessLab workshops provided an ideal case study as they created an opportunity for direct conversations between citizens and scientists, challenged some of the key issues with the deficit model of public engagement, and promoted responsiveness and dialogue.

Organised by two well-known and respected organisations (the British Science Association and FoAM Kernow), and with the first workshops taking place in 2017, AccessLab represents the most current and innovative thinking in this area, and therefore it is imperative that it is fully critiqued and explored. To do this I interviewed participants in the workshops to find out about their experiences.

In this essay I will explore what science and science engagement practices can learn from the AccessLabs project about how science can be useful to citizens, why it matters if citizens are engaged, and what features need to be in place for dialogue. I assess how successful the AccessLab project has been in addressing these concerns about the current state of public engagement with science.

## The structure of my essay

Throughout this essay I use the terms ‘citizen’, ‘the public’ (when discussing the field of public engagement), and ‘citizen participants’ (when in the context of the AccessLab project) to refer to people who are not academic science researchers. I use the term ‘scientist’ to describe someone who undertakes formal scientific research.

The first chapter of this essay is focused on context. I explore the history of power dynamics in public engagement with science and how they have evolved over time. It is only by critically examining previous efforts, the assumptions inherent in these models and the complexities involved, that we can begin to uncover a path towards a more productive citizen relationship with science. With this context, I then outline the problems with some historical efforts in science communication, both for scientists and for citizens.

The main body of my essay investigates the questions: What are the benefits of scientific dialogue with citizens? What do scientists and citizens stand to gain from interacting with one another? I use the AccessLab project to help answer the question of ‘how?’. Practically, how can productive, dialogic conversations between scientists and citizens take place? Four main groups of interrelated answers to this question emerged from my interviews with AccessLab participants, and I discuss each in turn.

# Chapter 1: The deficit model in public engagement with science

## 1.1 The history of deficit in public engagement

To fully understand the deficit problem and why it has pervaded, let us first look at its historical contexts and the changing attitudes to public engagement with science over time. The deficit, or transmission model of communication is the one-way imparting of pre-conceived knowledge (Carey, 1989) and in this essay I use it to refer to scientists communicating information ‘to’ citizens. This model assumes that there is a public reticence towards science which results from a lack of knowledge and therefore understanding. The argument continues that citizens would understand more and be more cooperative with advice from scientists if only they were provided with more information.

Historically, science was perceived to operate independently of the interests of scientists and institutions as research was, as Wilsdon and Willis (2004: 15) put it, ‘motivated purely by the spirit of inquiry’. This view of science as an objective pool of facts allowed its applications to be viewed independently of the research, leaving scientific research free to continue, unencumbered by the criticisms of the technology arising from it (Irwin, 1995).

However, this concept of scientific objectivity has come under scrutiny time again from scholars including Feyerabend (1975) and Kuhn (1996) who questioned how the ‘facts’ and knowledge created by science could possibly be independent of the values of the people doing the research, and the institutions funding it. If science is not value-free, this raises the question of whose values are considered in conversations about what research should be done?

The first real push into ‘science communication’ came in the late 1960s and early 1970s through the Sociology of Scientific Knowledge (SSK) movement. Scientists felt that the influence of science was declining due to public mistrust, and so embarked on a mission to ‘demystify’ their work. This involved attempts to improve citizens’ ‘scientific literacy’, or their understanding and knowledge of science, by supplying them with better quality and better communicated technical knowledge (Irwin, 1995).

This movement continued into the 1980s and in 1985, the Royal Society published a report on the Public Understanding of Science (PUS), which outlined ways that increased scientific literacy would benefit citizens and wider social systems (Bodmer, 1985). Irwin (1995: 110) called the SSK movement *‘*a science for (but not *of*) the people’, in other words, this call for citizens to be more involved in scientific activities did not challenge the deficit-based assumption that science is the source of knowledge and citizens should be consuming it, rather than actively contributing to it (Irwin, 1995).

In 2000, a House of Lords report discussed an increased appetite for dialogue between scientists and citizens and recommended approaches for increasing the input of citizens into science. The report called for greater engagement with public attitudes and values as a means to garner support and restore public trust (*Science and Technology - Third Report*, 2000). This report appeared to signal a tidal shift in power dynamics between science and society.

One type of citizen engagement activity which rapidly increased in number following the House of Lords report in 2000 was Citizen Science (McKinley *et al.*, 2015), defined by the Oxford English Dictionary as ‘scientific work undertaken by members of the general public, often in collaboration with or under the direction of professional scientists and scientific institutions’ (The Zooniverse, 2014). One of the prominent scholars in the field of Citizen Science, Rick Bonney, believes that there are many benefits to participants of taking part in these projects, including increased knowledge about science and its process, giving participants’ hobbies a deeper meaning, increasing their awareness of the breadth of scientific research taking place, and even improving their engagement with science after the study (Bonney *et al.*, 2016).

The problem with these efforts is that they rely on several, inaccurate assumptions about the relationship between science and citizens. The AccessLab project partly developed out of frustrations with the limitations of existing methods of public engagement and Citizen Science and I will now explore in more detail the problems these assumptions can cause.

## 1.2 Is deficit useful to science?

Considering this reluctance to relinquish the deficit model, one might reasonably assume that science benefits from it. However, this is not necessarily the case. If the hope is to convince the public of the sanctity of scientific knowledge, providing more information is ineffective, as it discounts the emotional element of decision making. There are a plethora of public engagement studies showing that the correlation between increased scientific knowledge on a topic and positive attitudes toward it is weak (Allum *et al.*, 2008) (Kahan *et al.*, 2012) (Kahan, 2015) (Nisbet, 2005). Therefore, even if the aim was to garner support for preconceived goals, which I argue it should not be, communicating information ‘to’ citizens without considering their knowledge, experiences and values is unlikely to be effective.

In addition, keeping communication one-way assumes that citizens do not have valuable knowledge to contribute to science, and so science misses important context which could help it to progress. In countless examples, from the knowledge of sheep farmers in the Lake District about the grazing patterns of their sheep (Wynne, 1992), to Inuit knowledge about the behaviour of bowhead whales in the Arctic (Albert, 2000), to AIDS activists participating in clinical trials (Epstein, 1995) we have learnt how science benefits significantly when it finds a way to incorporate the ideas and knowledge of ‘outsiders’.

## 1.3 Power and democracy – who gets a say?

Historically, science has been regarded as an instrument for democracy. Some historians even believe that modern democracy was a result of the shift in access to information, free inquiry and debate brought about by the scientific revolution (Jasanoff, 1996) and science and technology have long been regarded as tools for citizens to educate and therefore liberate themselves (Jasanoff, 2005).

Despite the apparently close link between science and democracy, in the past, science has operated outside of the accountability of other democratic processes, working with a ‘because we can, we should’ attitude, based on the assumption that innovation is self-evidently good both economically and socially (Wilsdon & Willis, 2004) (Stirling, 2008) (*Science & innovation investment framework*, 2004).

This is a theme of Ulrich Beck’s 1992 book ‘Risk Society. Towards a New Modernity’. Beck (1992) discusses how society is entering a phase in which citizens are focused on solving the primarily environmental problems created by industrial, technological solutions to earlier problems. A complex dynamic is arising where science and technology are seen as both the creator of risk and the solution.

Beck’s theory continues that as these negative consequences of industrialisation tend to affect those with lower socioeconomic status disproportionately, citizens who are less well-off are less trusting of industry and ‘progress’ and the powerful institutions which make decisions on how to deal with the risks created (Beck, 1992). As ‘expert elites’ continue unencumbered by complicated processes of public participation, scientific knowledge becomes more closely aligned with powerful institutions and the gap between the governors and the governed widens (Jasanoff, 2005).

This shift in societal priorities has exposed the inequalities created by science and technology, which has revealed in tandem that science is not in fact led by discovering the inevitable secrets of the natural world, but is in fact an exercise of values and therefore power (Wilsdon & Willis, 2004) (Stirling, 2007) which is open to both individual and institutional interests, and economic priorities. Therefore science can be viewed as a resource for the powerful and against the interests of people with lower socioeconomic status (Irwin & Wynne, 1996).

Whilst awareness of the importance of citizen input into science is growing in engagement activities, even in activities in which input from outsiders to science is being sought, it is often downstream of many of the decision-making processes. In other words, engagement in science is sought after agendas have been set. By assuming that new technologies are wanted, this means that conversations about risks only occur once the wheels are in motion, when it may be too late to change the trajectory of the research (Wilsdon & Willis, 2004).

Thorpe and Gregory (2010: 1) describe how ‘public engagement exercises prepare the product for the market and the market for the product’ – in order words, these exercises can be used to ensure buy-in by citizens to advance pre-determined goals.

This effect is reinforced by the language used, as democratic rhetoric can actually promote co-option and control (Thorpe & Gregory, 2010). Woolley *et al*. (2016) highlight how increasing numbers of science initiatives using words like ‘participatory’, ‘involvement’ and ‘engagement’ in relation to their relationship with citizens may appear to be a positive step, however these words have many meanings in different contexts and obfuscation about their definitions in different cases can allow projects to benefit from the popularity of the terms, without actually operating in dialogic, democratic ways you might expect from them.

In the case of Citizen Science projects, these terms are used to describe the full range of citizen participation levels from the very minimum of data entry or categorisation through to co-designing and creating a study, however most of these projects are designed for limited citizen participation within carefully constrained parameters (Rotman *et al.*, 2012), as one paper by Lukyanenko, Parsons and Wiersma puts it (2016: 447) ‘citizen science amounts to asking citizens to fill in the blanks in a story written by scientists’.

Scientists can benefit from the input of citizens into Citizen Science through increased capabilities for data collection, increased impact of their research in terms of greater numbers of citations (Mallapaty, 2018) and from the collective power of the voices of citizens to influence policy decisions (Irwin, 2018), without being dialogic or responsive to their needs.

Considering this, I argue that democratic rhetoric can disguise the continuation of the deficit model of communication. Without criticism, this rhetoric might strengthen power structures. Therefore it is vital that initiatives using these terms, including the AccessLab project, are questioned.

The revelation that scientific research priorities are in fact flexible as opposed to inevitable, coupled with the disproportionate impact of environmental threats caused by historically inequitable decision making processes means that it is vital that future efforts seek a diversity of voices to help steer research priorities to better reflect the needs of all citizens, particularly for research funded by taxpayers. This will require early, productive conversations between decision makers and citizens.

I began researching public engagement activities which attempted to address these issues of responsiveness and dialogue, and I found the AccessLab project particularly compelling compared to other efforts due to their focus on the skills rather than the knowledge of scientists, on solving problems important to citizens, their openness about the aims and format of the workshops, and their careful attention to detail in creating comfortable spaces for effective dialogue.

## 1.4 The AccessLab project

The AccessLabs are a series of workshops which were initially run by the British Science Association (BSA) and FoAM Kernow, with primary aims of decentralising research skills and creating open research advocates (Modinou, 2017) (Griffiths, 2018). Eight scientific researchers and eight citizens from roughly the same local area are invited to sign up. Each event is split into two days, the first day is a preparatory workshop for just the scientists and the next day is for all 16 participants.

For the first part of the full workshop, speakers give talks on the process of scientific research including funding and publishing papers. This is followed by further talks and exercises aiming to show citizens how to locate, access and assess the credibility of scientific information, and to make the scientists aware of the difficulties of accessing research as an outsider.

For the final part of the workshop, scientists and citizens are paired up to collaboratively solve a research problem of interest to the citizen participant and their community. As an example question, a town councillor might wish to find out how plans for a new building development might impact the local environment. The organisers deliberately pair the citizens and scientists to ensure that the questions are outside of the scientists’ area of expertise, in order to remove the view of scientists as having ‘the answers’ and rather show that their research skills are learnable and therefore accessible (Griffiths *et al.*, 2019).

Five labs were run as a collaboration between FoAM Kernow and the BSA between 2017 and 2018, with themed sessions for citizens with different job roles or interests, including artists, activists, community groups, as well as people working in the media and marine sectors. The organisers published a paper in 2019 which provided detailed information about the format of the workshops, with the intention that this would be an open-source resource for others to run similar events (Griffiths *et al.*, 2019).

## 1.5 Methodology

The paper by Griffiths *et al.* (2019) was an extremely valuable source of detailed information on the format of the AccessLab workshops and some of the principles behind decisions made. I spoke informally to one of the organisers, Ivvet Modinou, Head of Engagement at the BSA, via videoconference, to learn more about the ideas which had formed the workshops and how they had been embedded.

I was interested to know how the careful planning of the workshops, which theoretically sounded promising for addressing some of the problems I have outlined, had been experienced in reality by participants in the labs and so Ivvet and Dr Amber Griffiths, founding Director of FoAM Kernow, reached out to participants to arrange interviews. I decided that interviews with two scientist and two citizen participants would be the most appropriate method for my project.

I felt that the best way to access the direct, critical, honest and detailed information and opinions about the AccessLabs encounters I required for the project was to build rapport with my interviewees, and this would be most effectively achieved by a one-on-one interview. I also chose one-on-one interviews to try to ensure that the interviews did not feel too formal, in the hope that interviewees would be more relaxed and comfortable and therefore open in their responses. Given the timing of the project, during the COVID-19 pandemic, I decided to eliminate travel and conduct the interviews via videoconference. Though it would have been preferable to meet in person to help build rapport, the benefit of a remote meeting was that interviewees could be in a comfortable and familiar environment, which may have increased their openness.

I prepared open questions that would probe into the details of the interactions that took place at the workshops. As the themes I wanted to explore around power structures in science engagement were possibly unfamiliar topics for my interviewees, I had designed the questions to reveal what their underlying assumptions were about the power dynamics at play during the workshops, whilst ensuring that the questions did not lead towards my argument. Example questions I asked were ‘who took the lead in your pair?’ and ‘who from your pair do you think had the most to gain?’.

I began the interviews by introducing my project and asked each participant to introduce themselves and their work. I attempted to ease participants in with questions which had more factual answers, for example ‘how did you find out about the labs?’ and ‘which of the labs did you attend?’, before moving on to the open-ended and more probing questions.

For the main body of the interview I split the questions into three sections:

1. The first section explored participants’ existing relationships with science.
2. The second section explored participants’ experiences and interactions with others at the AccessLab workshop they attended, with a focus on how they felt about their interaction with their partner in the citizen-scientist pairings.
3. The third section explored the outcomes of the AccessLabs for each participant.

The interviews lasted between 35 and 50 minutes depending on the brevity of answers from interviewees. The interviews were semi-structured to allow me to divert and open new lines of questioning and clarify ambiguities. The majority of questions were the same for all participants, however there were some that I only asked to either the citizens or scientists. For example, I only asked the scientists what they thought science should be for, to understand their motivations for working in science and taking part in public engagement activities, and I only asked citizen participants whether they felt more confident finding and assessing the credibility of information post-event, as the dissemination of these skills was a large part of the workshops.

To address the limitations of my method, though initial contact with interviewees via the organisers avoided data protection issues, it also meant that the organisers approached participants that they had been in recent contact with, and as my interviewees had all participated in workshops that had occurred two years prior to our conversations, it implied that there had been lasting relationships and outcomes from the labs for those participants. The other limitation of this method of choosing interviewees was that their memories and perceptions of events might have altered in the two years since the labs they were involved in.

The scientists I interviewed were two of the 12 authors on the AccessLab paper by Griffiths *et al.* (2019) and therefore were likely more invested in and more knowledgeable about the project than the average participant. Both scientist participants had also taken part in public engagement events before.

For the citizen participants, the organisers had targeted groups of people they felt were likely to benefit from access to research to attend the sessions, which means they may have also been more likely to find beneficial outcomes from the labs than the ‘average’ citizen.

The combination of these factors means that all the participants I interviewed were highly engaged and so it could be argued that they were not fully representative of ‘citizen’ or ‘scientist’ groups both within and outside of the AccessLabs. I accepted this limitation given that I did not intend to represent whole groups, I was intending to gather qualitative information on individual experiences and opinions.

I recorded and transcribed my interviews using transcription software and used the principles of thematic analysis, such as those described by Braun and Clarke (2012) and Joffe and Yardley (2004) to analyse my data for repeating themes. I decided to use this method as my data was qualitative and based on the experiences and opinions of participants.

The steps for my thematic analysis were as follows.

1. Familiarisation – The transcription software I used did not capture the interviews perfectly so I listened back to the recordings alongside the scripts and edited errors as I went along. This had the benefit of helping me to become more familiar with my data.
2. Coding – I highlighted samples of text in distinct colours based upon their content and created a key to help identify which colour corresponded to which type of content.
3. Generating themes – I identified patterns between coded content and grouped those that arose most frequently into themes. When deciding on themes, I considered themes which arose across multiple interviews more important than themes that arose frequently within individual interviews.

A limitation of thematic analyses is that my own personal bias about what I deem to be most important was introduced (Braun & Clarke, 2012). The themes I selected were not only those most frequently occurring but to some extent were those I felt were most relevant to this essay, and my questions, my position as a student of Science Communication, and the nature of the AccessLabs project meant that certain themes were always more likely to arise.

As my interview questions mainly related to individual experiences and opinions, the responses I received were varied, however multiple interviewees expressed similar sentiment about the importance of science being relevant to citizens and the success of the format for dialogue. The latter included sub-themes of the productivity of small group conversations, emphasising interactions over outcomes, creating a comfortable and safe space and creating a sense of community. These are the themes I selected from my data and I will explore them in detail in the next chapters. In terms of how I will use the data from my conversations with my interviewees, I will summarise responses where appropriate and use quotes where ideas were particularly well articulated by individual interviewees.

# Chapter 2: The importance and practicalities of relevance and responsiveness

In the first part of this essay, I gave an overview of what I perceive as the problems with the dominant deficit model of science communication, how the problems arose and what assumptions they are based on. The key issue is that citizen input into science is sought too far down the track, when agendas have already been set, if it is sought at all. This means that science misses important input from citizens at early stages, which would ensure that science is beneficial, applicable, and critically, democratic. Given this context, this chapter will now explore how science should change to address this, and why it should, in terms of what it stands to gain.

As discussed in chapter 1, Beck (1992) believed that society is entering into a phase focused on solving the primarily environmental problems created by industrialism. As the effects of anthropogenic climate change worsen and continue to disproportionately affect those with lower socioeconomic status, it is arguably becoming more important than ever to ensure that citizens and scientists are working collaboratively, so that different voices are heard and science can improve the lives of those that need assistance the most.

To answer the question of what can be done to make science more responsive to citizen needs, there needs to be more avenues for the sharing of information, values and views between citizens and scientists, and crucially, citizens need to be engaged ‘upstream’ in the process (Wilsdon & Willis, 2004). A good example of this is the principle of Constructive Technology Assessment (CTA). CTA is where technical changes are tailored to the needs of society. It advocates for wider social actors to be involved in the design phases of new technologies to mitigate adverse social impacts early on. CTA puts people at the center of technological innovation, ensuring that issues such as reducing pollution, providing employment and ensuring safety are top priorities during agenda setting (Irwin, 1995). A more responsive system would create closer links between communities and researchers, which would give scientists a better understanding of the problems communities face, and would give citizens greater influence on research agendas.

If citizens are engaged in research agenda-setting, they can also understand more about the processes of scientific research. It is only through understanding the history and underlying assumptions of a system that it can be critiqued and improved upon.

In suggesting that science should be more responsive, I do not intend to devalue the role of ‘blue skies’ research, which is curiosity-driven and without predetermined goals. Scientists view this type of research as vitally important due to its ability to challenge paradigms of scientific understanding (Linden, 2008) and I do not suggest here that all research should necessarily be led by immediately obvious need, but in undertaking blue skies research, it should be recognised that those curiosities are socially driven and the purposes of research and its possible outcomes should be deliberated and debated more widely before it is undertaken.

In this chapter I have begun to tackle the question of what should be done, but how has it, and how is it being done? Discussions about CTA and responsive science are not new, Science Shops arose in the Netherlands in the 1970s in an attempt to address these issues. Science Shops framed science as a public service, providing independent responses to research enquiries from the public (*Science Shops: knowledge for the community*, 2003), they are usually based at universities or NGOs and have a small number of paid staff. The process is that the ‘client’, or citizen, requests information and then an audit is carried out to see if relevant information is already available. If it is, this information is communicated to the client. If it is not, research is carried out by the Science Shop (*Science Shops: knowledge for the community*, 2003).

Following success in the Netherlands, the idea was taken up rapidly in other European countries and the proliferation suggested an encouraging and increasing openness of institutions to new ways of working with citizens. It also suggested there was a need for programmes like Science Shops, in which science is responsive to citizen needs and where institutions can help people in underprivileged positions access resources to help improve their situations. This proliferation suggests that there have been features of these Science Shop encounters which have resulted in success in making improvements in the lives of citizens.

The final part of the AccessLab workshops were spent in citizen-scientist pairs, collaboratively researching the solution to a question of interest to the citizen participant, and this aspect of the workshops was inspired by the Science Shop model. This reverses the idea of citizens as a tool to aid scientists, which is prevalent in Citizen Science projects (Rotman *et al.*, 2012), as scientists are pitched as being at the service of citizens. This ensuresthat the science is relevant and citizens are engaged from the offset, as scientist participant Kate Baker emphasised:

‘If projects are co-created with the community, then they're more likely to be taken up. The science will be directed more by community so it's more relevant to them.’

This said, the small scale and ephemeral format of the AccessLab project means that the focus is on trying to solve problems with existing research, rather than setting research agendas or co-creating research projects and solutions, and therefore you could argue that this is still downstream engagement, however it does address the fundamental problem of ensuring that the science is relevant and useful for citizens, and explores ways of addressing this issue within the constraints of present scientific research practices.

The other limitation of the AccessLabs project and Science Shops in relation to the problem of relevance is that without a previous relationship with science, it can be hard for citizens to visualise how science could be applicable or useful to them and their situation (Stewart, 1988). People who might benefit most from the project might not feel it is for them and so would not attend in the first place. In the 2019 ‘public attitudes to science’ survey, the majority of respondents felt that the public should be involved in scientific decision making, but most people were not interested in being involved themselves (*Public attitudes to science 2019*, 2020). This may be because the historical defensiveness of science can make it a daunting space to enter into as an outsider. For the AccessLab organisers, in most cases it was much easier for them to recruit scientists to be involved than citizens.

It is only through dialogue and openness to change that science can begin to receive and benefit from the input and perspectives of outsiders, but also understand what is important to citizens, so that science can act in their interest. Dialogue is the second theme arising from my conversations with AccessLab participants, and I will now discuss the importance of the concept and how it can be achieved.

# Chapter 3: The importance and practicalities of dialogue

To understand what is relevant and important to people, there needs to be avenues for constructive dialogue between citizens, scientists, and those making decisions about what research is funded. Science needs to lose its defensiveness about the supposed objectivity and resulting superiority of scientific knowledge over other forms of knowledge and culture. To effect dialogue there needs to be a baseline of equal respect for cultures and knowledge, which requires the understanding that science is one of many ways of understanding the world with its own merits and flaws (Harding, 2017).

The view needs to change from one where the culture of non-scientific communities needs to adapt to new information, to one where that culture is viewed as important and useful in the process of creating knowledge and solving problems. To effect dialogue, both parties need to be willing to compromise and for their ideas and plans to change through the process.

The ‘funds of knowledge’ outlook can increase the efficacy of dialogue between scientists and citizens as it relies on a baseline of respect for other cultures. At its foundation, funds of knowledge assumes that people are competent and have their own knowledge based on their life experiences.

In saying that all voices need to be seen as equally valuable to allow dialogue between citizens and scientists, I am not suggesting that there is no role for expertise. Rather, that citizens need to be viewed as experts in their own experiences, including their areas of work, and that certain types of expertise cannot be seen as superior to others.

Potential limitations of adding more voices to debates on the direction of science and technology are that the process becomes time consuming (Freire, 1974), costly, and the outcomes become unpredictable, which some worry could stifle innovation (Jasanoff, 1996). However, Jasanoff (1996) believes that if knowledge and social legitimation are produced in tandem in the first place, this would create more trust and therefore save time on spiralling debates in the long term about technologies that were not elected by citizens in the first place.

Having outlined what need to be in place to achieve dialogue, I will now investigate how AccessLabs facilitates this. One aspect of the Science Shop model that the organisers of AccessLabs wanted to move away from was the imparting of knowledge by transmission. They felt that if citizens were not taught research skills for the future, scientists or institutions would retain the power and citizens would remain reliant on institutions for assistance (Griffiths *et al.*, 2019). To address this, the AccessLabs were set up so that a sizable proportion of the day was spent on talks and exercises aiming to disseminate research skills to the citizen participants present. The last part of the day was spent in citizen-scientist pairs collaboratively solving a problem outside of the scientists’ area of expertise, which removes the default idea of scientists as having reservoirs of knowledge ready to impart. Scientist participant Kate Baker appreciated this switch in the power dynamic:

‘I think it was good that the scientist was not the expert, so you're working out that problem together and get rid of that potential hierarchy that can happen’.

By ensuring that scientists were not solving problems within their area of expertise, this addresses another problem with Science Shops, which is that researchers can be reluctant to cross disciplinary boundaries, and this is unhelpful for tackling citizen concerns as they can rarely be neatly categorised into different areas of science (Stewart, 1988). AccessLabs removes this problem and ensures that scientists draw upon their universal researching skills rather than subject-specific knowledge.

Another way that the format of the AccessLab project eased dialogue was by theming the workshops by citizen speciality or interest. For example, there have been separate workshops for policymakers, artists, and climate activists. This grouping makes the skills and knowledge that the citizens can bring to the sessions clear and the collaborative problem solving between citizen and scientist creates a sense that the conversation will be between two experts in their own fields.

You could argue that the concept of scientists teaching research skills to citizens reinforces the transmission model of communication, however in focusing on demystifying the process of research and imparting skills rather than providing information, the organisers were attempting to empower citizens to be more critical.

In these discussions we can begin to see how the AccessLab project is structured to encourage dialogue. Dialogue is only possible if people feel comfortable and empowered to share their ideas and experiences, and I will next discuss how the organisers of the AccessLabs facilitated this using four themes arising from my interviews.

# Chapter 4: How does the AccessLab project facilitate dialogue?

Having explored which aspects of the deficit problem are addressed by the AccessLabs’ format, this chapter delves into the question of ‘how?’. How did the organisers of the workshops ensure their noble intentions of enabling dialogical conversations between scientists and citizens were effective? How did the participants experience this? I have chosen four themes from my interviews with participants to help answer these questions.

## 4.1 How small group sizes create lasting impressions

To properly take advantage of the views of citizens, more opportunities for one on one, in-person interactions between scientists and citizens need to be created. The small group sizes and time for one on one interactions was a key part of the AccessLab project and one of the central reasons I was interested in exploring this particular project. The benefits of a small group size was something that commonly came up during my interviews.

Discussions help people to express and elucidate their ideas, increase empathy and create respect between participants (Brookfield & Preskill, 2005) and small group discussions, such as those in the AccessLab workshops, allow for greater flexibility, interaction, reflexivity and engagement compared to larger groups, helping to remove hierarchy and encouraging participants to learn from each other (Mills & Alexander, 2013). Small groups are particularly beneficial for those who are less confident in larger groups as it can allow them to feel more comfortable sharing thoughts and opinions (Mills & Alexander, 2013).

Each workshop was made up of 16 people (eight scientists and eight citizens). The majority of the day was spent with the whole group or in smaller groups and this meant that by the last part of the day, when citizens and scientists were paired up to research a question together, the pairs had already met throughout the day, increasing their comfort with one another. Interviewees appreciated that the pair work gave them the ability to speak more directly with one another, and enabled them to learn more in comparison to engagement activities with larger group sizes.

Though all interviewees spoke well of their partners and considered their partnerships to have been collaborative and productive, three of the interviewees described feeling challenged, or slightly out of their comfort zones in the paired conversations. In relation to public engagement events more widely, scientist participant Kate Baker discussed how nerves and discomfort can hinder conversations between citizens and scientists:

‘I think there's a lot of mistrust and maybe the public are quite daunted by scientists and might feel uncomfortable working with scientists because they feel that they are not clever or they won't understand what they're saying. And I think that works both ways, I think scientists are often quite nervous about talking about their work with the public in case they don't know the answers.’

The idea of anxieties arising about interactions from preconceptions was raised by one of the citizen participants, who recalled initially feeling daunted about entering a room with clever, young scientists. AccessLabs subverted these expectations and helped to ease conversations by creating opportunities to work closely in pairs and for participants to get to know each other throughout the day, before the paired work. All of the interviewees enjoyed the company of their partners and felt their conversations had been productive, and the citizen participant who had initially felt intimidated described how they left feeling less daunted and more confident in their intelligence.

Interviewees also cited the novelty of this intimate setting for public engagement. Both scientists interviewed had taken part in public engagement events before but with much greater numbers, which they both acknowledged came with lesser impact.

## 4.2 Prioritising positive interactions over measurable outcomes

Sources have shown that public engagement with science is most effective when the interactions are low pressure, social and relaxed (*Theory of Change for Public Engagement with Science*, 2016) (Dickinson *et al.*, 2012) and the importance of this was raised by the AccessLab participants I interviewed. Scientist participant, Kate Baker, said of the scientist-citizen pairing section at the end of the workshops:

‘we didn't have to feedback afterwards or present what we'd found. It made it more relaxed and because we were given quite a bit of time, it meant we could align at the beginning and have a general chat about the day, where we live etc. That gained a bit of trust before we started talking about what she wanted to research.’

Kate’s point relates to one of the theories for change in public engagement with science, which is that it takes time to build relationships so that scientists and citizens can relate to each other on a human level, outside of their professions, to build a foundation of trust and respect (*Theory of Change for Public Engagement with Science*, 2016).

The AccessLab organisers were not focused on measurable outcomes and though they originally stated their aims as creating open research advocates and decentralising research skills (Modinou, 2017) (Griffiths, 2018), from the four interviews I held there were a vast range of additional outcomes for participants. Some of these were quantifiable, for instance the research and calculations from one of the pairs was used to make a policy change within a local council, and other participants became authors on the Griffiths *et al.* (2019) paper published about the labs. Many of the outcomes were not so easy to quantify however, and included:

Making the scientists more aware of the skills they take for granted in finding and critiquing information and undertaking ‘back of the envelope’ calculations

Showing researchers the difficulties for citizens in accessing scientific research

Building mutually beneficial relationships which continued outside of the workshops

Learning about open access publications

Receiving advice and guidance about writing a research paper

Learning about the scientific process

Feeling less daunted by interacting with scientists

The focus on the experience and learnings from the labs rather than quantifiable outcomes meant that participants could enjoy the process, and judging by the number and variability of outcomes cited by the interviewees, the lack of pressure did not appear to have negatively impacted the productivity of the participants I interviewed.

One aim of AccessLabs that did not appear to have been as important an outcome for citizen participants was the focus on helping them to access and critique scientific research. One of the citizen participants mentioned finding the information on how to access and critique scientific research interesting at the time, but as she was not now regularly using those skills, her memory of the advice given had faded. Though I believe skills in critiquing information are useful outside of academia, even if more papers are made accessible via open access licenses, and citizens know how to access them, I am not convinced that citizens will find sufficient value in accessing research papers as they currently exist with their inaccessible language and inward focus.

## 4.3 The value of a well-designed setting

One of the most important considerations for facilitating productive interactions is creating a space and atmosphere in which participants can feel comfortable, and there is a wealth of research on how surroundings, including factors such as noise, lighting, views of nature, ergonomics, furniture, ventilation and temperature, can impact wellbeing and therefore productivity (Lamb & Kwok, 2016) (Salonen *et al.*, 2013) (Van Der Valk *et al.*, 2015).

The organisers of the AccessLabs spent time and effort researching spaces which would be as neutral as possible for attendees, they wanted to move away from the format of Science Shops, which are often connected to universities and therefore university buildings, as they can be unfamiliar or intimidating spaces for citizens and they wanted attendees to feel that neither group was being prioritised over the other.

The way in which seating is arranged can have enormous impact on how discussions take place, and whose voices are legitimised (Ward, 1968) and in the AccessLab workshops, tables were placed in circular or square arrangements with participants facing inwards, suggesting that all voices would be equally valuable.

All the participants I interviewed, despite partaking two years prior to our conversation, mentioned on several occasions their appreciation of the small touches, which included a delicious lunch, plants and notebooks. Although it might seem glib, clearly these were an important part of the experience. These features give the impression that someone has carefully considered how the participants might experience the space and how to make it comfortable, and this implies that the opinions of the people in the room are valuable. The fact that these ‘small touches’ were the same for the scientists and citizens implies that their contributions were valued equally.

The organisers recognised that their ability to keep numbers small, hire a space for a full day to give enough time for conversations, and provide these small touches was dependent on having staff resource and ‘progressive’ funders who were not driven by numbers reached and other measurable outcomes. The organisers also recognised that funders such as these can be rare.

## 4.4 Creating community connections

The final theme arising from my interviews is the importance of scientists and citizens having connections outside of the workshops, which in the case of AccessLabs was living in the same local area. This was something all interviewees felt was important to the success of the workshops.

It helped them to form initial relationships as they could discuss the obvious thing they had in common, their knowledge of the local area, and also gave the participants a reason to connect on a person to person level, as citizens living in and therefore invested in the same community, before they connected on a professional level.

The second key outcome for participants arising from the workshops being local was that it allowed them to form lasting connections after the workshop completed. For instance scientist participant Kate Baker mentioned that she had gone on to run public engagement events with another participant in the workshops, and citizen participant Sue Sayer’s seal conservation charity still benefits from connections to university researchers that she made at the AccessLab workshop she attended.

Locality is part of the larger matter of contextualisation. For engagement to feel effective and for science to feel integrated into people’s lives, it needs to feel relevant, and therefore it is essential that science is contextualised within sociocultural and personal contexts (*Theory of Change for Public Engagement with Science*, 2016). The way that the AccessLabs are set up relies on citizens bringing issues they are interested in, which ensures that the research question is applicable to their sociocultural context.

# Chapter 5: What does the AccessLab project reveal about public engagement?

Through my investigation into the AccessLab project, I have found four main ways that it begins to address problems arising from deficit communication models. Firstly, as AccessLabs pitches science as a service to citizens, this stresses the importance of ensuring science is not only relevant but responsive to citizen needs. Though the small scale of the project meant that the focus was downstream, using existing research to solve problems rather than directing new research.

Secondly, AccessLabs demonstrates ways of challenging transmission models of communication by disseminating research skills, highlighting the skills rather than expertise of scientists, and theming the citizen participant groups by interest or role to make the value of their expertise in conversations clear.

The third major learning from the AccessLab project was how to create safe spaces for effective dialogue, four groups of ways that AccessLabs achieved this arose from my conversations:

1. Small group and one on one interactions can help people to feel at ease and be heard.
2. It can help to pair citizens and scientists with something in common so that they can bond over shared experiences and if possible, are working towards something both parties are invested in.
3. A comfortable environment in which both groups are equally valued can put people at ease and sets the expectation of dialogue.
4. Removing expectations of particular outcomes gives participants time to build trust.

Finally, the AccessLab project also revealed the importance of adopting a critical view of both previous science engagement practices and of its own methods. Its format challenged several assumptions from previous science-citizen engagement efforts: that scientists have reservoirs of facts ready to impart, that the directions of research should be decided by ‘experts’, and that citizens do not have valuable knowledge to contribute to science.

In terms of how self-criticism is built into AccessLabs, the format was experimentative and had been adapted over time based on feedback. The organisers had also published an open access paper which outlined the format of the sessions in an unusual level of detail, allowing others to critique, adopt and adapt the workshops (Griffiths *et al.*, 2019).

Though I appreciate the value of disseminating skills in finding and critiquing information, I would reduce the focus on open access and citizen access to scientific papers, and instead focus attention on how to move the citizen participant input upstream in the research process. There has previously been a lack of consideration and therefore precedent for how to carry out upstream engagement activities, and therefore it is not a simple task to envisage how this would be achieved within the constraints of current research processes. Despite this, efforts in this area, however successful, should as a minimum encourage people to challenge their ideas about public engagement and the roles of citizens and scientists in research.

The project would also benefit from finding ways to include both citizen and scientist participants from further outside of the organisers’ circles, to increase the range of perspectives shared. Finding ways to encourage citizen participants who are reluctant to engage with science to take part, though difficult, may prove the most revealing conversations.

My final thought about how the AccessLab project could develop would be to give even more attention to the history and philosophy aspects of science. This is something that is already explored to an extent, as citizen participant Sue Sayer mentioned:

‘they gave us a holistic understanding of the scientific process’

However this aspect could be further emphasised in discussions to make the workshops even more thought provoking and impactful for participants.

Reflecting on the limitations of AccessLabs as a case study for my argument helps to bring to the surface the constraints that current science practices place on public engagement activities. When assessing public engagement activities, it is essential to consider how systems in place, particularly impact measurement and funding allocation, create pressures for scientists. Individual scientists are not necessarily reluctant to engage with citizens, but the culture and existing methods of scientific research can make it difficult for them to do so in meaningful ways.

The openness, reflexivity and organised criticality AccessLabs displays is sorely missed in many science engagement practices and it reflects the lack of reflexivity of science more widely. Though there is a great deal of work being done in the field of Science and Technology Studies exploring how scientific research and innovation is affected by politics, society and culture, there is a disconnect as these philosophical insights are rarely taught to scientists (Grüne-Yanoff, 2014) and modern scientists often view philosophy as dichotomous, even contradictory, to science (Laplane *et al.*, 2019).

To make science more responsive to citizen needs, it needs to be more reflexive and scientists need tools to critically examine and question their roles in society. This kind of critical thinking requires scientists to have a knowledge of the history and philosophy of science, and a detailed understanding of the systems they are constrained by. This should be seen as a fundamental part of science education.

# Conclusions

The deficit model of science communication is problematic for both citizens and scientists. For scientists, deficit assumptions are ineffective in reducing public opposition and the inability to incorporate ‘outsider’ ideas stifles innovation. More importantly though, the deficit model makes science less democratic, and as citizens with lower socioeconomic status are often disproportionately affected by the negative side-effects of technological progress (Beck, 1992), inequalities will widen if they are not able to participate.

To address these challenges, science needs to be more responsive to citizen needs, creating opportunities for upstream engagement to increase citizen influence on research agendas. By asking citizens to bring issues important to them to the AccessLabs to solve collaboratively with scientists, the labs showed how important it is that science is seen as a service to citizens and responds to their needs.

To benefit from these essential insights from citizens, science needs to move from a deficit to a dialogue model of communication in which knowledge is co-created rather than transmitted. The three ways that AccessLabs tackled this were by disseminating research skills, ensuring that scientists were working outside of their areas of expertise, and by theming the citizen participant groups to make the value of their expertise clear. AccessLabs also revealed how important considerations about the practicalities of running public engagement events are for enabling dialogue between citizens and scientists.

Though the AccessLab project provides innovative and valuable tools and ideas for encouraging dialogue to those interested in public engagement with science, it is limited by the constraints of wider scientific research processes. To begin to address this, it is essential that scientists are given the tools and the opportunity to reflect on their position and role in society.

The current climate crisis and COVID-19 pandemic have stressed the importance of the relationship between science and society. As history has shown, science has the potential to vastly improve the quality of the lives of citizens, but citizens need opportunities to input not only into how to deal with secondary risks, but into primary research objectives.

AccessLabs demonstrates how dialogue is possible within the constraints of current scientific systems, but its norm-challenging approaches also inspire more creative problem solving and expand ideas of what is meant by ‘public engagement with science’, including what, and who, it is for.

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