The Art of Asking Questions, and why Scientists Are Better at it

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Introduction

As explained in other parts of this volume, the Dutch government has involved the public in generating 'questions for research'. Through the National Research Agenda (*Nationale Wetenschapsagenda*, or NWA) individuals and organisations were invited to pose questions for scientific research. A large number of questions have been formulated, across all disciplines, and of varying forms. By inviting the whole of society to ask scientific questions, the principal aim is to 'solve problems'. But another important purpose is to enlarge the legitimacy of academic research. If society can influence the agenda of academe, it will be easier to defend that researchers do basic research without a direct 'return' in the form of economic or social spin-off. We can let scientists play, but according to the rules set by society. Even if the legitimacy issue is not at the core of the matter, the structuring capacity of the NWA for the research agendas of tomorrow does pose the science–society connection at the heart of the endeavour. We thus need to see whether the problem-solving and legitimizing ambitions of the NWA are achieved in the current process.

   While I share the view that it is important that scientific research finds legitimation in society, and I am all for solving the problems that emerge in society, I fear that the way society and research have become interconnected in the current process is ineffective. More specifically, I have three worrying questions about whether and how the more relevant scientific research can be produced in the way the NWA is set up. First and foremost, is it sensible to let society do the job, by letting it ask questions? Or would there have been another, more effective way to improve the connections between research and society? Letting society do the asking, letting the public, firms, and interest groups take the initiative in the agenda-setting, is, in my view, worrisome. It invalidates one core quality of scientists, that they master the art of asking questions better than anyone else.

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Second, will legitimacy of scientific research be enlarged if the public can formulate questions? What can we learn from other areas where the public directly influences agenda-setting, in particular politics? And third, is it the public where the connection with society should be sought, or had we better seek it elsewhere? Can the public oversee the various solutions that scientific research can achieve?

The direction of influence: who asks the best questions?

The approach taken in the NWA is that society can formulate questions for science. This has resulted in almost 12,000 questions in various shapes and forms, varying from points on the horizon ('how can we make society more XX in the 21st century?') to proper research questions. These 12,000 questions have been summarised in 140 'cluster questions', again in various shapes and forms . Scientists and knowledge institutes have played an important role in getting from the 12,000 questions to the 140 cluster questions.

My first worry is that the direction of influence, where society influences the questions that scientists ask, is the wrong one. I agree that it would be good to stimulate interaction between scientists and society. Possibly scientists have had too little focus on the usefulness of their expertise for business, technological, and social issues, and the aim to bridge scientific expertise with partners in the field, such as businesses, governments, or other stakeholders, is laudable. Yet letting society do the asking is a mistake.

Formulating research problems is at the core of the scientific process. Research questions guide our work. To formulate them properly is a skill in itself, a skill that takes more than requesting solutions for everyday problems. A good research problem is not just a guide for looking for facts. A good research problem is informed by, and grounded in, scientific theories. Answering them helps to better understand the merits of these theories and, thus, to improve our knowledge of the world. Moreover, as examples from my field (sociology) illustrate, research problems are improved if they are layered: a specific research question can be seen as a sub-question under a broader research problem. The whole field of sociology can be subsumed under three overarching problems, according to Ultee, Arts, and Flap (1996): inequality, social cohesion, and rationalization, or, according to Wilterdink and Van Heerikhuizen (2013), under four types of social relationships (economic ties, political ties, affective ties, and cognitive ties). Independent of which approach one prefers, it is crucial for scientific progress, also to the

aim of solving problems, to formulate problems that are believed to be of broader scientific interest for a discipline.

Part of the challenge of formulating research problems is the delicate balance between problems and theories – a balance that will not be at the forefront of societal stakeholders posing questions to us. Somewhat jokingly we sometimes hear that scientists come in two sorts: those with a problem looking for a theory, and those with a theory looking for a problem. This distinction is, however, hardly useful, and ill-informed by a Kuhnian perspective emphasizing that scientific problems are asked within the context of theoretical paradigms. Problems that fall out of the blue may be looking for a theory, but if they are not posed from the interest of a particular theory we are left with fact-finding rather than theory development. Hypotheses can be loosely formulated but if their test doesn't say anything about a broader theory we have gained little relevant knowledge. Hypotheses should, therefore, not 'come from the neighbour' but rather be developed from the perspective of (layered) theories. On the other hand, if a theory is looking for a problem we may end up with research that is hardly connected to the real-world problems for which scientific knowledge is useful. If, for instance, we are interested in broad theories that say that humans are altruistic by nature, we may end up with some interesting and well-done laboratory experiments, but without clear linkage to the real-world problems in which altruism and cooperation may be decisive. In short, only by close interaction between problems and theories can scientific research emerge that is able to help solve real-world problems. But it is doubtful whether the one-way street of asking questions as employed in the NWA is able to improve this interaction (notwithstanding that scientists have been involved in the classification of questions).

The good thing about the NWA is that it promotes a closer interaction between science and society to solve real-world problems. Such an interaction will not happen automatically; scientists cherish their academic freedom, and theoretically constrained problem formulations lead to scientific progress. But are scientists really so distanced from real-world problems, and from the applicability of their theories? I don't have that impression, and criticisms we sometimes hear from politicians that we should leave the ivory tower are misplaced. The problem is not that scientists refuse to descend from the tower. Rather, the problem is that partners in society are not willing to posit their specific problems within the context of broader scientific theories. It is not a lack of noise; it is a lack of audibility.

As an example, I would like to take the reader to my field of education research, cross-cutting between the fields of sociology, education, and

economics. The strong empirical focus of researchers in this field ensures that many of us almost automatically think in terms of applications. While some discussion emerges about the external validity of experimental research, and about causality in non-experimental research, there is no unwillingness to be involved with the field (schools, policymakers). What seems to be a bigger problem is that non-academic partners have a strong influence on the funding of educational research in the Netherlands, so that sometimes scientifically excellent proposals do not get funded, even if the ensuing knowledge would find applications in the field.

Nevertheless, in the field of education and elsewhere, scientists can improve making their case for the applicability of their knowledge to real-life problems, and an improvement of the interaction between non-academic partners and scientists is desired. However, if science is to be more strongly connected to the solution of real-world problems, and if we believe that research problems are only scientifically valuable if they are developed in close connection to theories, I would think that scientists should have the first hand in the game. A more effective way to promote interaction would be to stimulate scientific researchers to help partner organisations to *formulate* research questions. By involving scientists in the formulation of research problems – not only their own research problems but particularly the research problems of 'society' – practical problems can be placed within broader theoretical agendas that can be overseen by scientists. This implies that mundane real-life problems become scientifically relevant, which further ensures that the problems will help to improve our understanding of the world. Through better theories we can solve problems, not because one particular acute problem emerges but because each particular acute problem is part of a larger scientific challenge. And scientists are better able to see that.

Looking at the cluster questions

Looking at the 140 cluster questions, we see that the nature of the questions differs a lot, varying from purely scientific research problems, to a mixture of research and societal challenge, to clear societal challenges without a clear research agenda emerging. Societal challenges are typically practical questions about the future: 'How can we ensure that… ?' Scientific problems aim to find explanations for existing (or past) phenomena: 'How can we explain…? ' For instance, cluster question 11 (*How can we manage water carefully in the future?*) is, by nature, a societal challenge more than

anything else. There is no clear scientific research problem stated in the question. Another example of a policy-driven (rather than scientific) question is number 94: *How can we improve healthcare, but at the same time keep it affordable?* These are in fact two societal challenges, rather than a scientific problem. Other cluster questions combine scientific questions with societal challenges, such as 43: *What are the causes and consequences of migration and how can we deal with it?* Although the latter part of the question is not quite clear to me, it illustrates a societal challenge rather than a scientific problem, while the study of causes and consequences of migration clearly relates to a proper and relevant research agenda. Another example where scientific and societal challenges are combined is question 108: *Which social changes caused by technological changes can be expected, and affect our wealth?* The confusing part is 'can be expected'; one thing we have learned is that social sciences can poorly predict the future, but is better at explaining the empirical observations of the present or the past. But besides that, a clear research agenda emerges about the interrelationship between social and technological changes and wealth. Another clear scientific problem emerges in cluster question 31: *What does globalization mean for our cultural identity and the determination of the position of the Netherlands in the world?* Especially the first part of the question can easily culminate in a relevant research agenda. Thus, some questions are more easily seen as building blocks of a research agenda than others.

An important exercise of the NWA is furthermore to provide a limited number of 'exemplary routes' through the 140 cluster questions. As the term illustrates, these routes are examples, and could be extended by other routes that scientists or stakeholders can create through the cluster questions. In fact, establishing routes can be seen as an important way in which scientists can categorize cluster questions into layers of a larger scientific problem; a main criterion for scientific relevance, as I have laid out above. However, the Dutch ministers of Education, Culture and Science, and of Economic Affairs, have written to Parliament that the current routes will be used as an anchor for science policy, by using them as building blocks for research funding of the Netherlands Organisation for Scientific Research. Before we know it the routes have become a reality, while it takes a more thorough involvement of academics to see all the relevant layers in the 140 cluster questions. From my expertise it is, for instance, remarkable that there is no route for youth and education (including cluster questions from psychology, social sciences, and health), or for life courses (combining clusters from economics, health, and social sciences), or for diversities and inequalities (social sciences, health,

economics, psychology, political science, philosophy). I am sure scientists from other fields will find similar omissions in the current list of sixteen routes. The point is that the 140 cluster questions have a broad coverage across scientific fields, and many fields will feel rather well-represented (although not always by clear research problems). Nevertheless, the routes seem rather arbitrary, and they should not become building blocks for policy without a stronger involvement of scientists. If scientists are better at asking, and layering, questions, it should be scientists who determine the routes through the cluster questions.

Will involvement promote the legitimation of science?

The connection between science and society is not only relevant from the perspective of solving problems, the main focus of the NWA, but also from the perspective of legitimacy of science. My second worry is that a stronger involvement of societal stakeholders in the scientific agenda-setting will not automatically improve the legitimation of science.

Empirical research shows that science, and especially scientific institutions, are not always trusted by the public (Achterberg, 2015; Achterberg et al., 2015). Especially the lower-educated population distrusts scientific institutions, as opposed to the more highly educated population. Importantly, the educational gradient in trust in science is explained by cultural discontent with the complexities of the modern social order, where more uncertainty and 'anomie' (normlessness) are experienced by the less educated. It should be noted that the lower educated are more distrustful of all institutions. Moreover, overall the trust in science is highest of all known institutions, including the legal system, medical doctors, and politics.

It would require more empirical research than currently possible to be sure, but it is very likely that the public that have been involved in generating questions for science covers the well-educated fraction of Dutch society (and the organisations that have posed questions are also populated with more highly educated individuals). So, legitimacy is increased among the group that already puts strong trust in science, which may in fact *increase* the social differentiation in trust in science. With regard to trust in institutions (be it scientific or other institutions such as Parliament, the police, or the legal system), one may claim that social cohesion in society is particularly enlarged if there is little variation in trust across social and demographic groups (Green et al., 2006). So whether the NWA has improved social cohesion by enlarging the legitimacy of science can be questioned.

It is interesting to see how public involvement in an institution is related to trust in this institution by looking at the field of politics. In democracies, the public elects Parliament – a closer connection between public involvement and national institutions is hardly possible. Yet, in the Netherlands only half of the population trusts Parliament, a portion that is, moreover, decreasing (Dekker and De Ridder, 2015). So there is no clear relationship between potential involvement and trust. It is therefore unlikely that a stronger involvement of the public in scientific agenda-setting will improve the legitimacy of scientific research.

Who can judge whether society has improved?

The third and final worry concerning the procedure of asking society to pose questions concerns a more fundamental issue relating to the enhancement of the legitimizing and problem-solving capacities of the NWA. The question is, who is able to see the benefits of scientific research? A quest for solutions of problems does not only require that we generate research problems, but also that we know which problems are already solved at various levels. And while scientists and other partner organisations together may get rather far in deciding which solutions are still desired, it is doubtful whether laymen can be of much help here.

Thinking about the 'problems' that science can solve, these problems come in various forms. Technological innovations may help businesses, governments, schools, and civic organisations. Clear problems may emerge in terms of, say, sales, water management, ICT in schools, or increasing membership of non-governmental organisations, and technology may help to solve them. What Mazzucato (2013) shows is that technology is often funded by the state through fundamental research, without partner involvement from the business community. The most prominent example is the iPhone, many parts of which have been developed with funding from the National Science Foundation in the United States.

But problems are not always technological. What about knowledge of the history of monotheistic religions, or of international relations; do we believe that the public can oversee the problems that need solutions? Or more directly related to my field, could inequality of educational opportunity in Western societies exist without people being aware of it, and/or without people being worried about it? It is striking to realise that the Dutch government thinks that everybody has equal opportunities in Dutch education; it is believed by many policymakers that if people have the abilities and

the motivation they can achieve all levels of education. It takes persistence of researchers, without liaison with policymakers, to show that parental background still matters for the (binding) advice that school teachers give to pupils concerning their secondary school type, even when controlling for intelligence and standardized test results (Van de Werfhorst et al., 2015). If we had to rely on policymakers or politics, it is unlikely that this knowledge would have been presented. Likewise, early-selecting systems of education have been shown to be related to larger inequalities of opportunity, especially in the absence of standardized tests (Bol et al., 2014). Given the fact that the education field is currently allergic to 'educational system questions', it is unlikely that the theme of early selection would have been put on the agenda if we had to rely on partners in the field in the formulation of questions.

In short, both with regard to problem-solving and legitimation, it is doubtful whether societal stakeholders or the general public can oversee the relevance of the issues at stake.

Discussion

Summarising the three worries that I have about the Dutch National Research Agenda, my view is that scientists are better at formulating questions and better able to see which solutions need to be formulated than anyone else. Moreover, from the perspective of legitimation it is doubtful whether science finds more legitimacy if the public can influence the scientific agenda.

I agree that more can be done to connect scientists with other partner organisations; and that scientists may need to be challenged to step into society to see what they can contribute. Choosing a direction of influence 'from society to research' has resulted in a set of questions that vary strongly with regard to the research agenda that has emerged from them. It truly concerns 'questions for science' rather than 'scientific questions', and I would have liked to see it the other around.

It should further be noted that already today a strong attachment between science and society is propagated in various ways. Through the 'top sector' approach, appointed fields receive extra research funding from the state in which businesses and scientists work together. This approach is not considered a success story (Koier et al., 2015; OECD, 2014). Likewise, in education research we see a heavy involvement of societal stakeholders in the agenda-setting of educational research through the Netherlands Initiative for Education Research (Nationaal Regieorgaan Onderwijsonderzoek, NRO).

Both the field (school organisations) and policymakers are represented in all layers of the NRO, including the fundamental research branch. Of note is that the NRO also involves the field in generating research questions, in ways similar to the NWA. And here too it would have been preferable if scientists had been stimulated to cooperate with partner organisations to help them formulate relevant research questions. It takes scientists to do the asking.

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