

From deficit to dialogue in science communication

The dialogue communication model requires additional roles from scientists

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As applications of gene editing in medicine, agriculture, and biotechnology become increasingly feasible, public interest and calls for public dialogue intensify. The UK Royal Society initiated the “Genetic Technologies Public Dialogue” in 2017 to explore the views of UK citizens on possible applications of gene editing. Last year, the Netherlands set off to organize multiple public dialogues on human genetic germline modification (HGGM) over one year. The overall goal of the Dutch dialogue is to stimulate societal opinion forming on the desirability of genetically modifying the human germline (van Baalen *et al*, 2019). Researchers from different disciplines—biomedicine, ethics, and reproductive medicine—will attend these sessions as experts along with other participants. Together, they will discuss and explore the broad societal implications of the science and potential clinical applications of HGGM. However, it raises the question whether these experts (here referred to as researchers with expertise on HGGM from within their specific discipline) know how to participate in public interactions such as these.

Indeed, several studies conducted both in Europe and the USA indicate that the majority of scientists still adhere to a so-called “deficit model” when interacting with non-scientist publics (Davies, 2008; Dudo & Besley, 2016). According to the model, scientists and other experts possess crucial knowledge that non-scientists lack, and the purpose of science communication is to “fill the knowledge gaps” in a largely

one-way flow of information from expert to layperson. It also assumes that more scientific literacy or more knowledge induces a positive attitude with respect to science, for example, feelings of trust (Nisbet & Scheufele, 2009). The deficit model has been heavily criticized, among other things for its implicit assumption that scientific expertise and worldview are dominant over other forms of knowledge (Jasanoff, 2011).

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Public dialogues such as in the UK and the Netherlands are expected to become more common as a means to stimulate solid opinion forming based on a wide range of views. For these dialogues to be successful however, it is essential that experts step away from the deficit model. Here, we describe what constitutes a constructive expert role in public dialogues, and how an expert can fulfill this role. We start with a brief introduction on theoretical principles underlying the dialogue model of science communication. We then explore expert responsibilities with a real-life example: the

Dutch dialogue on HGGM. We end with suggestions for good practice that are relevant for any field of science communication.

Principles of two-way science communication

Today, communication experts consider the deficit model to be obsolete (Nisbet & Scheufele, 2009; Dudo & Besley, 2016), and from the late 20th century on, more bi-directional forms of science communication have become popular. In the dialogue model, non-scientific forms of knowledge, such as cultural and experiential knowledge, are considered to have equal value as scientific knowledge since complex societal issues such as HGGM can impossibly be dealt with by using only scientific knowledge. Science may offer insights in possible risks and benefits of modifying the human germline, but not in the individual or social meaning assigned to these risks and benefits. For example, there may be differences in regard to how we value health and disease that are to some extent influenced by factors such as culture, (religious) beliefs, and personal experiences. Not so long ago, the introduction of cochlear implants to correct deafness in young children evoked strong reactions within the deaf community. In general, hearing people consider deafness as an impairment that has to be corrected if possible. The deaf community however, with its specific culture and social bonding, think of deaf children as perfectly healthy and see no reason to operate on them (Lane & Bahan,

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1998). In the dialogue model, the deaf community would be particularly encouraged to share its perspective.

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Science communication based on the dialogue model—also referred to as public engagement with science—foregrounds a two-way flow of information from expert to layperson and vice versa. A key feature is mutual learning (McCallie *et al*, 2009), which may be characterized as the process in which different views, values, experiences, and concerns are exposed with the intention to learn with and from each other. In sum, the dialogue model explicitly acknowledges different forms of knowledge, scientists and non-experts have equal status, and together they are expected to learn with and from each other.

The role of experts in the dialogue model

The target audience in the dialogue model can no longer be regarded as passive receivers of knowledge, and the overall purpose of delivering expert knowledge has changed. Besley *et al* (2018) propose a set of eight communication objectives for scientists engaging in bi-directional science communication, in which we clearly recognize the responsibilities of sharing input that is well received by others, and listening to and learning from the input of others. In addition, there seems to be a separate set of objectives related to fostering interpersonal appreciation, such as respect and trust. This is why we attribute a third responsibility for experts in the dialogue model: investing in relationships. This is in line with contributions of others pointing to the importance of relationship-building in interactions between (scientific) experts and non-experts (Nisbet & Scheufele, 2009).

In sum, we contend that experts in the dialogue model have three main responsibilities: sharing input that is well received by others; listening to and learning from the

input of others; and investing in relationships with others. Notably, the third responsibility can be seen as the result of the first and second, but also as a catalyzer of both. In other words, relationships may be built in the process of sharing and listening and learning, but at the same time may foster sharing and listening and learning: this should become a self-enhancing process.

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For the purpose of a dialogue, will it suffice to just instruct experts to take notice of these three responsibilities? We think not. For example, when considering sharing input; what specific knowledge is expected, and how is it best delivered? Or what should experts say or do to invest in relationships and with whom? In the remaining of this paper, we will further explicate each of the expert responsibilities and make corresponding recommendations. We use the Dutch dialogue on HGGM as a vehicle to identify starting points for behavioral and/or attitudinal demands. It was instigated by the Dutch Government and is organized by a number of societal parties with relevant expertise (Box 1). Van Baalen and colleagues drafted ten “lessons” (five on content and five on process) to support design and execution of the dialogue (van Baalen *et al*, 2019).

Share knowledge

Experts in the Dutch dialogue are advised to not only discuss HGGM in terms of medical risks and benefits, but also in terms of personal and societal implications. Technomoral vignettes based on future scenarios can be used to present information in a meaningful context (van Baalen *et al*, 2019). Experiences from the past demonstrate that it could be challenging for experts to discuss questions and concerns that they regard as outside their field of expertise (Radstake *et al*, 2009). However, it may be that this is exactly what publics expect from experts: to take responsibility for the topic in a broader

sense, by including, for example, economic or political issues.

In fact, such public dialogues are being held—at least partly—to prevent the breakdown of a broad and constructive debate such as happened after the introduction of genetically modified crops in Europe. Instead, it should be the goal to anticipate such situations and to give HGGM a fair chance of being questioned not only for its potential risks, uncertainties, and concerns, but also to consider its potential benefits and formulate conditions for clinical use. In this regard, doubt and criticism is to be taken serious and deserves discussion. Experts, in turn, should not hide behind their expert knowledge, but also respond to questions and concerns that they regard as outside their field of expertise. Even better, they should bring up those questions and concerns themselves. To put it in the words of Jennifer Doudna, co-inventor of CRISPR-Cas9: “Scientists are equipped to not only advance ongoing scientific research but also guide the public conversation. Individuals and the scientific community alike have a responsibility and opportunity to help shape future research in an ethical manner” (Kearny & Doudna, 2020).

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Listen and learn

Less than two years ago, the announcement by He Jiankui that he genetically modified the genome of two twin girls, provoked strong public reactions. Experts in the Dutch dialogue therefore have to be prepared for being confronted with sometimes extreme and highly diverse expressions of concern. In these instances, it is especially important to remain open and to listen. However, even more important is that experts are willing to open their frame of reference and engage in a mutual learning process that can yield meaningful accomplishments in terms of closing the gap between science and society.

There are previous examples of online dialogues, such as the one organized by a Dutch online magazine about parenting that discussed extending the common storage period of blood from standard neonatal screening beyond five years; it failed at least partly because experts had considered these encounters with the public as merely a diagnostic tool to get information on that public's opinions, questions, and concerns (Radstake *et al*, 2009). Instead, they found themselves confronted with public appeals to critically reflect on their own attitudes with regard to—as they felt—“off-topic” issues brought up by the public (Radstake *et al*, 2009).

Clearly, in dialogue it cannot be decided beforehand, or by a specific group, what needs to be discussed. In this light, it is important for experts to realize that opening their frame of reference starts the minute others start to speak and that the responsibility to listen and learn can by no means be narrowed down to the expert perspective. However, when participants behave disrespectful toward experts, or pertinently refuse to assess their own views, the expert responsibility to listen and learn can no longer hold. Dialogue builds on mutual respect, and when one party consistently fails to show that respect, it is legitimate for the other to withdraw.

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Although HGGM can evoke strong reactions, non-expert participants may feel hesitant to speak or may believe their contributions of little value (van Baalen *et al*, 2019). They may be afraid to ask witless questions or fear that their concerns will be put aside as irrational. Lastly, some may have strong convictions that their voices will not influence political decision-making at all. For all these reasons, experts should put serious effort in encouraging others to speak, for instance by emphasizing that expert knowledge is not the only valuable perspective or by stressing the importance of hearing many different voices; it may also help to pose thought-provoking

questions. Moreover, listening in an open and non-judgmental way might be equally important. In doing so, experts can assist in creating a safe and comfortable environment, in which participants feel confident to express themselves.

Invest in relationships

In public dialogues, experts that express themselves in a highly scientific manner may create a sense of distance and may deter others from contributing (van Baalen *et al*, 2019). On the other hand, demonstrating expertise is believed to enhance feelings of trust (Besley *et al*, 2018). Therefore, experts are to constantly navigate between gaining trust by showing expertise while avoiding being too scientific. Relationships may strengthen when dialogue participants experience a mutual sense of equality.

For experts, it is not easy to be seen as an equal partner however. First, experts are at risk of being suspected to merely participate in the HGGM dialogue to obtain legitimacy for research or to acquire financial support. Second, experts may unknowingly give the impression that the science behind HGGM is absolute and certain, when in reality it is not. Third, apart from being blamed for hiding behind their wall of expertise, experts are at the same time easily accused of overrating their specific expertise. Biologists in the Dutch dialogue on HGGM for example may have solid knowledge on the shortcomings of current gene-modifying techniques, but they can only speculate on how fast technical problems will be solved and hypothetical scenarios become reality. In order to be genuinely seen as equal partners in the dialogue, we advise experts to communicate in an open and transparent way on their interests, as well as on the uncertainties in and the limitations of their knowledge.

In the case of HGGM, different normative views are at stake. For example, applying HGGM will unquestionably change practices, norms, and values around pregnancy and reproduction, as well as perceptions of disease and disability (van Baalen *et al*, 2019). When experts behave in a way that might suggest they are not receptive to different normative views, for example, because they cannot display genuine interest in the beliefs and emotions of others, they are at risk of creating distance. Environmentalists might advocate that HGGM will negatively affect biodiversity and ecosystems.

Religious groups might claim that HGGM intervenes with the work of God. Patients with genetic conditions might struggle with feelings of rejection given the possibility to correct genetic mutations before birth, or they might fiercely advocate the introduction of HGGM to prevent transmitting the mutation to their children. All these (groups of) people either oppose HGGM or have strong feelings about it. Yet, since HGGM can be seen as the product of science, these emotions are easily projected onto the scientific community and its members, probably increasing already existing feelings of mistrust. At this point, displaying a willingness to listen and learn will not suffice. The best thing for experts then might be to convince their dialogue partners that they genuinely respect their beliefs and emotions with regard to HGGM, and that they truly care. In the end, it will be society at large—mostly by means of political decision-making—who decides on if and/or when HGGM will become available. Dialogue is not about reaching consensus, but about learning with and from each other. In that sense, public dialogues can be seen as opportunities to bring science closer to society; to improve relations; and to demonstrate that scientists *do* care.

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Concluding remarks

Since public dialogues are becoming more frequent and can be positively influenced by experts truly willing to learn instead of falling back into a deficit-like mode of communication, we believe it is important to clarify the responsibilities of expert scientists. Our paper proposes recommendations for scientists on the basis of matching science communication theory to the goal and design of the Dutch dialogue on HGGM. Although specifically formulated in relation to this particular dialogue, these recommendations can be valuable for the many public dialogues on HGGM and other topics that are currently initiated throughout the world, and any two-way science communication that aims to engage its participants in

Box 1. The Dutch dialogue on HGGM; rational and goals. From van Baalen et al (2019, pp. 14–15)

The Dutch dialogue on HGGM is to some extent a response to discussions on the tenability of the current Dutch Embryo Act. This act prohibits both the creation of human embryos for merely research purposes, and the development of a pregnancy with genetically modified embryos or germ cells. In the past few years, different scientific organizations and advisory boards (Dutch Health Council, Commission on Genetic Modification, and the Dutch Royal Academy for the Sciences) called for an extension of the Dutch Embryo Act to allow the creation of human embryos for merely research purposes, and for public debate on the development of a pregnancy with genetically modified embryos or germ cells. In the 2017 Dutch Coalition Agreement it had been recorded that possible adjustments of the Dutch Embryo Act would require extensive public debate on the social and ethical implications concerned. In 2018, the Health, Welfare and Sports minister explicated his wish to arrange for broad and inclusive societal discussion, in order to foster public opinion forming with which political decision making could be supported. The two-year project 'Public Dialogue on Human Genetic Germline Modification' was granted, with the overall goal to: "...facilitate and stimulate broad societal dialogue, a process of collective opinion forming. Therefore the broad public has to be reached, informed, and stimulated to discuss among each other the hopes, wishes and concerns with regards to genetically modifying germline DNA in embryos, as well as its broad societal implications."

meaningful dialogue. As a next step, training aimed at equipping scientists with supportive skills should be developed. Ultimately, this would lead to higher quality dialogues, in which science-based societal questions have a better chance at being addressed in a socially robust way.

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