Science Communication in a Complex World

Discussions, impulses and results from two stakeholder workshops

This paper gives insight into the main discussions and results that came up during two stakeholder workshops in late 2018.[1] *Participants of the events focused on cooperation and future strategies in science communication. It became clear that although different stakeholders do not necessarily agree on all approaches, formats and target groups, they share a common interest in having an open and knowledge-based public discourse on science-related topics. Participants of the workshops agreed that science communication should not only aim at informing the public about scientific processes. Instead, it should also emphasise the relevance of science for any democratic society and the role it can play in solving societal problems. In this sense, participants of the workshops identified the need to coordinate science communication projects on similar topics and to strengthen the exchange of best practices and experiences across sectors and boarders.*

Introduction

Science and research are at the heart of any societal development. The way we live, learn and work together and the influences we have on our environment all share direct links to scientific innovations. Neither a single country or company, nor a single scientific discipline or research institute can deal with grand societal challenges such as climate change, poverty or public health on its own. Instead, they require transnational, transdisciplinary and trans-sectoral solutions. Communicating these solutions and the research behind them to and with society is a highly complex and multi-layered endeavour. Science communication is shaped by multiple stakeholders from science, media, civil society and industry with diverse perspectives and interests. Direct dialogue between the different stakeholders is essential but often lacking. Moreover, while some scientists become increasingly involved in external science communication and public engagement, many of their colleagues are still reluctant to engage in science communication for a variety of reasons. Hence, there are many topics of enormous societal and political relevance with a distinct lack of scientific impulses in public discourses.

This was the context of two stakeholder workshops that took place in late 2018. This paper gives insight into the main discussions and results that came up during the events and proposes future strategies and actions for science communication and stakeholder cooperation. The focus of the first section is on the different points of contact between science and the public, leading to the overall goals of science communication. What follows is a summary of the public attitudes towards genome editing as an example for a contested field of communication. This section will

[1] The event "Communicating Science in a Complex World" in Brussels was co-organised by the German organisation Wissenschaft im Dialog (WiD), the Swedish organisation Vetenskap & Allmänhet, the European Science Engagement Association (EUSEA) and ALLEA – All European Academies. The follow-up event in Berlin, "Miteinander statt übereinander reden" was co-organised by WiD and the Stifterverband. The Bayer AG supported both events.

lead over to the question of what it means to communicate science with integrity. The paper ends with an outlook on the way ahead, highlighting the need for increased stakeholder cooperation and inter-sectoral dialogue on communicating research topics and contributing to open, science-based public discourses.

Communicating Science

Science communication is a contested and rather unspecific term. This paper follows a broad understanding of science communication as an umbrella term that encompasses all forms of communicating science (Schäfer et al. 2015: 13). Researchers differentiate between internal and external communication of science. Internal science communication takes place within the realm of science and includes formal publications but also informal exchanges between scientists. This paper focuses on external science communication that comprises all communication activities with audiences outside the realm of science such as politicians or the broader public. Its stakeholders can be scientists, science journalists or communication departments of institutes, organisations and companies that have a scientific background (Schäfer 2017; Siggen 2018). The formats that science communicators can choose from include classical panel discussions and presentations, world cafes and bar camps, as well as science slams and FameLabs. This constantly growing field of event formats is complemented by a wide array of science communication online through social media.

Science in Society

Science is deeply interwoven with any modern society and influences the life of everyone – but how and when does the public reflect on it? How do people actively engage with science? And what are the main challenges for science-based discourses in modern societies?

Citizens inform themselves about scientific developments. They use scientific information for decision making and to orient themselves in their daily lives. Digital media has significantly facilitated this process and has thereby constituted new opportunities but also challenges for science communication. People can choose from an increasing number of channels to inform themselves about scientific developments. Meanwhile, well-established mass-communication channels no longer work effectively to reach multiple audiences. Thus, while science communicators have more communication tools at hand, they are faced with an ongoing fragmentation of audiences as well as discourses and are thus required to have a deep understanding of their target group and its preferred communication channels. Science and research have always been debated and argued over. This is a normal state of affairs that supports the development of any knowledge society (ALLEA 2018: 6). However, science is vociferously challenged by anti-scientific claims that can reach many people through targeted campaigns. Using the attention economy of digital media, anti-scientific interest groups can create alternative “realities” that may severely damage the established scientific consensus (see

Siggener Impulse 2018). Science communication can challenge such sentiments by providing strong narratives that explain the pivotal role of science in tackling societal challenges such as climate change, public health or food security.

Against this background, participants of the Berlin workshop discussed the changing conditions for science communication through social media. The participants agreed that science communicators would be well advised to first identify and analyse relevant target groups before using their social media channels. They encouraged science communicators to engage with existing online communities and to try out new formats such as scientific podcasts or take-overs of their social media accounts. Participants further recommended institutions to **support individual researchers in their science communication activities** and to discuss joint communication activities and exchanges with scientists who are actively communicating their research.

Science communication not only informs but also educates people. Faced with ongoing anti-scientific backlash science communicators should challenge such campaigns by giving their audiences a **basic understanding for scientific methods and processes**, while communicating remaining uncertainties in their research transparently. In this way, science communication mediates between science and the public and takes a pivotal role in empowering people to recognize anti-scientific, alternative 'realities'. The educational aspect of science communication also includes recruiting the next generation of potential scientists. Often, young people are not well informed about the different scientific careers that are available, nor do they identify with them. This is especially the case for young people from educationally disadvantaged backgrounds. **Science communication should address all parts of society, provide skills and enable young people to consider a scientific career and to make informed choices.**

Lastly, many citizens are genuinely enthusiastic about science and find direct points of contact for example through **citizen science projects**. These projects enable citizens to gain profound insights into scientific processes and fields of research. Moreover, citizen science projects can contribute to a further democratization of science by opening scientific processes to public participation. While people should have easy access to participating in citizen science projects, the opportunities as well as the constraints of public engagement should be openly discussed in order to avoid false promises and disappointment. Participants of the Brussels/Berlin workshops saw open questions regarding the ownership of citizen science results and whether the citizen science community should and can be linked with industrial stakeholders. Moreover, participants expressed the need for more strategic and long-term funding of citizen science projects as well as better publication opportunities. One way to achieve a strategic approach would be to develop ways to compare and evaluate the impacts of citizen science projects on citizens, scientists, the industry or NGOs and to share lessons learned and good practice.

Goals of Science Communication

The specific and underlying goals of different science communication projects can vary enormously, depending on the stakeholders' perspectives, backgrounds and strategic aims.

Scientists may aim at **promoting** their findings but are also interested in **legitimizing** and **securing funding** for their research. Many scientific institutions also see science communication as a way to **promote their institution and to recruit young talents** (Siggener Impulse 2018: 2). Science journalists report research outcomes that they consider relevant to society and interesting for their readership, NGOs comment on science from their specific perspectives in order to **position themselves in the public discourse** and industrial actors communicate research and promote the products that evolve from it. Undoubtedly, there has regularly been unease with the pace and direction of some scientific and technological advances among the public (ALLEA 2018: 5). Nonetheless, science communication was for a long time regarded as a unilateral approach to educate and inform without taking exchange and dialogue with the public into consideration.

This has changed continuously over recent years, with science communicators trying to receive more and more feedback from citizens through dialogue-oriented, interactive formats. Citizens are no longer envisioned as simple information receivers but as individuals who deal with science critically and who should be supported to base their reasoning on scientific facts. Even though different stakeholders do not necessarily agree on all approaches, formats and target groups, they share a common interest in having an **open and knowledge-based public discourse** on science-related topics such as digitalisation, food security or public health (Ziegler et al. 2018). Against this background, communicating science aims not only at informing the public about scientific processes and results but also emphasises the **relevance of science for any democratic society** and the role it can play in solving societal problems.

Communication about Genome Editing

Shaped by different stakeholders with diverse perspectives and interests, some fields of research have been at the centre of controversial public discourses. The Brussels workshop focused on the communication of genome editing as an exemplary field that faces complex communication challenges. Keynote speaker Professor George Gaskell (London School of Economics) presented findings of his studies on the European public views on gene editing and its uses. Rapid advances in genome editing and its potential applications have been controversially debated in science and the media, while a broader fact-oriented public debate on the topic has been lacking. Gaskell and his colleagues analysed public support for the use of gene editing in ten EEA-countries and the United States of America.[2] They compared judgements about human genome editing in the contexts of therapy versus enhancement, while differentiating between the two recipient categories prenatal and adult. The results show broad support for adult therapy using genome editing, while prenatal enhancement is widely rejected (Gaskell et al. 2017: 1021). Both adult enhancement and prenatal therapy appear to be morally ambiguous. Maria Hagardt (Vetenskap & Allmänhet/Orion project) complemented these findings with results from a survey on life sciences, which she presented during the Brussels workshop. Similar to Gaskell's presentation, the

[2] The authors conducted online quota sample surveys of more than 1,000 respondents in Austria, Denmark, Germany, Hungary, Iceland, Italy, the Netherlands, Portugal, Spain, UK and the US (n = 11,716) (Gaskell et al. 2017).

Orion project on Life Science research[3] shows that positive attitudes towards genome editing are high when its purpose is related to human health. However, the project further indicates that public attitudes are comparatively low when the same technology is used to improve plant or livestock production. Accordingly, the key point highlighted by both surveys is a distinct variation in public attitudes towards the same technology in different areas of application. Gaskell and his colleagues conclude that public attitudes towards genome editing are not primarily driven by the technology itself, but rather by different applications that the technology might have (Gaskell et al. 2017: 1022). Scientists, on the other hand, tend to focus on research and the technology itself (ibid.). As the United States National Academies of Sciences, Engineering, and Medicine remarks in its report, research on genome editing should be accompanied by extensive and inclusive public engagement "informed by technical experts and by social scientists who undertake systematic public opinion research, develop appropriate communication materials, and minimize artificial biases or constraints that would hinder discussion and debate" (NAS 2017: 177f.). Accordingly, science communicators should bring public attention to the applications of genome editing and scientists' focus on the technology itself together. Thereby, they should create opportunities for open and cross-cutting dialogue that also includes ethical, legal as well as social implications.

Communicating Science with Integrity

In the digital age, laypeople can access scientific information easily online. The internet provides unfiltered and competing information on any topic. At the same time, science communicators as well as scientists who engage in communication are faced with the pressures, speed and demands of modern communication that pose a risk for scientific integrity. The main challenge for laypeople then is to determine the credibility of a given source of information, or in short, whom to trust (Hendricks et al. 2015). The science barometer 2018 shows that, at least in Germany, there is a stable public trust in scientists and no rampant scepticism towards science (Wissenschaft im Dialog 2018). From a psychological perspective, trust in scientists is based on three main dimensions: expertise, integrity and benevolence (Hendriks et al. 2015).[4] The results of the science barometer 2018 imply that most people trust scientists because of their expertise, while public trust in scientists' integrity and benevolence is less pronounced (see Wissenschaft im Dialog 2018).

For this reason, the participants of the Brussels workshop focused on scientific integrity as well as integrity in science communication. This dimension includes all facets related to an expert's "honesty, objectivity, and adherence to recognized standards" (Hendriks et al. 2015: 3). On the one hand, adherence to scientific integrity provides insulation from scientific misconduct such as plagiarism and falsifying data (Barr 2007). On the other hand, it includes fully disclosing any potential area of bias, outside interference and censorship (Barr 2007, EPA 2019). Often, the

[3] Find more information online at: https://www.orion-openscience.eu/

[4] The authors refer to benevolence as the good will an expert has towards others, which may be the most difficult dimension to assess for outside observers, and expertise as his or her competence or ability in a field of research (Hendricks et al. 2015).

limitations of scientific processes are not well understood by the public (ALLEA 2018: 5). **In order to communicate science with integrity, underlying uncertainties and the often provisional character of scientific findings need to be openly addressed.** People should gain an insight into the working principles of the science system such as peer review processes guaranteeing that the current state of research is always the best possible according to scientific standards.

As the participants of the Brussels/Berlin workshops emphasized, younger generations of scientists especially should receive a better understanding not only of good scientific practice but also of how to communicate their research with the public. By international comparison, there has been an apparent lack of young scientists in Germany who are willing to actively engage in science communication with the public (Könneker et al. 2018).[5] The authors find that although the majority of young scientists in Germany acknowledge the societal relevance of science communication, they asses its positive impact on their careers much more pessimistically than scientists from other countries (ibid.: 872). Young scientists often see science communication as an optional addition but not as an integrated and valuable part of the scientific process. Accordingly, Könneker and his colleagues assume that there might still be a lack of acceptance and appreciation of scientists who get involved in dialogue with society. Workshop participants consequently discussed ways to involve more young scientists in science communication activities. They saw the need to **include science communication interdisciplinarily into university curricula** and supported the **development of more training opportunities** and workshops on science communication formats, digital tools and social media. Participants further suggested finding key actors as role models who are already actively communicating science and facilitating an exchange between young scientists and these actors.

How to move forward: Good Science Communication in the Future

Citizens who are empowered to deal with science consciously and base their reasoning on scientific facts should be the overall goal of science communication efforts. Discussions during the Brussels/Berlin workshops showed that loosely connected stakeholders who communicate science through multiple channels have a wide array of opportunities and formats at hand to reach that goal. Despite their different perspectives and backgrounds, these stakeholders acknowledge the need for open, science-driven public discourses on socially relevant research. Participants of the workshops found that **science communicators need to know their audiences** and should focus on content and channels to reach even the uninterested parts of society. They should not only **communicate** the successes and benefits, but also **the limitations and uncertainties of their research transparently**. Moreover, young scientists should receive a better training for and a more positive picture of communicating their research with the public.

There has been an apparent lack of clarification on the specific aims and intended effects of many science communication projects. This can lead to duplications and overlaps of projects,

[5] The authors analysed 988 complete data sets of young scientists not older than 35 from 89 countries (Könneker et al. 2018: 870).

ineffective, random activities and unintended side effects that could be avoided. As the workshop participants argued, “only by **thinking in advance about the intended impacts of science communication** [...] can the communication become more strategic” (Ziegler et al. 2018). Accordingly, there is the need for further discussions on the role and potential of science communication as a facilitator of dialogue between science and the public. Similar to the Brussels/Berlin workshops, these discussions should continue on a national and international level and should include a wide array of stakeholders from science, media, industry and civil society.

There has only been limited success in connecting these stakeholders, which leads to lost opportunities to coordinate science communication projects on similar topics across sectors and borders. Science communicators should strive towards **building communities** in order to identify common ground for cooperation initiatives. In general, cooperation between stakeholders from different backgrounds should be based on dialogue that includes not only technical, but also the social, cultural and ethical aspects of the issues discussed. Such a dialogue can only be achieved when the stakeholders involved make clear which perspectives and strategies they agree on and which fundamental differences in activities, interests and goals remain. Participants of the Brussels/Berlin workshops further pointed out that cooperation between stakeholders would work best on the project level and could include **pooling of resources, co-funding of projects or even advanced coordination on certain topics** such as the bioeconomy, a field of research that includes multiple stakeholders and many controversial debates. This can be supplemented by **identifying or creating new platforms for continuous exchange on best practices**, which should be shared among stakeholders both within Germany and on a European level. Against this background, the organisers and participants of the Brussels/Berlin workshops emphasised the great potential for future events and exchanges on controversial research topics, the cooperation of stakeholders and the support of engaged scientists and their communication with society.

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