Public Understanding of Science

How to take non-knowledge seriously, or 'the unexpected virtue of ignorance'

Journal:	*PUBLIC UNDERSTANDING OF SCIENCE*
Manuscript ID:	PUS-15-0073.R1
Manuscript Type:	Commentary
Keywords:	science communication, lay expertise, non-knowledge, ignorance, media and science, public understanding of science
Abstract:	This commentary argues that we need to take ignorance and non-knowledge seriously in the fields of science communication and public understanding of science. As much as we want ignorance to disappear, it seems that it is here to stay – in the sciences and in the rest of society. Drawing on the vast but scattered literature on ignorance and non-knowledge, we suggest that paying closer attention to these phenomena could be beneficial for science communicators. Despite the fact that ignorance and non-knowledge, just like knowledge, today are highly politicized fields, they may also open up for new lines of inquiry and may be key to more pluralistic and equal democratic deliberation about science and technology.

Recently, Nisbet and Fahy (2015) have argued for the need to promote knowledge-based science communication in politicized science debates. They specifically challenge journalists and their news organizations to 'contextualize and critically evaluate expert knowledge, facilitate discussion that bridges entrenched ideological divisions, and promote consideration of a broader menu of policy options and technologies' (p. 223).

We applaud such efforts to tackle head on the question of the role of knowledge in science communication (see also the contributions in Fischhoff & Scheufele, 2013, 2014). Like Nisbet and Fahy (2015), we believe that it is important to develop a wide range of approaches to communicate and broker different forms of scientific knowledge. In this commentary, we further want to suggest that putting more emphasis on ignorance or non-knowledge can improve democratic debate about science by reducing epistemological barriers to lay public input, getting citizens and others to see that science is tentative and encouraging authorities to stop being risk averse.

Whereas knowledge has strictly positive connotations, ignorance seems to be epistemically unattractive and morally questionable. Ignorance signifies a lack of knowledge, and ignorance leads to bad decision-making in one's personal life and in policy-making. Such ideas have been nurtured by a long and strong intellectual tradition in Western culture. Yet, increasingly, sociologists, philosophers and other scholars have begun to emphasize what could, borrowing a term from the 2015 Academy Award-winning movie Birdman, be called 'the unexpected virtue of ignorance'.

Questions concerning ignorance need to be given critically attention by science communication researchers. We assert that different forms of ignorance not only are fundamental to processes of scientific knowledge production, but also are virtuous to democratic deliberation. We argue that ignorance deserves a more prominent role in science communication and democracy. Attention to the ways in which ignorance is (mis)construed and how it works in different settings allows us to develop even more diverse and socially responsible practices within science communication. We also call for more research into the role of ignorance in science communication.

What is non-knowledge?

There is a long continuing discussion on the role of ignorance, or non-knowledge ('Nichtwissen') as it is often called, in science and in society. Many different attempts have been made to conceptualize what we talk about when we talk about these things. Popper (1962) and Merton (1987) pointed out that certain types of ignorance are fruitful to the advancement of science. Merton's 'specified ignorance', for example, describes 'the express recognition of what is not yet known but needs to be known in order to lay the foundation for still more knowledge' (Merton, 1987, p. 1).

Knowledge grows out of ignorance, giving rise to new questions, that is to say, more specified ignorance. Kerwin (1993) and Gross (2010) later criticized these notions for being overly instrumental in their approach to the phenomenon of non-knowledge: Specifying a domain of ignorance as a prelude to more knowledge implies that knowledge production is a linear, planned process and that knowledge gradually will replace ignorance.

Today, there seems to be a growing consensus among scholars of ignorance and non-knowledge that non-knowledge is here to stay and therefore merits closer attention (Beck, 2009; Beck & Wehling, 2012; Frickel, 2014; Frickel et al., 2010; Gross, 2010; Kerwin, 1993; Proctor & Schiebinger, 2008; Smithson, 1989). Rather than seeing non-knowledge as something that will eventually go away, non-knowledge appears to be a foundational aspect of contemporary knowledge societies based on science and technology.

Non-knowledge not only systematically emerges from the very heart of modern knowledge and wealth production, i.e. science and technology. Non-knowledge also stems from structural factors governing the relationship between science, technology, and society. In an effort to make the discussion about knowledge versus non-knowledge more nuanced and more fruitful for purposes of science communication, we in what follows consider the distinction between known knowns, known unknowns, unknown knowns and unknown unknowns (inspired by the above mentioned scholars and particularly Daase & Kessler, 2007).

Known and unknown

The domain of what we know is spanned by known knowns and known unknowns. The former concept denotes well-established facts and evidence, i.e. all the things we know we know. The latter includes all the things we know that we do not yet know. Merton (1987) used the term 'specified ignorance', and Smithson (1989) 'conscious ignorance', to indicate all that is known to be unknown. With Beck and Wehling (2012) we may use a map metaphor to describe what is at stake in this conceptualization of knowledge: Known knowns are all the areas already detailed to a certain extent on the map; known unknowns, or not-yet-knowledge, are the white spots representing regions we know to be there, but still haven't had the chance to map.

What we do not know includes unknown knowns and unknown unknowns. Unknown unknowns, i.e. 'unrecognized ignorance' (Merton, 1987) or 'meta-ignorance' (Smithson, 1989), is absolute non-knowledge in the sense that we do not even know that we do not have the knowledge. These unknowns may be irrelevant. There are a lot of things we do not know about and at the same time are completely irrelevant for us as individuals and for society as a whole. We only come to realize the existence of such unknowns in a retrospect manner, when we become genuinely surprised, for example in the advent of disasters (Daase & Kessler, 2007; Gross, 2010). The unexpected occurrence potentially allows us to become aware of our own ignorance and thus may have epistemological value for science, but also moral and social value for society.

The relevance of unknown unknowns is connected to the application of new technologies and unanticipated consequences thereof. Beck (2009) mentions the use of CFC gases as a case in point. In the 1930s, when CFCs were being introduced as a kind of wonder chemical, nobody expected that these gases would one day be linked to the depletion of the ozone layer. At the time, it was one of those unknown unknowns that gradually, throughout the late 1970s and early 1980s, dawned on authorities, scientists, and citizens. In a remarkably short period of time, the idea that CFCs diffuse quickly throughout the atmosphere and cause depletion of the earth's protective ozone layer in the stratosphere moved from being unknown to being known. Even if some groups tried hard to characterize this knowledge as a known unknown, that is specified ignorance, which to some extent it was if one takes into concern only the scientific discussion, consensus emerged that this was something that the international community as a whole needed to deal with. The example shows that unknowns are not merely the 'unacknowledged muse of science' (Kerwin, 1993, p. 176). Unknowns should also be seen as a welcome addition to public debate and decision-making processes.

Unknown knowns are all the things that we do not know we know, but may also be extended to include things that we for some reason do not want to know, taboos, and tacit knowledge (Kerwin, 1993). Again, some knowns are probably best left unknown. For personal reasons, we may not want to have knowledge about our genetic makeup because this would allow us to determine our own risk of developing certain diseases (Frank, 2011). Or for religious reasons, we may choose to ignore knowledge about evolution. Unknown knowns, however, also arise in situations where knowledge is deliberately retained or hidden.

The politics of non-knowledge

To be sure, the very existence of non-knowledge has political consequences. Former US Secretary of Defense Donald Rumsfeld notoriously used the term unknown unknowns to avoid critical questions about the evidence of weapons of mass destruction at a press conference in February 2002, one year before the invasion of Iraq. Similarly, industry-sponsored scientists, interest groups and think-tanks for decades consciously have manufactured uncertainty about health and environmental issues in order to discourage political regulations (Michaels, 2008; Oreskes & Conway, 2010). Such examples provide ample reason for exerting caution with regard to non-knowledge in science communication.

So, we have to ask ourselves if non-knowledge really ought to play a role in the public understanding of science. If science communicators and others continue to emphasize the existence of non-knowledge in the sciences, are they not simply playing the same game as the 'merchants of doubt' (Oreskes & Conway, 2010)? Is even thinking about non-knowledge not counterproductive to making the best decisions? Will scrupulous interest groups and politicians not simply use non-knowledge as yet another opportunity to manufacture uncertainty, effectively hindering necessary regulations? And will non-knowledge place the general public in an even more difficult situation, increasing levels of uncertainty about scientific findings and scepticism in regards to experts and authorities?

The risk certainly is there. Yet, we also can be sure that non-knowledge will not go away, even if we continue to communicate only known knowns, or known unknowns. The Internet and mobile technologies have increased our ability to communicate knowledge, but also made issues of non-knowledge more pressing. In an age where access to information has been radically democratized, and where most people thanks to the Internet and mobile technologies are confronted on a daily basis with all sorts of information, it is more than ever important that experts and authorities address the consequences of non-knowledge upfront instead of pretending that non-knowledge do not exist. In our view the proliferation of non-knowledge, greatly enhanced by new information and communication technologies, places new demands on all stakeholders in the field of science communication and calls for further attention to established relationships between science, politics, media, and the public sphere.

Experts, authorities and science

Experts and authorities have to balance the communication of scientific evidence with attention to different forms of non-knowledge. Just as much as it is important to avoid manufactured uncertainty, scientific and political authorities should also avoid manufacturing certainty in areas where knowns and unknowns co-exist (Beck & Wehling, 2012). In a liberal society, we have to be able to trust that authorities communicate in a balanced and nuanced way about politicized science issues like global warming, genetically modified organisms, nuclear power, vaccine programs, etc. Unknowns arise from the very research process itself, and unknowns are produced in consequence of the ongoing public debate. Experts and authorities need not only concern themselves with presenting evidence, i.e. the known knowns, but also questions such as: What is it we know we don't know? What are the potential political consequences of our unknowns?

One way to do this is to acknowledge the kind of unknowns, i.e. unknown from the authorities' perspective, that spring from so-called lay knowledge (Irwin & Wynne, 1996; Wynne, 1996). This has turned out to be particularly important in the assessment of new technologies where unforeseen consequences, i.e. unknown unknowns, quite often emerge. As Hoffmann-Riem and Wynne (2002) pointed out in their correspondence to *Nature*, it is important to start out with the idea that unforeseen effects of new technologies are not only possible but likely. Most often more research will not be enough to fully assess possible consequences because in effect we are dealing with a form of unknown knowns (what others may know that we don't) and unknown unknowns. In order to make sure that no stone is left unturned in these domains of non-knowledge, Hoffmann-Riem and Wynne (2002) suggest that as many different people and forms of knowledge as possible are taken into account in the assessment of new technologies, and not just scientific knowledge and risk assessment techniques. They strongly emphasize that the knowledge and experiences of lay persons are particularly important to include, as they represent entirely different perspectives than those of experts and authorities. The same idea was presented earlier by Slovic (1987), who wrote:

> There is wisdom as well as error in public attitudes and perceptions. Lay people sometimes lack certain information about hazards. However, their basic conceptualization of risk is much richer than that of the experts and reflects legitimate concerns that are typically omitted from expert risk assessments. As a result, risk communication and risk management efforts are destined to fail unless they are structured as a two-way process. Each side, expert and public, has something valid to contribute. Each side must respect the insights and intelligence of the other (p. 285).

Journalists and the media

Adequately dealing with non-knowledge, including making room for the possible existence of unknown unknowns in arguments about science and technology, is therefore a major challenge for science communication and for the public sphere on the whole. As Nisbet and Fahy (2015) argue, we have to be attentive to political problems stemming from the polarization and politicization of certain science issues, while at the same time trying to include more perspectives and a broader range of policy options into the public debate. In this regard, they stress, journalists have a special role to play as brokers of knowledge, dialogue and policy. As an example, they mention Andrew Revkin who according to them in his *New York Times*' Dot Earth blog acts as a knowledge broker. Revkin apparently wants his readers to pay close attention to knowns and unknowns in climate change research, not because he thinks that there is reasonable doubt about anthropogenic climate change, but rather because there are many important nuances in the existing body of knowledge and non-knowledge, which are typically ignored in the average coverage of climate research.

We fully agree that journalists – and the media system as a whole – play a vital role in facilitating and creating the necessary dialogue between lay people, experts and policy-makers, serving as what Nisbet and

Fahy (2015) call ‘dialogue brokers’ and ‘policy brokers’ (p. 229-231). A challenge here is, however, that the media system operates from its own logic, causing it to always pay attention to the number of readers, listeners and viewers.

Another challenge is to avoid creating ‘false balances’ in the news stories (Dixon & Clake, 2012). Ethical rules within journalism such as ‘the equal-space rule’, ‘the equal-access rule’, and ‘the get-the-other-side-of-the-story rule’ (Dearing, 1995) can sometimes lead to a false balance in the coverage of an issue. If we take climate change as an example it would be a false balance if so-called climate sceptics and climate scientists got equal space in news stories about climate change (Boykoff, 2007).

Balanced news coverage of climate change in terms of knowledge/non-knowledge would instead pay more attention to the systematic production and reproduction of non-knowledge in the sciences and in public debate: What is the nature of climate models, how far have they advanced, and what inherent confidences and uncertainties do they have? How come the Intergovernmental Panel on Climate Change (IPCC) in its fifth assessment report uses terms such as ‘extreme likely’ with respect to human influence on the climate system (IPCC, 203, p. 47)? What ought to be done about the ‘big gap’ between how scientists and Americans perceive climate change and its consequences (Vaidyanathan, 2015)?

Citizens and the public sphere

As important as the role of experts, authorities and journalists may be, we want to stress that the existence of non-knowledge as a fundamental condition for science, media and politics also places demands on citizens and the public sphere. Briefly put, we feel that citizens in general need to develop a more nuanced way of understanding science and the role of scientific expertise in public debate and policymaking. Rather than ‘shooting the messenger’ by turning their backs to science, citizens need to develop strategies for handling non-knowledge in relation to science (Smithson, 1993, p. 136).

Instead of rejecting science if it is unable to provide certainty, or for the same reasons claim that ‘anything goes’ in science, we as citizens have to realize that science produce tentative results. Unambiguity is found only in scientific textbooks, and for educational purposes that have little to do with stimulating a diverse public debate on science. In real life, we often have to deal with opposing findings. This is the nature of science and something we as citizens have to understand – and must learn to live with!

However, this is not merely a question relating to the proper understanding of the nature of science; it also has bearings for the public understanding of contemporary society based on science and technology. If we fail to embrace the fact that non-knowledge is a fundamental condition of both science and society, we might end up being paralyzed by irrational fears. Furedi (2002) has argued that this is in fact what might be happening.

Even though, thanks to modern science, medicine and technology, we live longer and we are able to cure more diseases than ever, we apparently are less willing than before to accept risks and uncertainty. Furedi (2002) deplores this condition, as he thinks we ought to embrace risk-taking as one of the fundamentals of modern society. Beck (1992, 2009) calls for more caution, since the risks that we are facing today – what he calls ‘man-made disasters’ (Beck, 1995) or ‘new risks’ (Beck, 1991) – are fundamentally different to the ones we faced in the past. The stakes now are simply higher, if we accept that we are living in a world risk society (Beck, 2009). In such a society the public sphere is a crucial place for mobilizing both resistance and innovation (Hess, 2007).

Conclusion

We recognize that developing more nuanced public understanding of knowledge and non-knowledge is not an easy task. It probably requires dedicated efforts at all levels of the educational system, particularly with respect to developing a deeper understanding of the nature of science. Douglas (2015) surely has a point when she argues that 'more attention needs to be paid in teacher training to scientific methods, to the process of evidence gathering, of questioning, of challenging, in core science classes, at all levels of instruction.' (p. 301). She maintains that scientific literacy should include the nature of science, and she calls for a new way of teaching science that not only makes sure that students learn about established facts, but puts more weight on the open-endedness and tentativeness of science.

As we have argued, ignorance and non-knowledge just won't go away. It is there to stay in science as well as in all other spheres of society. We might wish for knowledge one day to replace ignorance, but for the reasons given in this commentary, this remains wishful thinking. Ignorance is a necessary condition for scientific inquiry, and it is inherent to our knowledge-based democratic society. Rather than seeing ignorance as a necessary evil, we have tried to provide good reasons for viewing ignorance as a kind of virtue. Ignorance in science, surely, is not a bad thing. It amounts to asking new questions and being prepared for surprises in the quest for knowledge.

In the rest of society ignorance, in its many different forms, also has to be regarded as fully legitimate and as a fruitful starting point for inquiries and debates about the future of society and the role of science and scientific knowledge in society. In democratic deliberations there is not just one scientifically certified way of handling ignorance but rather there should be many different forums for taking on the difficult task of dealing with the challenge of ignorance (Beck & Wehling, 2012).

Despite the many pitfalls of non-knowledge, to be ignorant about the state of contemporary societies and the road ahead might also stimulate new ideas, conflicting as well as cooperative ones, as we have tried to argue in this commentary. Non-knowledge might even benefit society and democratic deliberation – it might also stimulate science communication and lead to new research questions. This could be the unexpected virtue of ignorance.

Acknowledgements

The authors would like to thank colleagues at AU IDEAS Pilot Center for Research on the Democratic Public Sphere as well as two anonymous reviewers for valuable comments to previous editions of this paper.

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