

Policy

Red Teaming



Policy Red Teaming:

A How-To Guide on Science Sparring



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Science Sparring has been developed in cooperation with Finnish ministries to support policy preparation. This work has given rise to a new method that we believe meets some of the critical needs of the science-for-policy ecosystem. We hope it will be tested boldly across a range of policy-making contexts, and that this guide will serve as a source of inspiration along the way.

CONTENTS

ACKNOWLEDGEMENTS	3
TERMINOLOGY	6
INTRODUCTION	8
THEORY	
1 SCIENCE SPARRING IS AN EFFECTIVE METHOD FOR KNOWLEDGE BROKERING	12
1.1 Established models of science-policy interaction	13
1.2 The adversarial roots of policy red teaming	15
2 WHAT IS SCIENCE SPARRING?	20
2.1 At the core of Science Sparring is the reform of knowledge brokering	22
2.2 Policy red teaming and Science Sparring	22
2.3 The key elements of interaction in Science Sparring	26
3 IN WHICH POLICY-MAKING CONTEXTS IS SCIENCE SPARRING THE MOST APPROPRIATE?	28
3.1 When does Science Sparring work particularly well?	29
3.2 When does Science Sparring not work?	33
3.3 Knowledge needs at different stages of policy-making	35
PRACTICE	
4 HOW TO ORGANIZE SCIENCE SPARRING?	42

4.1 The five stages of Science Sparring	42
4.2 The roles and responsibilities of participants	47
5 HOW DO KNOWLEDGE BROKERS GUIDE DISCUSSIONS DURING SCIENCE SPARRING WORKSHOPS?	50
5.1 Dialogue-based approach	52
5.2 Supporting facilitation with artificial intelligence	54
6 WHAT COMPETENCES ARE REQUIRED FOR ORGANISING A SCIENCE SPARRING?	58
6.1 Understanding the realities of policy-making and academic research provides a strong foundation	59
6.2 Negotiation and collaboration skills are core competencies of the knowledge broker	61
6.3 Knowledge broker recognizes their own role and communicates it transparently	62
7 TEN TIPS FOR PLANNING SCIENCE SPARRING	66
THEORY	
8 WHEN HAS SCIENCE SPARRING SUCCEEDED?	70
8.1 Prerequisites for successful Science Sparring	70
8.2 Benefits for participants	71
9 FURTHER INFORMATION AND MATERIALS	74
9.1 For applying policy red teaming	74
9.2 On Science Sparring	75
9.3 Examples of Science Sparring processes conducted by the Finnish Academy of Science and Letters	75
BIBLIOGRAPHY	78
TOOLS	
Appendix 1. Researcher: How to prepare for Science Sparring	
Appendix 2. Policymaker: How to refine your knowledge need	
Appendix 3. Knowledge broker: How to find the right experts	
Appendix 4. Knowledge broker: How to design a workshop	

TERMINOLOGY

Dialogue

A form of discussion aimed at increasing understanding of the issues at hand, other people, and oneself. The purpose is to learn through interaction with others.¹

Boundary object

A written document outlining the elements essential to the topic under discussion, such as the situational overview, existing evidence, and key concepts. The purpose of the boundary object is to keep participants focused on the issue and to reduce the risk of talking past one another. In the context of Science Sparring, it is usually a draft policy/strategy, a background paper, or a working group memo. If needed, it may also include short explanations of key terminology or background on the policy-making context.

Knowledge brokering

A process that seeks, rather than merely transmitting research knowledge in a supposedly neutral manner, to build a meaningful culture of interaction between researchers and decision-makers that strengthens decision-making.

Knowledge need

Defines what kind of knowledge is required to support a given decision. Precise articulation of a knowledge need requires understanding what knowledge about the issue already exists, scoping what new or complementary knowledge is required, and identifying which types of knowledge the need relates to.²

1 Alhanen 2024

2 Finnish Academy of Science and Letters 2024a

Policy-maker

A civil servant or an elected representative responsible for preparing or making decisions on collective or public matters. In this handbook, the term is often used to refer specifically to civil servants, as in practice Science Sparrings have predominantly involved civil servants working within ministries or agencies rather than elected officials.

Policy red teaming

Policy red teaming is a structured, systematic critique conducted by a multidisciplinary group of researchers, and applied at an early stage of the policy-making process, while changes are still feasible.

Science advice

A process aimed at providing scientific evidence to support policy-making. The term often refers to a traditional linear model of science-policy engagement, in which researchers respond to questions posed by policy-makers (cf. *knowledge brokering*).

Science Sparring

A knowledge brokering method that uses policy red teaming to systematically and proactively support policy-making. Science Sparring can respond to the knowledge needs of both civil servants in policy preparation and political decision-makers.

Science Sparring briefly:

- Policy red teaming, where researchers review and comment on early policy drafts from the perspective of research knowledge and expertise, providing adversarial scrutiny to the policy-making process.
- Suitable particularly for complex systemic policy topics, where identifying interdependencies between policy issues is crucial.
- Knowledge brokers design and facilitate the process. A well-planned process creates a unique environment of trust and enables an equal science-policy dialogue.
- Science Sparring is inspired by methods using adversarial scrutiny, including red teaming,³ which has been used in intelligence and foresight.⁴

3 For more about red teaming in Chapter 2.2. Red Teaming and Science Sparring, p. 22.

4 Zhang & Gronwall 2020

INTRODUCTION

Science Sparring is a knowledge brokering method designed to support policy-making by identifying risks, such as unintended consequences and uncertainties, as well as alternative opportunities within a draft policy. The method has been co-developed with Finnish ministries since 2019.

This handbook is intended primarily for **knowledge brokers** whose role is to strengthen collaboration between researchers and policy-makers. In other words, it is written for those who plan to facilitate Science Sparring. The handbook offers practical guidance on planning and organising a Science Sparring process. It also brings together lessons learned from development work conducted at the Finnish Academy of Science and Letters between 2022 and 2026.

Although the handbook is aimed mainly at knowledge brokers, it may also be useful to others interested in the method. The appendices include tools for the different participants involved in the process: two for knowledge brokers, focusing on facilitating a Science Sparring; one for researchers, on preparing for one; and one

for policy-makers, on defining the knowledge need.

This handbook was originally published in Finnish in March 2026. This English translation includes some slight modifications intended to better suit readers working in other contexts. That said, Science Sparring, as described here, was developed for the Finnish science-for-policy context, and readers from elsewhere should approach the handbook with the understanding that the method is likely to need some adaptation to local needs. Compared with the original, the modifications are most substantial in Chapters 1 and 3.

The first chapter places Science Sparring in the broader context of knowledge brokering. The second explores the distinctive features of the method, and the third outlines the types of policy-making contexts in which it is most suitable. Chapters four and five provide practical guidance on implementation. Chapter six discusses the competencies needed to organise a Science Sparring. Chapter seven brings together key tips for planning a Science Sparring, for readers looking for a more practice-oriented overview.

Chapter eight examines the method's impact and considers how it might be further strengthened.

This handbook also includes several features familiar from the Finnish Academy of Science and Letters' *Researcher's Handbook on Science-for-Policy*.⁵

Reflection invites readers to consider the issues discussed in the text from their own perspective.

Example offers a concrete illustration of Science Sparring in practice, or of a knowledge broker's work in facilitating science-policy interactions.

Dive deeper explores the topic in greater depth, offering fresh insights to readers already familiar with the material covered earlier in the chapter.

Tools provide practical guidance for testing, practising and applying the approaches discussed in the text. These tools are collected in the appendices at the end of the handbook.

The ideas presented in this handbook draw on our practical experience developing the Science Sparring method, relevant research literature, and the views of experts in knowledge brokering.

Our ambition is for Finland to become a global leader in evidence-informed policy-making. We believe that Science Sparring is one small but important step towards that goal, and we warmly invite you to join us in this work and to stay in touch.

*With warm regards,
The knowledge brokers at the Finnish
Academy of Science and Letters*

5 Available at: acadsci.fi/en/academy-publications/tools-to-support-knowledge-brokers/researchers-handbook/

THEORY

1 SCIENCE SPARRING IS AN EFFECTIVE METHOD FOR KNOWLEDGE BROKERING

Evidence-informed policy-making can improve policy design and implementation and, in doing so, build trust in government institutions.⁶ Policy problems are increasingly interconnected and characterised by uncertainty, contested values, and high stakes.⁷ Responding to them **requires bridging the gap between available knowledge and policy-making.**

This gap is not new, but the landscape has changed. **The volume of information available to policy-makers is growing rapidly, with generative AI adding to the noise.** There is no shortage of available information, but

finding relevant, high-quality evidence has become harder.

Science-policy interactions are largely organised around two established models: the linear model and the co-production model. While both have their strengths, they also have well-documented limitations. These include a lack of timely, relevant, and clearly communicated research, and deficits in policy-makers' competencies and resources to use it.⁸ Simultaneously at a systems level, the existing practices and structures of science-policy interaction remain fragmented and disjointed. As a result, evidence uptake

6 Keizer et al. 2025: 5

7 Funtowicz & Ravetz, 2003; Pedersen et al., 2021

8 Oliver et al., 2014; Newman, Cherney & Head, 2017; Oliver et al., 2022



remains inefficient relative to policy-makers' knowledge needs.⁹

More fundamentally, neither model is designed to ask what happens if the premise underlying a policy is itself flawed. The linear model has no mechanism for interrogating how the policy problem was framed in the first place. The co-productive model avoids this by bringing researchers and policy-makers together, but its orientation is towards negotiation and convergence rather than deliberate critical reflection. Studies have argued for the need to look beyond this dichotomy, noting that science-policy interaction is always more complex than either traditional model depicts.¹⁰

Closing this gap requires more than supplying expertise. It requires researchers willing to test whether a policy's own assumptions hold up against the best available evidence. Rather than simply answering the questions policy-makers pose or negotiating a shared account of the issue, researchers have much to give to mapping the contested policy terrain and making sense of it: to structure what is known, what is contested, and what remains genuinely unknown.¹¹

This handbook introduces an alternative model to support evidence-informed policy-making: **policy red teaming**. It is not a panacea to the problems that current policy-making faces, but it is one additional method for the knowledge brokers' toolbox. This chapter sets out its theoretic

cal backdrop, positioning it against the linear and co-production models, before Chapters 2 and 3 turn to its practical methodology, Science Sparring.

1.1 ESTABLISHED MODELS OF SCIENCE-POLICY INTERACTION

Traditionally, science-policy interaction has been organised through the so-called **linear model**. The basic idea is straightforward: first scientific knowledge is produced, then it is used in policy-making, which leads to better decisions.

The model is visible when researchers try to communicate their scientific findings to policy-makers after their research has been published. It is also visible in science advice practices that follow a question-and-answer logic, in which policy-makers identify knowledge needs, communicate them to researchers, who interpret them, conduct the required analysis, and deliver their answers or outputs.¹² Such practices include, for example, public hearings and commissioned research.

The linear model continues to have its uses, for example, in policy areas that are relatively clearly delimited and connected to an academic discipline that has extensively studied the topic.¹³ However, the model has been widely criticised as a poor reflection of how evidence-informed policy-making actually works, resting, it is argued, on several unrealistic assumptions:

9 Migone et al., 2024; Hornung & Trein, 2025; Lammensalo et al., 2025

10 Thoni & Livingston, 2021; De Donà & Linke, 2023

11 see Stirling, 2010

12 Maas et al. 2022

13 Funtowicz 2006



- 1 Scientific knowledge is treated as separate from society and therefore value-free.
- 2 Researchers are assumed to be capable of producing unambiguous and directly applicable solutions for decision-makers.
- 3 Policy-makers are assumed to act rationally and to rely primarily on scientific expert knowledge.¹⁴

As both a reaction to and a critique of the linear model, the **co-production model** has emerged. In theoretical terms, co-production models emphasise the joint production of knowledge, interaction, and trust-building between experts and policy-makers. The central premise of the co-production model is that complex societal challenges cannot be solved by a single discipline or solely by scientific knowledge; thus, there needs to be efforts to improve understanding among different actors and, through that, generate actionable knowledge.¹⁵

14 Adapted from Tangney 2022

15 Lemos & Morehouse 2005

DIVE DEEPER

How does Science Sparring differ from the linear model of science advice?

1. Rather than following a traditional question-and-answer logic, **Science Sparring, as a form of policy red teaming, does not begin with predefined questions but with a broader articulation of the knowledge need.** Based on this need, knowledge brokers design the process to meet the need.
2. **In Science Sparring, researchers apply adversarial scrutiny to a policy draft based on available evidence and their expertise.** The role of policy-makers extends beyond receiving and using knowledge; they contribute their own expertise to the process.
3. **Science Sparring takes place at an early stage of policy preparation.** This maximises the potential impact of research-based knowledge.
4. **The knowledge base is built on multidisciplinary input** to identify where scientific knowledge is strong and where uncertainties or evidence gaps remain, rather than relying on a single science adviser or research unit.

In practice, boundary actors such as science advisory networks and intermediary organisations have sought both to democratise the relationship between science and policy-making and to strengthen communication and mutual understanding between the two. In the co-production model, accountability for the outcome is dispersed among participants, and legitimacy comes from the quality of that shared process rather than from the separation of science and policy (cf. linear model).

Having evolved across different disciplines and practices, the term co-production now carries several meanings, including interaction between science and politics, epistemic democracy, crossing disciplinary boundaries, boundary work, and interventions in the knowledge base.¹⁶

1.2 THE ADVERSARIAL ROOTS OF POLICY RED TEAMING

Alongside the linear and co-productive models, a further set of approaches has emerged that subjects policy reasoning to adversarial scrutiny before decisions are made. Many of these have roots in systems thinking, sharing the recognition that changing complex systems requires examining issues from diverse perspectives and critically reflecting on them. What unites these approaches is a shared logic: a policy proposition is deliberately subjected to *ex ante* scrutiny, in which its assumptions, expected outcomes, and/or impacts are critically tested before a decision is taken rather than after implemen-

tation. In this section, we present a few such approaches.

Strategic assumption surfacing and testing (SAST) is one such approach. It is a systems methodology rooted in social systems design and particularly suited to addressing complex, interconnected problems.¹⁷ In practice, it follows a structure of group formation, assumption surfacing, dialectical debate, and synthesis, using these steps to understand a system from different angles and to reflect critically on its limits, so that the resulting design can be improved.¹⁸

Assumption-based planning, closely linked to red teaming and stress-testing,¹⁹ involves identifying the assumptions behind an organisation's plan or strategy and determining which of these load-bearing assumptions are also vulnerable and therefore likely to fail over the plan or strategy's lifetime. It considers what shaping actions could reduce the likelihood of failure, what hedging actions could be taken should assumptions fail regardless, and what signposts, meaning trends or events, could be monitored to detect early signs of failure.²⁰

Assumption-based planning has also given rise to a computational branch of counterparts within the broader field of decision-making under deep uncertainty. Most notably, these are exploratory modelling approaches, such as **Robust Decision Making (RDM)**. Where assumption-based planning identifies vulnerable,

¹⁷ Jackson 2019: 343–367

¹⁸ Jackson 2019: 354–360

¹⁹ Dewar et al. 1993

²⁰ Lempert 2019: 28



load-bearing assumptions through structured analytical review, these computational approaches operationalise the same logic by running a policy through simulation models across thousands of computer-generated futures, with scenario discovery algorithms then identifying the conditions under which it would fail.²¹ Here, the challenge itself is generated computationally, through model runs, rather than by a dissenting human voice, although stakeholders still deliberate over what the results mean and what to do about them. In comparison, policy red teaming and Science Sparring, within it, instead belong to the latter, dialogical tradition, relying on the deliberate introduction of dissenting human perspectives.

Policy red teaming is inspired by other forms of dialogical traditions, including devil's advocacy and red teaming used in military and intelligence contexts. **Devil's advocacy** has been used to deepen understanding of complex societal issues by bringing conflicting perspectives and adversarial thinking to a policy problem.²² The devil's advocate role is typically given to a person tasked with testing a proposition by deliberately challenging it. In some practical applications, this role has been assigned to facilitators.²³ As with adversarial approaches more broadly, devil's advocacy has been criticised for risking excessive negativity at the expense of identifying genuine opportunities and solutions.²⁴ Therefore, Science Sparring has been developed not only to identify risks and weaknesses but also to examine opportunities and alternative approaches.

Anticipatory stress testing, or policy stress testing, tests policy plans and alternatives against various scenarios to anticipate how they would perform under external pressure.²⁵ Several national actors have developed and implemented methodologies for anticipatory stress testing, such as the Government Office for Science in the United Kingdom and the Centre for Strategic Futures in Singapore²⁶. Guidance and tools for anticipatory stress testing have also been published by the European Parliament's research services²⁷ and by the OECD.²⁸ In the publications mentioned above, the English term *policy stress testing* refers to scenario-based foresight work, typically conducted as part of an organisation's internal processes or official policy preparation. As a rule, it does not involve external experts from outside the drafting process. It shares with the dialogical tradition an orientation towards testing plans against adverse conditions, but without red teaming's characteristic use of outside voices.

Taken together, these approaches serve to future-proof policy directions, solutions and ideas.²⁹ Subjecting policy assumptions to epistemic scrutiny aims to identify their vulnerabilities, for instance, regarding anticipated societal risks. The recognition of a need for such scrutiny often, though not always, originates with policy-makers themselves, typically during the preparatory phase, when goals and measures are

21 Lempert et al. 2003

22 Cunico et al. 2024

23 see Cunico et al., 2024

24 Jackson, 2019: 361

25 Government Office for Science 2024

26 See csf.gov.sg

27 European Parliament 2022

28 OECD 2025

29 cf. Zhang & Gronvall 2020; Klerk et al., 2021; Cunico et al., 2024





still being formulated, and the issues at stake are highly uncertain and fast-moving. Unlike in co-production, the central goal here is not consensus-oriented knowledge production but the deliberate introduction of critical reflection. And unlike in the linear model, adversarial scrutiny is organised in close science-policy collaboration and dialogue.

Science Sparring is a form of policy red teaming developed by knowledge brokers, drawing methodologically on the approaches described above. At the

same time, it grew bottom-up, out of practical demand and a wish to respond directly to policy-makers' own needs, and it has been refined continuously ever since. Chapter 2 explains the practical elements of the policy red teaming model in more detail: it brings together multidisciplinary researchers to apply adversarial scrutiny to draft policy documents before decisions are made, with the explicit aim of surfacing hidden assumptions, knowledge gaps and flaws in reasoning.



Ultimately, it aims to improve the robustness of policies to uncertain futures, defined here as the capacity of policy to withstand scrutiny and maintain its core functions across changing contexts.³⁰ This is closely related to, but distinct from, the ex-ante evaluation: whereas ex-ante evaluation assesses a policy's likely impacts before implementation, robustness describes a property of the reasoning itself, namely whether its assumptions hold against the best

available evidence, alternative perspectives, and unanticipated conditions. Here, robustness is extended from policy performance across scenarios to the reasoning behind the policy, on the premise that assumptions which withstand scrutiny are more likely to produce a policy that performs robustly once implemented. Policy red teaming, and Science Sparring in particular, is one practical route to building policy robustness.

30 For a definition of policy robustness, see, for example, El-Taliawi & Goyal, 2026



Table 1. Summary of the different models^{31,32}

Dimension	Linear model	Co-production model	Policy red teaming
Principles of organising interaction	Research and policy are kept separate Accountability sits with researchers	Research and policy are integrated Accountability is shared among participants	Research and policy are deliberately brought together for a defined period and purpose Accountability is shared, though policy-makers retain ownership of the final outcome
Sources of legitimacy	The independence and quality of research expertise	Close negotiation and trust-building between researchers and policy-makers	The policy mandate and knowledge need that trigger the process, combined with a safe, facilitated space for critical scrutiny
Actor dynamics	Push and pull: researchers supply knowledge, policy-makers request it	Dialogue and iteration aimed at building socially robust, shared knowledge	Structured challenge: researchers act as a red team, critically scrutinising a draft policy against evidence while policy-makers remain owners of the material
How policy relevance is built	Policy needs are addressed through research findings, or assumed by researchers themselves	Policy needs are present and negotiated throughout the process	Policy needs are defined jointly with policy-makers at the outset, then tested through adversarial scrutiny that surfaces both risks and opportunities
Examples	Popularised publications Research commissioning	Collaborative research projects Participatory workshops	Science Sparring

31 Special thanks to Tommi Kärkkäinen for your contribution in developing this table.

32 The format in the table is illustrative, not a claim that these models are equivalent in practice. The linear and co-productive models already encompass diverse ways of working, whereas the policy red teaming model is still developing, including conceptually.



2 WHAT IS SCIENCE SPARRING?

Science Sparring is a knowledge brokering method that uses policy red teaming to systematically and proactively support policy-making. It was initially developed as part of the national science advice development initiative SOFI (2019–2021), funded by the Ministry of Education and Culture. The method and its core idea were developed in collaboration with seven different ministries. From the outset, the **aim was to create a new, goal-oriented method of science-policy interaction:** one that would reduce the risk of talking past one another and ensure that the knowledge communicated to policy-makers addressed their actual needs.

The first Science Sparring session grew out of a dialogue event organised with the

Ministry of the Environment in January 2020. At the time, the government had introduced a requirement for new legislative proposals submitted to Parliament to include an assessment of climate impacts. Nine legislative projects took part in that first session, with researchers supporting policy-makers on their preliminary plans for climate impact assessment.

Following this successful pilot, **development of the method continued in close cooperation with ministries.** The central commitment remained the same: to respond to genuine policy-makers' knowledge needs and to structure interactions purposefully. By spring 2026, ten of Finland's twelve ministries had taken part in the method's development.



This work is guided by a vision of Finland as a leading country in evidence-informed policy-making. In that vision, the preparation of major policy decisions routinely brings policy-makers and researchers together to scrutinise uncertainties and

risks, making policies more resilient to future change. **Our aim is for Science Sparring to become widely used across central government as a method for future-proofing policies.**

2019

Development of the Science Sparring model begins in the SOFI project.

2020

The first Science Sparring is organised in collaboration with the SOFI project, the Ministry of the Environment, and the Ministry of Justice on climate impact assessment.

2021

Urban Academy and Urbaria start using Science Sparring with cities in the Helsinki metropolitan area.

Development of the Science Sparring continues at the Finnish Academy of Science and Letters after the SOFI project has ended.

2023

Science Sparring is presented at the United Nations Science, Technology & Innovation Forum.

The Government Report on the Future (2019–2023) proposes broader adoption of Science Sparring in legislative drafting.

2024

OECD Education Policy Perspectives features Science Sparring.

The Nature mentions Science Sparring as a promising method for advancing evidence-informed policy-making.

2025

Piloting AI-assisted facilitation begins.

The European Commission's Science Advice Mechanism (SAM) recognises Science Sparring as the most innovative knowledge brokering method at its annual conference.

The Government's Legislative Consultation Guide recommends Science Sparring as a low-threshold consultation method.

Science Sparring is tested in new contexts, including with journalists, regional actors, and the National Emergency Supply Agency.

2026

The Science Sparring Masterclass, a peer-learning group for Science Sparring, launches.

Figure 1. Milestones of Science Sparring



2.1 AT THE CORE OF SCIENCE SPARRING IS THE REFORM OF KNOWLEDGE BROKERING

In Science Sparring, researchers and policy-makers jointly examine the most critical dimensions of policy preparation. Rather than beginning with narrowly defined questions, Science Sparring first seeks to identify the underlying knowledge need and the objectives of the policy preparation process.

In the longer term, Science Sparring seeks to promote a **broader cultural shift in how research-based knowledge is used in policy-making**. At the same time, it is only one method in the knowledge broker's toolkit. It does not solve all the challenges of evidence-informed policy-making, such as mismatches between knowledge supply and demand, insufficient interaction, or the short-term nature of collaboration. Even so, we hope it will challenge established ways of bringing research into policy-making and encourage reflection on what kinds of operating models knowledge brokers should use and develop.³³

Through developing the method, we have identified several conditions that distinguish it from other forms of interaction, such as dialogue events or roundtable discussions. Science Sparring is a **form of structured policy red teaming** in which the discussion systematically focuses on identifying knowledge gaps, assessing assumptions, and examining opportunities that underlie policy preparation.

The knowledge need and the objective of the process are defined jointly with policy-makers, and workshop discussions are confined to specific policy themes.

This does not mean that a Science Sparring process must always be initiated by the knowledge user (see *Science- or decision-driven Science Sparring?*, p. 32). Rather, it means the user's needs are discussed in advance, and the process is designed around them to make it goal-oriented.

During the process, participants work together to identify weaknesses and alternative approaches in the policy draft. Both researchers and knowledge users therefore take an active part in the discussion and contribute their expertise to the adversarial scrutiny. Science Sparring is inherently multi-perspectival: it brings together researchers from different disciplines and policy-makers in different roles. For the process to succeed, it also **requires an atmosphere of trust**. Knowledge brokers play a central role in creating and sustaining a safe atmosphere for adversarial scrutiny.

2.2 POLICY RED TEAMING AND SCIENCE SPARRING

Chapter 1 situated policy red teaming within a wider family of approaches that involve some level of adversarial scrutiny. Although the development of Science Sparring has benefited from these approaches, its practical application has drawn most heavily from red teaming. Here, red teaming is defined as a range of practices in which experts assembled for a defined task adopt the role of a chal-

33 See Lammensalo et al. 2025



lenger, expose blind spots, identify flaws in reasoning, and broaden the alternatives under consideration.³⁴

The objective of Science Sparring is to **reveal potentially problematic underlying assumptions and gaps in the knowledge base**. The interaction framework draws inspiration from the red teaming approach,³⁵ which is used in risk assessment, for example, in intelligence, foresight, and cybersecurity contexts.

Indeed, in **red teaming**, a group of experts assembled for the task adopts the role of challenger and stress-tests the resilience of an organisation's structures, practices, or ideas.³⁶ Typically, the red team consists of individuals who are not involved in the

operations of the organisation being tested. The experts adopt a critical mindset and critically scrutinise the selected boundary object. They challenge assumptions and beliefs, expose blind spots, broaden the range of knowledge and alternatives under consideration, and identify flaws in reasoning. The aim is to help the knowledge user make a more well-founded decision or produce a more robust outcome.³⁷

In Science Sparring, the **researchers form the red team**: an expert group not directly involved in policy preparation, which can therefore comment on a draft proposal from an external perspective. Their role is to scrutinise the draft critically, question the assumptions on which it rests, and surface its weaknesses.

34 Moran 2021; Scott, 2021; UK Ministry of Defence, 2021

35 See Zhang & Gronwall 2020

36 Moran 2021; Scott 2021

37 UK Ministry of Defence 2021 p. 5

DIVE DEEPER

Fundamentals of the Red Teaming approach³⁸

Red Teaming is based on

- Critical but constructive analysis
- An independent perspective
- A culture of continuous learning
- Acceptance of change
- The identification of risks and opportunities

Red Teaming is not

- Undermining policy-making
- A substitute for poor preparation
- Cynical criticism

38 Hoffman 2017 p. 49–66

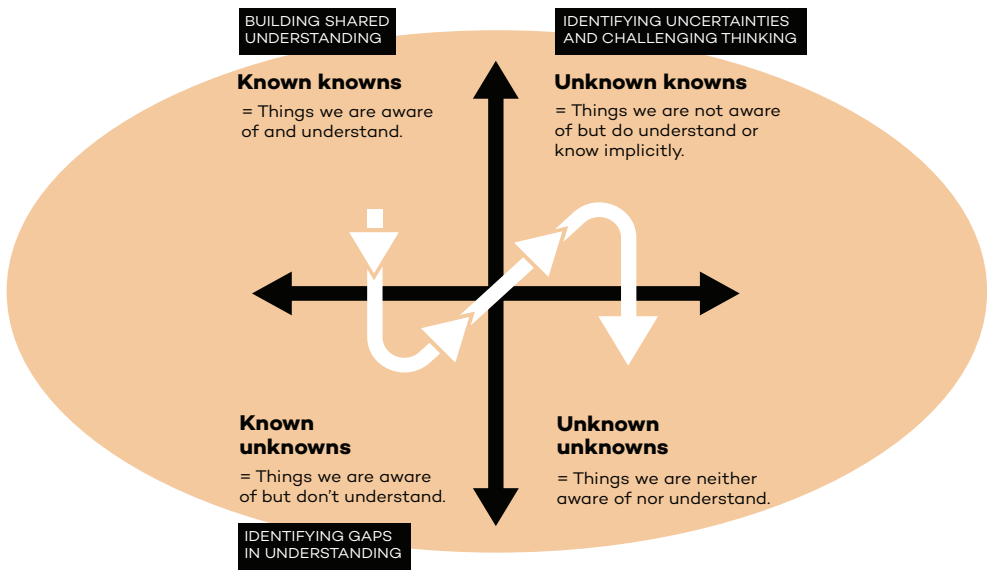


Figure 2. The pathway for policy red teaming in Science Sparring.

Policy preparation always rests on assumptions, and those assumptions in turn rest on understandings of the issue at hand. Those understandings may easily be incomplete or flawed.³⁹ In addition to challenging assumptions, policy red teaming can also reveal interconnections between issues and bring unintended consequences into view.⁴⁰

Subjecting draft policy proposals to policy red teaming at an early stage can help identify, for example:

- Incorrect assumptions and knowledge gaps.
- Risks or unforeseen costs associated with policy measures.
- Problematic conceptual framings and unfounded assumptions about causal relationships.

- Interdependencies that require particular attention in further preparation.
- Alternative ways of approaching solutions.

More broadly, a structured interaction setting can also help **counter groupthink**.⁴¹ At its best, Science Sparring generates new shared understanding that goes beyond participants' original, often relatively similar, mental models.

Unlike in some other models (see Chapter 1.1), policy red teaming does not require consensus among participants. Indeed,

⁴¹ By groupthink, we refer to the phenomenon in which similar views and interests lead to premature consensus and narrow critical debate. The structured policy red teaming in Science Sparring seeks to challenge this by surfacing diverse perspectives and questioning the group's assumptions (Cunico et al. 2024; Kahneman et al. 2011).

³⁹ Hoffman 2017 p. 50

⁴⁰ Hoffman 2017



seeking consensus is discouraged, as it can suppress the airing of diverse viewpoints. Researchers are accountable for the quality of evidence they bring to the discussion, but ultimate accountability remains with the participating policy-makers.

Researchers challenge policy-makers' thinking, and together they engage in collective brainstorming of ways forward. Yet, it is the policy-makers who ultimately decide how their plan, policy or strategy is adjusted.

“Red teaming is all about looking at things differently, so you need to avoid the tendency to approach every problem the same way and with the same techniques.”

*Bryce Hoffman*⁴²

⁴² Hoffman 2017 p. 241



2.3 THE KEY ELEMENTS OF INTERACTION IN SCIENCE SPARRING

Science Sparring can be adapted to different contexts, the core elements of its practical implementation are straightforward and readily transferable. Through developing the method, we have found that purposeful interaction can be strengthened and talking past one another reduced through a relatively small number of practical measures. The main elements are outlined below.

1 Knowledge brokers make participation easy for both researchers and policy-makers.

Knowledge brokers surface policy-makers' latent needs and guide the discussion so that the policy draft can be examined constructively and critically.

2 Knowledge need describes what kind of knowledge is needed, what is already known about the topic, and in what policy preparation context the knowledge will be used.

Precise articulation of the knowledge need helps knowledge brokers identify the appropriate researchers and the themes to be addressed during the process.

3 Draft policy documents act as boundary objects that anchor participants to the topic and reduce talking past each other.

Using a boundary object helps frame conversations and reduce the tendency to talk past each other. It can also serve as background material for workshop participants. Often, the material consists of preparatory material, such as a background paper, a working group memo, or an early impact assessment draft. If needed, it may also include short explanations of key terminology or background on the policy-making context.

4 Trust is a critical component of Science Sparring.

In Science Sparrings, policy-makers essentially open the policy preparation process at an early stage, exposing potential flaws and misunderstandings. The interaction can easily turn unconstructive unless there is a mutual understanding that the process is essentially an instrument for improving policy. Discussions in Science Sparring workshops follow the Chatham House Rule to foster a confidential and trust-based atmosphere. This means that themes discussed during the workshop may be shared afterwards, provided that individual observations are not attributed to specific participants.⁴³

5 Closed setting supports trust-building and enables an exploratory space.⁴⁴

Science Sparring requires an exploratory space with opportunities for tangents in the interaction. This can be hard when

⁴³ See chathamhouse.org/about-us/chatham-house-rule

⁴⁴ Alhanen 2024



third parties (e.g., stakeholders and interest groups) are present, and the interaction can quickly turn from constructive, exploratory dialogue to an antagonistic public spectacle. The closed nature of the method means it is crucial that the process is conducted as transparently as possible. Transparency of the

process can be enhanced by publishing a summary that lists participants and explains the role of knowledge brokers to external audiences. In practice, the summary of a Science Sparring process typically takes the form of a structured memorandum of the discussion.



3 IN WHICH POLICY-MAKING CONTEXTS IS SCIENCE SPARRING THE MOST APPROPRIATE?

In the Finnish Government's *Consultation Guide*, published in autumn 2025, Science Sparring is recommended as a **low-threshold consultation method**.⁴⁵ It has proven effective in building cooperation with the research community in policy preparation, whether at a single stage of a project or across multiple phases.

Science Sparring has demonstrated considerable flexibility as a method, but its suitability varies depending on the policy-making context. One of the most important skills of a knowledge broker convening a Science Sparring is the ability to recognise when it is the appropriate method

for a particular knowledge need. This in turn requires a clear understanding of the method's strengths and limitations.

Based on our experience, three factors shape this suitability:

- The possibility of clearly delimiting the knowledge need;
- The stage and time horizon of the policy-making process; and
- The motivation and readiness of participants to engage in critical dialogue.

In this chapter, we share lessons from our development work on the contexts in which Science Sparring has worked most effectively and supported the uptake of

⁴⁵ See valtioneuvosto.fi/lainvalmistelun-kuulemisopas [Only in Finnish]



research-based knowledge in policy-making processes. We examine how knowledge needs vary across different stages of policy preparation, and how this variation shapes the design of the Science Sparring.

3.1 WHEN DOES SCIENCE SPARRING WORK PARTICULARLY WELL?

Science Sparring is particularly well-suited to broad and complex policy topics, meaning systemic issues that span administrative sectors and academic disciplines.

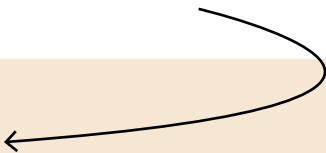
Nevertheless, the knowledge users must still be able to articulate and communicate the knowledge need and the precise goals of the process. This ensures that the process is goal-oriented and contributes to the uptake of research-based knowledge in policy preparation.

The method has been developed primarily for ministerial policy preparation, but it can also be applied in other contexts, such as municipal decision-making or parliamentary preparation. Below are examples of situations in which Science Sparring works particularly well.

1 When there is a need to anticipate risks and unintended consequences in policy preparation.

Science Sparring brings latent risks and unintended consequences of policy measures to light at an early stage of policy preparation, before final decisions are taken. Researchers scrutinise policy drafts and raise identified weaknesses, gaps and uncertainties directly with policy-makers, enabling real-time discussion of alternative solutions.

EXAMPLE



Anticipatory Work on the Biodiversity Act, Ministry of the Environment, 2023

Objective: To strengthen understanding of alternative regulatory options and to identify their potential benefits and risks proactively.

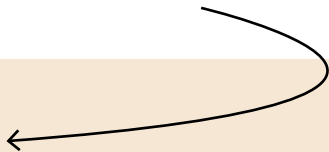
Benefits for policy preparation:

- Gaps in the existing legislation safeguarding biodiversity were mapped, and the risks and potential impacts of alternative regulatory approaches were critically assessed.
- The Science Sparring process formed the basis for a more extensive study on the topic conducted by two of the participating researchers.⁴⁶

2 When the knowledge base of preparation requires critical scrutiny.

Science Sparring exposes weaknesses and problematic interpretations in the knowledge base of policy preparation, allowing the process to be redirected where necessary. Researchers present relevant data, knowledge, and expert insights directly to policy-makers, who might otherwise have overlooked them.

EXAMPLE



Evidence Base of Civil Society Policy, Ministry of Justice, 2025

Objective: To assess the knowledge base underpinning the preparation of the Civil Society Strategy before the formulation of a broader civil society vision. In other words, to examine whether the knowledge base contained risks that had not been identified or considered.

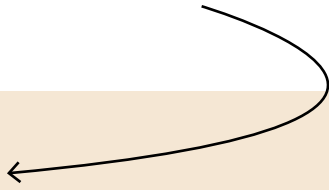
Benefits for policy preparation:

- Additions were proposed to the situational analysis to better account for, for example, the increasing diversity of civil society and civil society organisations.
- Deficiencies in data collection were identified: comprehensive data on the state of civil society are lacking, and quantitative and longitudinal datasets are largely absent.
- Core assumptions were identified and critically examined in the discussion, namely whether civil society always plays a positive role in democracy; and whether the partnership between public administration and civil society will remain unchanged in the future.
- Ongoing trends and weak signals of potential future change within civil society were identified, and strategies of how civil society should respond to these changes were discussed.

3 When proactive evaluation is required.

Researchers challenge the underlying assumptions and mechanisms of impact in policy drafts, complement impact assessments, and help identify and anticipate challenges in evaluating impacts before implementation.

EXAMPLE



Reform of the Nature Conservation Act, Ministry of Environment, 2020

Objective: To strengthen the knowledge base underpinning the impact assessment of the Nature Conservation Act reform. The collaboration focused on impacts related to biodiversity, climate, society, and the economy.

Benefits for policy preparation:

- The conclusions were distilled into key messages, which were presented, together with their justifications, to the broader project group overseeing the reform. The key messages identified, for example, the need for comprehensive and openly accessible biodiversity data.
- The most significant proposed amendments in terms of impact, as well as the most critical anticipated effects, were identified.
- Knowledge gaps were highlighted where further studies would be needed as the impact assessment progressed.
- Understanding was strengthened of the uncertainties and cumulative effects of different legislative initiatives.

Further information:

Lonkila, Kirsi-Marja (2021). *Stronger Knowledge Base for Preparation Processes through Cooperation with Researchers. Drafter's Guide to Effective Cooperation with Researchers*. Ministry of the Environment. <http://urn.fi/URN:ISBN:978-952-361-416-1>

DIVE DEEPER

Science or policy-driven process?

During the development of Science Sparring, we have often been asked: at whose initiative did *Science Sparring* begin?

The majority of Science Sparring processes organised by the Finnish Academy of Science and Letters have been policy-driven. The initiative, for example, has come directly from a ministry where a concrete knowledge need has emerged. A policy-maker recognises the need for knowledge, and the process is designed to address it. However, we have also organised science-driven processes, in which the initiative comes instead from researchers who identify a policy-relevant question worth raising.

Both approaches require a clear link to knowledge users' needs

Regardless of how the process is initiated, it is essential to ensure its purposefulness and its connection to a genuine policy-making need. Without a real context of knowledge use, Science Sparring risks becoming a detached discussion exercise with limited impact. Even in science-driven processes, continuous dialogue with knowledge users is essential, and the process must be framed to meet their needs.

If you are planning a science-driven Science Sparring process, consider the following:

- Is there a timely and relevant policy-making need for the planned process?
- Which policy-maker could make use of the knowledge, and from whom could I seek clarification regarding the need?
- How can I ensure that researchers understand the practical realities of policy-making and are able to communicate knowledge in a form suited to that context?

3.2 WHEN DOES SCIENCE SPARRING NOT WORK?

Not every knowledge need is suited to Science Sparring, and recognising when it is not is an important part of a knowledge broker's skills.

We have tested the method across a wide range of contexts, and have learned not only where it works but also where it falls short. Below are examples of situations in which other methods tend to be more effective.

1 Policy-makers lack motivation to participate.

Science Sparring requires both researchers and policy-makers to be willing to engage with each other and work together to strengthen the quality of policy preparation. Without this motivation, the process rarely generates the intended added value for policy.

2 The knowledge need is too broad or poorly defined.

Launching a Science Sparring process requires that knowledge users are able to articulate the type of knowledge they require. If the knowledge need is still emerging or remains too open-ended, an initial consultation event or a co-creation workshop may be more appropriate.

3 There is a desire to engage a broad audience.

Structured critical scrutiny during policy preparation requires a confidential and psychologically safe space. For trust to develop, the participants' roles in the process must be clear to everyone involved. So-called third parties should not observe or participate in the discussion.

4 Preparatory documents are already in final form.

Science Sparring seeks to strengthen evidence-informed policy-making and support policy preparation. For this to be possible, the process must be timed so that changes remain feasible. In practice, this means that policy documents or other preparatory materials should still be at an initial or draft stage, and that knowledge users are responsive to adversarial scrutiny.

5 Documents or themes are too sensitive to be shared in advance.

Science Sparring requires that researchers familiarise themselves in advance with the draft policy documents or other materials that give a sense of the assumptions and knowledge base underpinning policy preparation. If this is not possible due to, for example, confidentiality constraints, Science Sparring is unlikely to be the most appropriate method.



DIVE DEEPER

Remote or in person?

When planning Science Sparring, one question arises frequently: *can it be organised remotely?*

In-person works the best

Physical presence fosters a trusting atmosphere and often enables deeper dialogue. Both of these are important to the policy red teaming and adversarial scrutiny of Science Sparring. In a shared physical space, the facilitator can more easily read group dynamics, ensure that different voices are heard, and adjust the agenda in response to participants' energy levels. Informal discussions during breaks can also generate valuable insights.

When might an online format be a viable option?

An online format may be justified, particularly when participants are dispersed across the country, and travel would be unreasonable. We have experimented with an online format together with Finland's climate expert network at the Centres for Economic Development, Transport and the Environment (ELY Centres). In that process, enabling participation by experts from across Finland was a central objective.

In an online setting, the main challenge is to deepen discussion and adversarial scrutiny, creating genuine space for fruitful exchange. If you are considering an online Science Sparring process, think carefully about what you are aiming to achieve, and whether those objectives are attainable without physical presence. A successful online workshop requires careful planning, adjustments to techniques used by the discussion guide, and thorough technical preparation. The workshop should be short (no more than 2–3 hours) or include sufficient breaks to keep participants actively engaged.

What about a hybrid?

A hybrid discussion, where some participants are in the room and others join online, is extremely difficult to facilitate on equal terms. At the Finnish Academy of Science and Letters, we have not organised a hybrid Science Sparring.

3.3 KNOWLEDGE NEEDS AT DIFFERENT STAGES OF POLICY-MAKING

The stage of the policy-making process significantly influences the type of knowledge and added value sought through Science Sparring. The method can be useful in different stages, and identifying the correct window of opportunity for it remains a core function of a knowledge broker.

To date, most Science Sparring processes organised by the Finnish Academy of Science and Letters have taken place during the preliminary preparation and regulatory drafting phases of policy preparation. The table below illustrates how the role of Science Sparring may vary across different stages of policy-making.

Table 2. Science Sparring at the different stages of policy-making

Stage	Knowledge need	Science Sparring's role	Case examples
Problem definition and pre-drafting	To understand the scope of the problem, causal relationships, and potential points of intervention.	- Refines and deepens the problem definition by challenging its assumptions - Identifies perspectives that have not been considered - Challenges underlying assumptions In practice: Science Sparring can, for example, support the drafting of a project plan.	Impacts of Earth System Tipping Points on National Preparedness. National Emergency Supply Agency & Operaatio Arktis, 2025 Objective: To identify the risks associated with crossing planetary tipping points being exceeded and to assess their implications for the security of supply. Key question: If the Atlantic Meridional Overturning Circulation (AMOC) were to slow down significantly or collapse entirely, what direct and cascading impacts would this have for national security of supply in Finland? Findings: Imagining the crossing of the AMOC tipping point fundamentally alters thinking about security of supply, since it would represent a permanent structural change rather than a temporary disruption. The process identified the need for anticipatory security of supply planning, requiring the courage to initiate preparedness measures before necessity becomes urgent.



Policy- options	To scrutinise whether the assumptions behind proposed measures hold up against existing research-based knowledge, and to identify where the evidence base is incomplete or contested.	• Adversarial scrutiny of the knowledge base and assumptions underpinning preparation • Challenges the feasibility and impact mechanisms of alternative options • Surfaces trade-offs and unintended consequences between different options • Identifies knowledge gaps and areas where evidence is incomplete or disputed In practice: Science Sparring can, for example, test whether initial policy options are grounded in current research before the proposals proceed further.	Measures to improve education learning outcomes Ministry of Education and Culture, 2026 Objective: To examine a working group's proposed measures addressing basic education learning outcomes, and to assess the extent to which the proposed measures align with existing research. Key questions: Which assumptions underpin the proposed measures, and do they hold up against current research? Are there measures that are context-dependent, insufficiently studied, or wrongly assumed to resolve broader problems? Findings: The workshop found that research does not yet fully explain the link between pupils' wellbeing and learning outcomes, limiting confidence that any single measure will improve both. A related assumption, that increasing the home's responsibility would support all pupils equally, was found to be unsupported by existing evidence.
Monitoring and evaluation	To assess whether monitoring and evaluation frameworks measure the right things, and to identify where indicators or data sources need adjustment.	• Ensures that monitoring is grounded in the latest research knowledge • Tests whether indicators capture what they are intended to measure • Complements and refines the evaluation framework In practice: Science Sparring can, for example, review whether an evaluation framework and its indicators are fit for purpose before it is finalised.	Evaluation and monitoring plan for public R&D funding Prime Minister's Office, 2024 Objective: To complement the evaluation framework and monitoring indicators, and to compile information on data sources relevant to monitoring. Key questions: Which datasets and research streams could be useful for the evaluation? Are the indicators appropriate, and do they capture everything that should be measured? Findings: The measurement of R&D collaboration should be examined as broadly as possible, and a clear impact framework should be established for the overall system. As a result of the discussion, the weighting of indicators was adjusted, and some indicators were removed.



EXAMPLE

Science Sparring in Support of Urban Development

Between 2021 and 2022, the joint *Urban Academy* initiative of the cities of the Helsinki metropolitan area, the University of Helsinki, and Aalto University, together with the University of Helsinki's Urban Research Institute, Urbaria, implemented Science Sparring processes to address cities' needs. The work built on the Science Sparring method, originally developed within the Sofi initiative, and was adapted to support cities' strategic preparation processes.

The first Science Sparring session supported the preparation of urban strategies in the cities of Helsinki, Espoo and Vantaa. Depending on the city, the objective was either to complement the situational analysis and knowledge base of strategy preparation or to identify concrete policy measures within selected thematic areas. The refinement of the knowledge need was demand-driven.

In Helsinki, themes included, for example, promoting the well-being of children and young people, preventing inequality, and supporting sustainable consumption among residents through public policy instruments. In Vantaa, the themes focused on well-being and socio-economic disparities, including children and young people's mental health, the resourcing of positive discrimination at the neighbourhood level, and integration measures. In Espoo, Science Sparring focused on the governance of sustainability transitions and on measuring the city's sustainability.

The process included guided, confidential discussions with two to three experienced researchers from different academic disciplines and approximately ten to fifteen public administrators from each city at a time. Due to the COVID-19 pandemic, the sessions were held online. Cities selected the discussion themes, and researchers prepared on the topics in advance. The role of the researchers was not to provide direct policy recommendations but to introduce research-based understanding, alternatives, and constraints relevant to the cities' preparatory work. Responsibility for decisions and implementation remained with the cities.

From the outset, the workshops received very positive feedback from both public administrators and researchers. A key factor was timing: researchers were invited to contribute during the phase of expanding the knowledge base or drafting the programme. Based on participant feedback, the workshop duration was slightly extended to reduce the sense of urgency. Despite this adjustment, public administrators continued to request more time, particularly to ensure sufficient space for their perspectives to be heard.

Despite the emphasis on dialogue, the workshops tended to be clearly research-led, as the limited time available encourages researchers to present as much relevant knowledge as possible on the selected theme.

Following the successful initial pilots, the urban-themed Science Sparrings have continued. In Vantaa, for example, Science Sparring assessed the city's Resource Wisdom Roadmap, focusing on themes such as urban carbon sinks and ecological compensation as a novel policy instrument for municipalities. In 2025, the City of Vantaa became the first Finnish city to adopt ecological compensation more broadly in its land-use planning projects.

Annina Ala-Outinen and Iiris Koivulehto



PRACTICE

4 HOW TO ORGANISE SCIENCE SPARRING

A common misconception is that Science Sparring refers to just one workshop. We take a broader view: **Science Sparring is a knowledge brokering method and process, with the workshop as only one of its elements.**

4.1. THE FIVE STAGES OF SCIENCE SPARRING

There are **five key stages** in organising Science Sparring: defining the knowledge need, selecting participants, preparing for the workshop, conducting the workshop, and producing the summary.

Defining the knowledge need

At the outset of the collaboration, knowledge brokers work with policy-makers to refine their knowledge needs and identify the factors relevant to the Science Sparring process, such as the timeline for policy preparation and political priorities. Together, they establish the objectives and schedule for the Science Sparring, agree on the boundary object to be used, and decide on the summary format (see *Appendix 2: Tool, Policy-maker: How to refine your knowledge need*).



Selecting participants

Knowledge brokers identify four to eight researchers with doctoral degrees across disciplines relevant to the knowledge need.⁴⁷ At the same time, the key policy-makers responsible for the policy preparation on the topic are also identified. In addition to the policy-maker responsible for coordinating policy preparation, participants may include, for example, civil servants from other ministries working on the topic. The aim is to balance the number of researchers and policy-makers.

Direct contact with participants is essential in preparing a Science Sparring. Before the workshop, knowledge brokers should hold a brief introductory conversation with each participant about the content and objectives of the Science Sparring, and their role in it. This builds participants' understanding of the process and trust in the knowledge brokers, both essential to its success.

Preparation for the workshop

Before the workshop, knowledge brokers work with the policy-makers to specify which questions or themes will be addressed and how they will be prioritised. These questions and themes are also discussed with researchers during their scoping phase. Insights from the researchers help refine both the knowledge need and the workshop preparation.

At this stage, knowledge brokers also prepare background material that serves as the boundary object for the workshop discussions. It usually consists of the early policy draft accompanied by an introductory paragraph. If needed, it may also include short explanations of key terminology or background on the policy-making context. Although policy-makers are generally responsible for the policy draft, knowledge brokers may help them fine-tune the boundary object, for example, by supporting the finalisation of the introductory paragraph and the formatting of the document.

The document should be of a manageable length for researchers to review. In Science Sparring sessions organised by the Finnish Academy of Science and Letters, we have aimed for concise material (usually less than 10 pages) so that researchers' preparation for the workshop can be kept at approximately one to two hours. Discussions about how to limit the length of the background material can also be a useful way for knowledge brokers to clarify the precise knowledge need together with policy-makers.

For clarity, the background material should be presented as a single document, making it easy for participants to review. Printed copies can also be useful during the workshop itself, to anchor the discussion.

The background material, along with the key discussion themes and questions, is sent to all participants at least one week before the workshop. Throughout the process, particular attention should be paid to clear and accessible communication.

47 As a rule, in Science Sparring organised by the Finnish Academy of Science and Letters, researchers are selected on the basis of academic expertise and therefore hold doctoral degrees. Exceptions have been made in individual cases where late-stage doctoral researchers were among the best experts on the topic.



EXAMPLE

The workshop schedule

The duration and structure of a Science Sparring workshop vary depending on the scope of the topic, the number of participants, and available resources. Often, the most productive format is a three- to six-hour workshop.

Below is an example of the schedule used in a Science Sparring organised in autumn 2025 with the Finnish Ministry for Foreign Affairs and the Finnish Ministry of Economic Affairs and Employment. The Science Sparring addressed capital-driven industrial competitiveness. The workshop was facilitated by two knowledge brokers at the Finnish Academy of Science and Letters and was attended by four policy-makers and five researchers.

Schedule:

- 11.45 – Arrival
- 12.00 – Welcome
- 12.05 – Description of the knowledge need (Ministries)
- 12.15 – Introduction to the working method and a warm-up
- 12.30 – Group work: assessment of the boundary object, assumptions, and gaps in knowledge
- 13.45 – Break
- 14.00 – Joint discussion: future scenarios and "what if" questions
- 14.50 – Summary of the discussions
- 15.00 – End of session

EXAMPLE

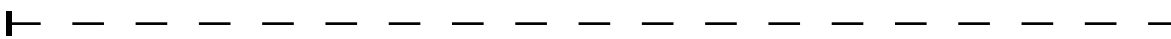
Draft monitoring and evaluation plan for government R&D funding as background material

In autumn 2024, the Finnish Academy of Science and Letters organised a Science Sparring at the request of the Research and Innovation Council secretariat at the Prime Minister's Office, comprising two workshops. The objective of the first workshop was to review the draft R&D funding evaluation and monitoring plan and its indicators from a research-based perspective.

The draft evaluation plan served as the boundary object for discussion, with the R&D funding monitoring indicators provided to the researchers as an appendix. They were asked to familiarise themselves with the content using the preliminary questions below.

The preliminary questions:

- What perspectives or issues, in light of research knowledge, should be given particular consideration in monitoring and evaluation?
- What existing or forthcoming datasets, sources, or research approaches would you consider useful for the evaluation?
- The Research and Innovation Council's monitoring and evaluation work is intended to be carried out in collaboration with various government sectors and RDI actors. What kind of scientific evidence would be useful in this context?
- A key consideration in the monitoring and evaluation of RDI funding is the varying time horizons for results, effects, and impacts. What does research knowledge tell us about the role of time horizons in RDI funding evaluation?



Knowledge brokers design the workshop structure around the knowledge need and guide the discussions. The workshop typically opens with brief introductions, for example on the knowledge need, followed by a warm-up, before continuing as a guided discussion anchored in the background material. A workshop typically lasts three to six hours and, depending on the knowledge need, may run as a single session or several.

The summary of the Science Sparring reflects the goal-oriented nature of the process. Documenting the discussion in writing enables the long-term use of the knowledge. In practice, the summary format is always tailored to the policy-makers' knowledge needs. It may take the form of a concise written report, a Power-

Before the summary is handed over to the policy-makers, **the researchers validate it to ensure accuracy**. In practice, this involves a brief round of feedback in which the researchers check whether anything essential they said is missing or whether any phenomenon or concept has been described incorrectly.

Unless otherwise agreed, **the summary is published to enhance the transparency of Science Sparring.** It may be published on the website of either the knowledge broker organisation or the organisation that presented the knowledge need. The summary should include at least the names of the participating researchers and the organisation whose knowledge need was addressed. This also allows researchers to cite their participation in this kind of societal engagement activity.

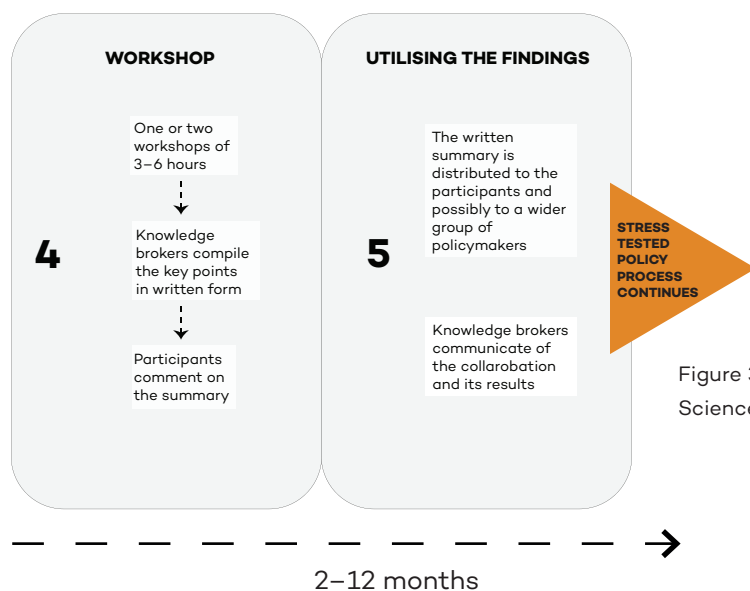


Figure 3. The stages of Science Sparring.

4.2. THE ROLES AND RESPONSIBILITIES OF PARTICIPANTS

Science Sparring typically involves three types of participants: knowledge brokers, policy-makers and researchers. Each group has distinct roles and responsibilities, as outlined in Table 3.

Knowledge brokers are professionals in facilitating science-policy interactions. They refine the policy-makers' knowledge needs, identify relevant researchers and guide the discussion in the workshop. In addition, they are responsible for communication and practical arrangements throughout the Science Sparring process. Their workload is considerably greater than that of policy-makers and researchers, as they bear the primary responsibility for organising the Science Sparring.

Policy-makers play a central role in defining the knowledge need, that is, identifying the context in which Science Sparring is organised and what added value it aims to achieve. During the workshop, policy-makers are not simply passive listeners of researchers' adversarial scrutiny. Instead, they are an active part of the discussion and bring their expertise, particularly regarding how the issues raised by researchers could be addressed. After the workshop, they are expected to apply the insights gained in their policy preparation and to update participants on how those insights were used.

Researchers bring multidisciplinary expertise to the discussion and provide constructive, critical feedback on the draft document under review. During the discussion, they are asked to indicate whether their views are based on peer-reviewed research or on their own expert judgement. After the workshop, researchers comment on the



discussion summary to avoid misunderstandings and factual errors.

When organising Science Sparring, the question of third-party participation, such as representatives of interest groups, often arises. Science Sparring is a method for communicating research-based knowledge

into policy-making; this is a distinction worth discussing openly with the policy-makers. To maintain a clear separation between research-based knowledge and other forms of input, it may be more appropriate to engage other stakeholders through different channels.

Table 3. Roles, responsibilities and estimated workload (in person-days) of Science Sparring participants.

	Role	Responsibilities	Resources (person-day)
Knowledge broker	Facilitator	• Refining the knowledge need, • identifying and briefing the participants, • preparing the workshop, • guiding the workshop discussions, • producing the summary, and • handling internal and external communication.	ca. 5–10
Policy-maker	Presenter of the knowledge need, and expert	• Refining the knowledge need, • identifying and producing the boundary object, • participating in the workshop, and • applying the knowledge in practice.	ca. 3–5
Researcher	Expert	• Preparing for the workshop using the background material, • participating in the workshop, and • providing feedback on the summary.	ca. 1,5



REFLECTION

Third-party participation in Science Sparring

Science Sparring is, in principle, a closed process between researchers and policy-makers. True to its nature and emphasis on science-policy dialogue, it does not have an audience. Instead, everyone present actively participates in the discussions. This is important for creating an exploratory and trusted atmosphere needed for the policy red teaming.

Why is Science Sparring limited to a discussion between researchers and policy-makers?

It is essential to distinguish among research-based knowledge (what we know), expert judgement (the interpretations we make of that knowledge), and value-based positions (what should be done). Researchers and policy-makers can naturally engage in discussion grounded in research-based knowledge and expert judgement. Third-party participation, however, may introduce value-based positions, even unintentionally, which run counter to the aim of Science Sparring.

Third parties supporting the work of knowledge brokers

In some situations, third-party involvement can support the knowledge broker's work. For example, the Finnish Academy of Science and Letters has collaborated with the climate strategy agency Operaatio Arktis⁴⁸, whose experts supported the knowledge brokers' work throughout the Science Sparring process. The experts from Operaatio Arktis compiled the background material for the Science Sparring and communicated about the collaboration through their own channels. In situations where a third party does not take part in the discussion but instead serves as a facilitator, such collaboration can be appropriate and fruitful.

When can third-party participation be fruitful?

- If the third-party has unique practical knowledge.
- If the third-party operates within a clearly defined role that has been agreed upon together.
- If the main facilitator can actively maintain a clear division of roles between the parties, ensuring that different types of knowledge remain distinct.

⁴⁸ See operaatioarktis.fi

5 HOW DO KNOWLEDGE BROKERS GUIDE DISCUSSIONS?

For knowledge brokers, guiding the discussion during Science Sparring’s workshop is a core professional skill that requires conscious effort to cultivate. In workshops, guiding the discussion is often referred to as facilitation. In this chapter, however, we use the term “guiding the discussion”. This is because, in the context of Science Sparring, “facilitation” can also refer to coordinating the entire process, from refining the knowledge need to publishing the summary.

It is worth noting that knowledge brokers always guide the discussion through their own personalities, and their working styles can vary considerably. We have found that being willing to put oneself on the line pays off: a strong presence in the workshop, together with the confidence to guide the discussion in one’s own style, contributes to a successful conversation.



REFLECTION

Should a knowledge broker have subject matter expertise on the workshop topic?

Is it necessary for the knowledge broker guiding discussions to have subject matter expertise, or are strong brokering skills enough? Both approaches have their strengths. A knowledge broker without prior expertise in the topic can support discussion perhaps more impartially and ensure that all voices are heard. Then again, someone familiar with the topic can ask more precise questions and identify gaps in the discussion (even though the actual expertise always remains with the policy-makers and researchers).

The knowledge brokers who have organised Science Sparring workshops for the Finnish Academy of Science and Letters have generally lacked subject-matter expertise on the workshop topic. Based on our experience, strong process skills have worked well in organising Science Sparring, although this requires the knowledge broker to still become sufficiently familiar with the content.

Use the following questions to reflect on which approach suits you the best:

- Do I prefer to focus on the technical guidance of the discussion, or do I want to engage more deeply with the topic?
- Is it easier to guide the discussion impartially if I am not a subject matter expert?
- Which gives me more confidence in guiding the discussion: relying on subject matter expertise, or strong skills in facilitating science-policy discussions?
- How do I react if the discussion drifts into topics I am not familiar with? Am I able to continue guiding discussions and ask relevant questions, or does it affect my confidence?

5.1. DIALOGUE-BASED APPROACH

The development of Science Sparring has drawn on lessons from the Dialogue Academy's dialogic approach. **Science Sparring applies key principles of the dialogic approach, although the goals of the workshop discussions are predetermined.** The knowledge need and background material steer the discussion in a certain direction, one that participants cannot entirely define themselves. We recommend exploring the Dialogue Academy's dialogic approach directly on their website.⁴⁹ In the following, we briefly outline how the dialogic approach is applied in Science Sparring.

Principles for guiding the discussion

The role of the knowledge broker is to create a safe space where researchers and policy-makers can engage in **open and equal dialogue**. Key principles include:

Impartiality | The knowledge broker guiding the discussions remains impartial on the content, focusing instead on steering the conversation. Their role may include challenging participants to think more critically about the issues. Yet subject-matter expertise on the topic always lies with the participants.

Equal participation | The knowledge broker ensures that everyone is heard and that all perspectives are given equal space.

Power of questions | Through open questions, the knowledge broker encourages deeper thinking rather than guiding participants towards a particular answer.

Active listening | The knowledge broker listens to the discussion, summarises key points, and reflects them back to the participants to maintain a shared understanding and guide the discussions forward.

⁴⁹ See dialogiakatemia.fi/en/



EXAMPLE

Ground rules used in Science Sparring workshops

At the start of the workshop, the knowledge broker guiding the discussions should go through the objectives of the Science Sparring, the ground rules for discussion and the nature of the process itself.

Ground rules:

- We engage in active discussion: we listen to one another and keep our contributions concise.
- We do not use phones, laptops or other devices during the discussion.
- Our discussion is confidential (Chatham House rules).
- We give constructive criticism.
- We offer our expertise without reservation.
- Where possible, we articulate the kind of knowledge that informs our contribution (research knowledge, expert judgement, etc.).

Explaining the nature of Science Sparring

The workshop should also begin by explaining what kind of process Science Sparring is, and what it is not. The following points are commonly used in workshops organised by the Finnish Academy of Science and Letters.

- Science Sparring is not a simple exchange of questions and answers; rather, it is a goal-oriented process aimed at addressing the defined knowledge need. In the process, researchers and policy-makers learn from each other.
- The role of knowledge brokers is to guide the interaction between the participating researchers and policy-makers. They are not subject-matter experts; instead, their expertise lies in how to organise the engagement.

Things to remind participants of:

- Research-based knowledge does not directly translate into policies or decisions. Policies are also shaped by values, practical constraints and other types of knowledge.
- The application and impact of research-based knowledge depend on interaction, trust and long-term collaboration.
- Science Sparring forms just one part of a wider process of collaboration and knowledge exchange.

5.2. SUPPORTING FACILITATION WITH ARTIFICIAL INTELLIGENCE

Successful Science Sparring relies on careful preparation and skilful guiding of the discussion by the knowledge broker. **AI has proven to be a valuable tool at various stages, though it does not replace the knowledge broker's expertise.** In this context, by AI we refer specifically to chatbots based on large language models.

In Science Sparring, the greatest value of AI lies not in automating individual tasks but in enriching the knowledge broker's thinking. At its best, AI challenges the knowledge broker to consider new perspectives and identify blind spots in the planning.

The following outlines practical ways to use AI at various stages of Science Sparring. The use of AI in Science Sparring is constantly evolving, and as the technology advances, new applications may emerge.

1 How can knowledge brokers use AI in preparation for the workshop?

For knowledge brokers preparing for the workshop, the greatest benefits of AI lie in **deepening and broadening their own thinking**. For example, AI can be used to try out different questions, work through the planned structure of the session, or explore provocative claims about the topic. AI helps the facilitator to **identify the “perennial questions” of policy preparation** (known knowns), which are topics that have been discussed extensively over the years, often with the same arguments repeated. By recognising these in advance, the knowledge broker

can steer the discussion towards less-explored but critical questions (unknown knowns and unknown unknowns) and ensure that the objectives of the Science Sparring are met.⁵⁰

Policy drafts often contain overlapping terms and concepts. With the help of AI, the knowledge broker can explore **how these concepts are understood across different academic disciplines and administrative fields**. This type of conceptual groundwork helps to understand and avoid potential misunderstandings and digressions during the workshop.

2 How can AI assist in guiding the workshop discussion?

The use of AI during Science Sparring workshops is still at a developmental stage.⁵¹ **The challenge lies in integrating the technology seamlessly into the dialogue without disrupting its natural flow.**

Real-time analysis of the workshop discussion is theoretically possible, as conversations can be transcribed and summarised automatically using AI. However, practical implementation still poses challenges. At the time of writing, AI applications do not yet reliably distinguish between multiple speakers in group discussions, and rapid transcription remains

⁵⁰ see Figure 2. The pathway for policy red teaming in Science Sparring p. 24

⁵¹ Throughout 2026, we at the Finnish Academy of Science and Letters have invested extensively in this development work, partnering with Aalto University. Because of the timeline of writing this handbook, many of the findings from that work have not yet made it into these pages. We therefore encourage anyone interested to visit our website for further information: acadsci.fi/en/science-and-policy/science-sparring/



DIVE DEEPER

How can AI help knowledge brokers prepare to guide the discussion?

AI can help identify:

- potential points of contention between different perspectives (for example, how people from different academic disciplines are likely to approach the issue),
- sensitive political topics that require careful navigation,
- terms or concepts that are understood differently across disciplines, and
- possible blind spots in one's own thinking and planning.

inaccurate. Managing the technology also takes considerable time during a workshop. Despite these challenges, we have integrated AI into workshops: knowledge brokers work with it during breaks.

During a coffee break at a workshop, the knowledge broker can use AI by:

- feeding the discussion transcript or key quotes into AI,
- asking AI to analyse what knowledge gaps have emerged,
- using AI to identify flawed assumptions that have not yet been challenged, and
- asking AI for suggestions for follow-up questions for the next segment of the session.

This requires the discussion guide to weave AI output naturally into the ongoing discussion. AI analysis serves best as a

source of inspiration rather than a script. The knowledge broker must still draw on their situational awareness and ability to read group dynamics.

In the future, using AI during workshops will likely become easier and more practical as the technology advances.

3 How can AI be used after the workshop?

A workshop typically generates a wealth of material, such as a transcript of the recorded discussion, notes, and completed visual matrices. For many knowledge brokers, using AI to compile summaries will likely be a familiar option, as summarising and classifying large bodies of text are among the most common uses of language models.



When compiling the summary, AI can be used to:

- identify the main themes of the discussion and how frequently they occurred,
- group similar observations together, and
- organise a wide-ranging discussion into a coherent narrative.

With due consideration, AI can also be used to review the summary. The knowledge broker can ask AI to evaluate the final summary using questions such as:

- Are all perspectives represented in a balanced way?
- Does the text include unfounded generalisations or exaggerations?
- Are concepts used consistently?
- Have any essential points raised in the workshop been overlooked?

Most importantly, **AI is a tool, not an agent**. Final responsibility for the content and interpretation of the summary always lies with the knowledge broker. Having been present in the discussion, they understand the context, dynamics and the unspoken meanings that a transcript alone does not reveal. It is also worth remembering that the final validation of the summary should also rest with the researchers who participated in the Science Sparring.



DIVE DEEPER

Responsible use of AI

The use of AI in Science Sparring must be **transparent and well considered**. Material should only be uploaded to platforms where the developer does not use user activity to train the language model.

Workshop discussions should be transcribed in a way that minimises personal identification details. If the discussion is recorded, for example, it is best to start recording only after introductions.

Participants should be informed about the use of AI during the Science Sparring process and before the workshop, so that they have a genuine opportunity to express preferences or decline from participating.

Example of how to explain the use of AI at the start of the workshop:

- The discussion will be recorded, the recordings will be transcribed, and the original recordings will be deleted. The material will be handled solely by the knowledge brokers responsible for the process.
- The transcript will be analysed with the help of AI, and the analysis will support the completion of the final summary.
- During the discussion, we will draw on AI-generated observations about the background material.
- Content generated by AI is always flagged with a designated symbol.

Note! Audio recordings often contain many personal identification details. The organisation facilitating the Science Sparring should establish clear guidelines on who is responsible for data protection for workshop recordings, including their storage, handling, and deletion.

Ultimately, the benefits of AI come down to the quality of the work and the time invested. These two measures need not be weighed against each other and viewing them in parallel often helps illustrate the value of AI tools. How would you value a situation in your work as an expert where an AI tool maintained the quality of your work while reducing the time spent by half? Or a situation where the quality of your work improves significantly but the process takes somewhat longer because of the use of AI?

6 WHAT COMPETENCES ARE REQUIRED FOR ORGANISING A SCIENCE SPARRING?

The skills and competencies needed for organising a Science Sparring are largely similar to those of knowledge brokers in general. However, in this chapter we outline those that we think are especially relevant facilitating the Science Sparring process from start to finish.

We have categorised the skills according to the competence framework that we have tailored to knowledge brokers from our earlier work (see *Researcher's Handbook: Keys to Societal Impact*⁵²). The framework consists of three dimensions: understanding, expertise, and good practices.

Our hope is that this framework will help knowledge brokers interested in Science Sparring identify their own strengths and potential areas for development. At first glance, the list of competencies may seem extensive for a single knowledge broker to hold. Since Science Sparring is typically organised by more than one knowledge broker, the framework can be used to reflect on a team's collective competencies, and to identify what further skills would be useful when organising a Science Sparring.

It is also worth mentioning that these skills and areas of expertise likely evolve alongside the professionalisation of knowledge brokering. For instance, the fluent and strategic use of AI in Science Sparring processes may play a significant role in the future.

52 Kärkkäinen et al. 2024



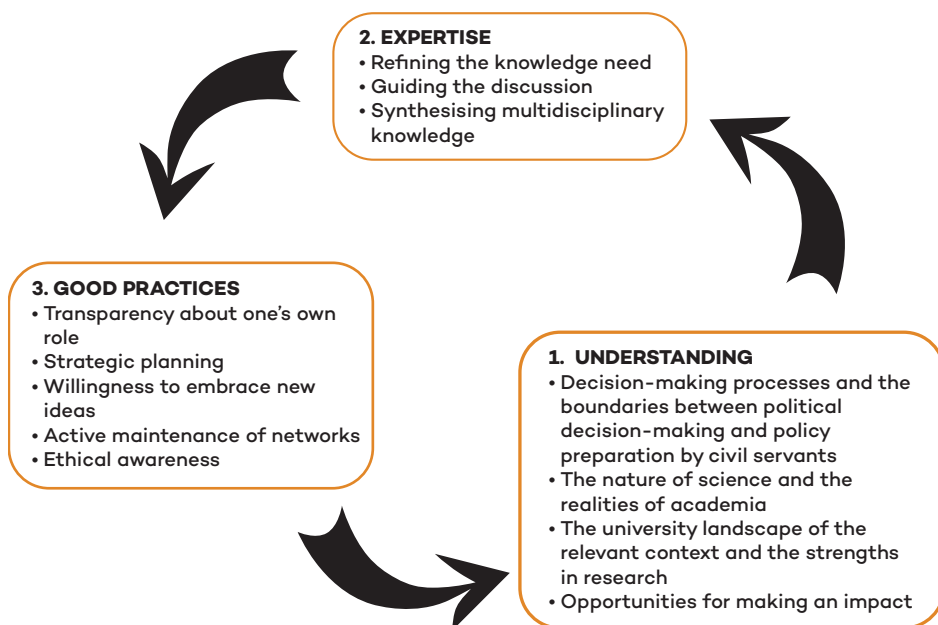


Figure 4. The Competence Framework for a Science Sparring practitioner

6.1. UNDERSTANDING THE REALITIES OF POLICY-MAKING AND ACADEMIC RESEARCH PROVIDES A STRONG FOUNDATION

Policy-making processes and the boundaries between political decision-making and policy preparation by civil servants

The purpose of Science Sparring is to provide policy-makers with relevant knowledge, sometimes at short notice. The knowledge broker facilitating Science Sparrings must understand the context and processes of policy-making and political decision-making and recognise its role in these processes.⁵³ Science Sparring

may, for example, complement the work of an expert working group established to support the policy preparation. In such a case, the knowledge broker should have a basic understanding of the working group's methods of operation, its members, and its role within the broader context of policy preparation.

It is especially important to understand how political decisions are reached and the role regulative drafting plays in that process. In practice, this means that the knowledge broker can identify the correct windows of opportunity for Science Sparring to support policy preparation. Additionally, it is useful to understand how the mandates of different ministries vary.

Needless to say, not everything needs to be known in advance. **It is worth having an**

⁵³ See Nieminen et al. 2019



open discussion with the policy-maker presenting the knowledge need about the role of Science Sparring and its relationship to the ongoing policy preparation.

When refining the knowledge need, the knowledge broker can, for example, ask policy-makers clarifying questions on how the topic has traditionally been approached across different ministries. Often, the answers reveal both formal and informal structures, as well as differences in priorities within the organisations' operations.

It is also important for the knowledge broker to understand **the realities of evidence-informed policy-making**. Even when research-based knowledge and other forms of knowledge are systematically considered in policy-making, evidence does not directly steer policy-makers towards a particular outcome.⁵⁴ Decision-making involves balancing different forms of knowledge, the competing interests of various stakeholder groups, and the political views within the government. Research knowledge is one component of this overall deliberation. Researchers often expect the knowledge broker to communicate these elements that influence decision-making.

Furthermore, not all stages of policy-making are equally open to new evidence. It is therefore important for the knowledge broker to be familiar with government processes and to **identify the stage at which research knowledge can have the greatest possible impact**. Typical windows of opportunity to have impact on policies include government formation negotiations, strategic work within minis-

tries, regulatory drafting, and the preparation of policy positions by political parties. The timescales also differ across these opportunities. For instance, influencing the government programme typically begins at least two years before parliamentary elections, whereas contributing to the knowledge base during regulative drafting can occur within a month of the ministry expressing a knowledge need.

The nature of science and the realities of academia

A skilled knowledge broker understands **how research knowledge is produced and what its strengths and limitations are**.

When negotiating a knowledge need with a policy-maker, the knowledge broker should be prepared to explain the nature of research knowledge to them. This includes being able to describe the basic principles of science. For example, that research knowledge is descriptive in nature and that, therefore, direct prescriptive conclusions cannot be drawn from it (the 'no ought from is' principle).⁵⁵ Policy-makers can thus draw on descriptive evidence in pursuit of value-laden objectives, but it does not directly tell them what should be done.

Furthermore, it may be necessary to explain to policy-makers that research knowledge is context-dependent, and why different findings may appear contradictory. Context-dependence means that research is always conducted under specific conditions and from a particular perspective, and no single study can capture every dimension of a phenomenon. Findings may also seem contradictory simply

54 SOFI 2021; French, 2019

55 Hume 1896 pp. 469–470



because studies employ different methods and examine different time spans and contexts. It may therefore be advisable for the knowledge broker to explain to the policy-maker that, owing to the nature of research-based knowledge, researchers may not always be able to provide unambiguous answers to policy questions. It is equally important to recognise that “more research is needed” does not signal a lack of knowledge but rather describes how science advances through iteration.

Knowledge brokers must be able to distinguish between different forms of knowledge, for example, by classifying them according to their sources or modes of production.⁵⁶ For instance, during a Science Sparring workshop, the knowledge broker guiding the discussions can pose clarifying questions to the researchers about which form of knowledge they are referring to at any given point, such as peer-reviewed research, expert insights or specific data.

Understanding the university landscape and their research profiles

Particularly for scoping researchers, it is beneficial for the knowledge broker to have a **solid understanding of the profiles of different universities and other research institutions, as well as their strengths across academic disciplines and research themes**. A strong grasp of the research landscape makes it easy for the knowledge broker to identify researchers relevant to any given topic and helps clarify what expertise is available on the subject within a given policy context when defining the knowledge need.

Although familiarity with researchers and different research institutions develops through practical experience, active networking accelerates the learning process. Additionally, it is helpful to know other knowledge brokers and support each other in scoping researchers for different opportunities. For instance, a knowledge brokering organisation specialising in a particular topic can often point directly to the leading experts in the field.

6.2. NEGOTIATION AND COLLABORATION SKILLS ARE CORE COMPETENCIES OF THE KNOWLEDGE BROKER

Refining the knowledge need calls for negotiation skills and the confidence to ask seemingly obvious questions.

One of the most important skills of the knowledge broker is the **ability to clarify what kind of knowledge policy-makers actually need**. In most cases, at the outset of a collaboration, the knowledge need has not been defined with sufficient precision. Therefore, the knowledge broker must be able to ask clarifying questions that may seem obvious or even “silly”. However, persistently posing follow-up questions often reveals what the actual knowledge need is and what knowledge policy-makers already have. This information is important for the next phase of scoping and selecting researchers to participate (see Appendix 2. *Tool: Policy-maker: How to refine your knowledge need*, for a more detailed list of questions).

56 Oreschnikoff 2025



A skilled knowledge broker **excels at navigating competing interests**. When agreeing on a collaboration, the knowledge broker should clearly articulate what Science Sparring can realistically achieve and find a framework for cooperation that satisfies all participants. All of this requires the ability to read evolving situations and build trust within a group of people who may not have met before.

Negotiation skills can be useful, for example, when agreeing on the background material that serves as the workshop's boundary object. Policy-makers are often accustomed to working with extensive and highly detailed documents. However, Science Sparring also aims to be a light process for researchers. Background material spanning dozens of pages is therefore not suitable as a boundary object for Science Sparring, and shortening it sometimes requires negotiation.

Guiding the discussion calls for strong listening, emotional, and empathy skills.

Science Sparring forms an interaction space where different perspectives, areas of expertise, and backgrounds come together. The knowledge broker's role in guiding the workshop discussion is central: to create a safe space where all participants can share their views and questions freely. This requires **active listening and the ability to read the group's shifting dynamics**. The knowledge broker guiding the discussions must recognise when someone feels uncertain or dismissed, when the discussion stalls, or when tension begins to build within the group that needs to be addressed collectively.

Empathy, the ability to see a situation from others' perspectives, helps the knowledge broker guide the discussion in ways that serve all participants. The aim is for participants to feel heard and for the discussion to progress towards concrete insights.

Preparing the summary requires the ability to synthesise multidisciplinary knowledge

The knowledge brokers' task is to identify the key themes from the various contributions made during the discussion, and to synthesise them into a coherent summary. The workshop summary must be written in accessible language so that policy-makers can use it later. **Good writing and editing skills** are, therefore, valuable for the knowledge broker.

A well-crafted summary makes the uncertainties and disagreements that emerged during the discussion visible. Policy-makers need to understand where there was consensus amongst the researchers, issues the researchers agreed on and where there were differences amongst the researchers.

6.3. KNOWLEDGE BROKER RECOGNISES THEIR OWN ROLE AND COMMUNICATES IT TRANSPARENTLY

Transparency fosters trust in the process

Knowledge brokers facilitating a Science Sparring exercise various forms of power throughout the process. It is therefore important for them to communicate their role unambiguously. Addi-



tionally, the stages of the process, its objectives, and how participants' contributions will be used in policy preparation must be communicated clearly.

The knowledge broker exercises power, for example, when scoping and selecting researchers to participate in the process. Although the knowledge need guides these choices, unconscious biases and personal networks may also influence the process, for instance, when the number of participants is close to the limit, and the knowledge broker must choose between two equally qualified researchers. It is important to acknowledge this power, to remain aware of it, and to communicate about it honestly.⁵⁷

Additionally, during the workshop and when guiding their discussions, the knowledge broker may need to limit the number or length of contributions. It is good practice to state at the outset of the Science Sparring workshop that the knowledge broker will exercise this authority when necessary, so that it does not come as a surprise to participants.

Knowledge brokers should communicate their role in the process to all participants.

For example, at the beginning of the workshop, or when briefing participants, it is good practice to make clear that the knowledge broker is not a subject-matter expert on the topic being discussed. They serve as a

broker whose core competence lies in connecting researchers and policy-makers.

A commitment to impartiality should be evident in everything the knowledge broker does. Trust between the participants is fostered by a shared understanding that the knowledge broker's aim is to ensure that the best available evidence reaches the policy-making process.

Strategic planning enables smooth collaboration

A successful Science Sparring requires a **strategic approach to process design, defining objectives, and implementation**. This calls for strong project and time management skills. At the outset of the process, it is good practice to draw up a collaboration plan that includes an action plan and timeline, and that is agreed by all parties. In addition, the progress of the Science Sparring process should be monitored and documented, to enable corrective actions where necessary and to ensure that the focus remains on the objectives of collaboration.

A competent knowledge broker is approachable and receptive to new ideas

It is an asset for a knowledge broker to be **easily approachable and receptive to diverse perspectives and questions**. Participants must feel free to ask questions at any point throughout the process without hesitation.

Although shared objectives are agreed at the outset of the process, this does not mean the knowledge broker cannot

57 It is also important to consider how such unconscious biases in participant selection could be minimised. In Science Sparring workshops organised by the Finnish Academy of Science and Letters, we try to minimise these by, for example, asking researchers questions such as "What academic disciplines are often not heard on this topic, although they should be?" Additionally, we ensure that no single knowledge broker makes the decision about the selected participants.



remain open to participants' evolving needs and adapt the process accordingly. An overly rigid process rarely yields the best possible outcome. Approachability is built on both attitude and practical arrangements. An approachable knowledge broker communicates in clear and polished language, responds to enquiries promptly, and takes a genuine interest in the perspectives of all parties involved.

Openness to new ideas also entails systematic learning from one's own practice.

Ideally, knowledge brokers actively reflect on their work by asking themselves: What worked well in this Science Sparring? What would I do differently next time?

It is also worth taking a curious approach to the working methods of other knowledge brokers. What can be learnt from colleagues? What new methods are being developed in the field? Active professional development keeps the knowledge broker's toolkit up to date.

Active maintenance of networks enables effective collaboration

Systematic maintenance of networks is a central part of the knowledge broker's work. Guiding individual workshops or discussions alone is not enough; it is also important to maintain contact with both researchers and policy-makers across the different stages of Science Sparring, and even beyond.

Good networking means, for instance, following up on how issues previously addressed in a Science Sparring have progressed in policy preparation and sharing this information with the researchers involved. Such small gestures strengthen

trust and sustain the collaborative relationship. Networking requires time and proactivity, but the investment pays off. When trust and relationships are already in place, initiating and carrying out new Science Sparring processes is seamless and efficient.

Ethical awareness ensures impartiality

The work of the knowledge broker involves numerous ethical questions that require sensitivity and careful judgement. **The most fundamental of these is impartiality.** All relevant academic disciplines and selected researchers should have the opportunity to be heard, not only those already familiar to the knowledge broker or those whose perspectives may seem agreeable.

In selecting researchers, impartiality means conducting a systematic scoping and applying clear selection criteria.

These criteria also guide the discussion: speaking time should be distributed equitably and with clear justification. Ethical judgment also applies to the handling of sources and evidence. Final summaries produced at the end of the Science Sparring process must be carefully prepared to represent different perspectives expressed in the discussions fairly and to avoid distorting the participants' contributions.

Ultimately, **ethical awareness means continuous reflection on one's own practice.** Am I acting fairly? Am I exercising my role as a knowledge broker responsibly?



DIVE DEEPER

Ethical considerations

As the aim of Science Sparring is to support the use of research-based knowledge in policy-making, it simultaneously influences which voices are heard in policy preparation and what kinds of knowledge are considered. This raises ethical questions that require careful reflection. Below, we list the ethical challenges we have identified, along with some measures to mitigate them.

Challenge | Selection of researchers

Unclear selection criteria may lead to bias, whilst a purely merit-based approach tends to favour established researchers. Furthermore, a small group size (four to eight researchers) makes it difficult to ensure a diversity of voices. It is particularly challenging if the same researchers repeatedly participate in Science Sparring workshops. This narrows the diversity of research perspectives and entrenches certain paradigms.



Solution | Improving the scoping and selection processes

We have developed selection criteria that consider the diversity of disciplines, perspectives, and backgrounds. In the Science Sparring sessions organised by the Finnish Academy of Science and Letters, emphasis is placed on multidisciplinary, and consideration is given to the experts' organisation, career stage, age, and gender.

Challenge | Transparency and openness

The closed nature of Science Sparring creates tensions between openness and confidentiality. Closed discussions foster a confidential atmosphere but reduce transparency and make it more difficult to monitor the process's impact. The challenge lies in finding a balance. Not all parts of the process require confidentiality, but sensitive preparatory documents must be handled with discretion.



Solution | Balancing transparency and confidentiality

Transparency in Science Sparring can be enhanced through public communication about the process. For example, publishing the summary and list of participants is part of this transparent communication about how knowledge brokering has supported policy-making.

Questions for reflection:

- How can we ensure that Science Sparring does not become entrenched in particular research paradigms and marginalise alternative approaches?
- How can the impact of Science Sparring be assessed and measured?

Overall, ethically conducted Science Sparring requires a conscious commitment to plurality of voices, transparency, and democratic values. It is not merely a technical instrument, but part of a broader endeavour to integrate research-based knowledge and expertise into policy-making in a way that serves the goals of both science and democracy.

7 TEN TIPS FOR PLANNING SCIENCE SPARRING

- 1 Do not underestimate your role as a knowledge broker in the process.** Science Sparring requires someone who coordinates the process from refining the knowledge need through to the publication of the summary.
- 2 Be patient when defining the knowledge need – it takes time and asking seemingly obvious questions.** The original knowledge need is rarely precisely defined and clear from the outset. Persistently ask clarifying questions to understand what is needed.
- 3 Recognise when Science Sparring is the right tool.** The method works best when the knowledge need can be articulated, boundary objects are still in draft form, and participants are motivated to engage in critical discussions.



- 4 Invest time in scoping researchers and ensuring that multidisciplinary and diversity of perspectives are achieved.** Consider not only the diversity of disciplines, but also the researchers' affiliations and career stages. Begin identifying researchers four to six weeks before the workshop.
- 5 Keep the preparatory material concise so that it genuinely anchors the discussion.** Well-chosen background material orients the participants and reduces the risk of talking past one another. Negotiate with the policy-makers responsible for the policy preparation to condense extensive materials so that the researchers can absorb them within a reasonable timeframe.
- 6 Build trust through transparency and clear communication.** Explain the stages of the process, the objectives, and your role to all parties. Establish your role as an impartial broker from the very first point of contact.
- 7 Guide discussion by being actively present and with the courage to show your personality.** It pays off to put yourself on the line. Steer the discussion with your own personal style, read group dynamics, and ensure that everyone's voice is heard. Be bold in experimenting with and adapting the method.
- 8 Use AI responsibly as an intelligent thinking partner, not a substitute.** Test using AI at different stages of the process, but remember your responsibility for the content. Be transparent with the participants about how you use AI.
- 9 Prepare the workshop summary carefully, as it can support the long-term impact of the discussions.** Summarise the main messages from the discussion into a coherent whole that is useful for those preparing policies. Always have the researchers validate the summary to ensure its quality and rigour.
- 10 Maintain contact with policy-makers and researchers between and after the Science Sparring process.** Investing in your networks pays off. If possible, track how policy preparation has progressed and seek information from policy-makers on how the Science Sparring influenced the outcome. Share details of this to the researchers who participated, along with possible other ways of engaging with topic on policy preparation.



THEORY

8 WHEN HAS SCIENCE SPARRING SUCCEEDED?

When discussing the wider adoption of any knowledge brokering method, it is important to reflect on its impact. Science Sparring is no exception: its use in policy-making processes must be justified, and its benefits to participants clearly articulated. However, assessing impact is challenging: the direct or indirect influence of research-based knowledge is considerably more difficult to trace than its sources or its formal use.

The impact of Science Sparring has been assessed once. The report, published in 2026, gives a more detailed overview of the method's impact and

effectiveness, and we recommend that those interested familiarise themselves with it. In this chapter, we point out a few key findings from the report.⁵⁸

8.1 PREREQUISITES FOR SUCCESSFUL SCIENCE SPARRING

The report identified key elements of Science Sparring that have contributed to its impact:⁵⁹

Policy relevance: The process is anchored in policy-makers' knowledge needs and in

58 Kärkkäinen 2026

59 See Kärkkäinen 2026



truly understanding what knowledge is needed and what knowledge policy-makers already have. Knowledge brokers facilitate the identification of a precise knowledge need and the articulation of effective questions and formats to respond to those needs.

Impartial facilitation and knowledge brokers' role: Science Sparring is organised by knowledge brokers, who are independent of the participating researchers and the policy-makers active in the policy preparation process. This way, their facilitation provides “a neutral ground” for science-policy interactions.

Multidisciplinary expertise: Researchers participating are selected with an emphasis on multidisciplinarity and diversity of perspectives. This supports policy red teaming of the policy draft from different perspectives and strengthens its robustness.

Equal participation: In the Science Sparring workshop, participants' views are heard systematically, for example, by ensuring each participant has an equal opportunity to contribute. Participating researchers and policy-makers all have valuable expertise to bring to the conversation.

Concise summary: At the end of the process, a written and clearly worded summary is produced. This can support the use of insights gathered in the process in later stages of policy preparation.

In addition to these factors, key individuals within the ministries have played an important role in the wider adoption of Science Sparring.⁶⁰ Satisfied policy-makers share

their experiences with colleagues, and as a result, new Science Sparring requests often arise through word of mouth.

8.2. BENEFITS FOR PARTICIPANTS

Science Sparring is successful when it produces tangible benefits for both researchers and policy-makers: Policy-makers gain a deeper understanding of the phenomena at hand, actionable knowledge, and valuable contacts. Researchers develop their expertise, expand their networks, and contribute to society's development. In the long term, successful Science Sparring strengthens trust between researchers and policy-makers and lays the foundation for ongoing science-policy dialogue. Below, the benefits of previous Science Sparrings conducted by the Finnish Academy of Science and Letters are described in more detail.⁶¹

Benefits for policy-makers

The expertise of researchers has helped **policy-makers grasp the complexity of phenomena, uncover overlooked perspectives and gaps in understanding, and identify flawed assumptions.** Researchers have highlighted, for instance, why certain individual solutions may not necessarily produce the desired outcomes in the context of a broader phenomenon. In several Science Sparring processes, policy-makers have **directly incorporated insights of the process into the policy preparation they have carried out.**

Policy red teaming workshops organised during Science Sparring create direct con-

60 Kärkkäinen 2026

61 See Kärkkäinen 2026



nections between policy-makers and researchers. Policy-makers have noted that these contacts have proved useful later on and have reached out to researchers they met during the Science Sparring. Indeed, they have noted that it is easier to engage with and reach out to researchers they have worked with during previous Science Sparrings.

Benefits for researchers

Researchers are not merely synthesising evidence in Science Sparring; for lasting collaboration to develop, they too must benefit from the process. Those who have participated in Science Sparrings have noted that multidisciplinary discussions have given them fresh insights, while working directly with policy-makers has **enabled them to better understand the policy preparation processes.**

Participating in Science Sparrings has encouraged researchers to articulate why their research matters, and how it relates

to ongoing policy preparation. Over time, some researchers have developed the **confidence, skills and networks to engage with policy-makers in other ways**, for example during public consultations or parliamentary hearings.

Multidisciplinary collaboration has introduced researchers to individuals they would not otherwise encounter in their own work. Some have reportedly drawn on these networks beyond the Science Sparring context, for instance, when seeking fresh perspectives or expert opinions on their own work.

Overall, the report found that researchers have generally been motivated to participate in Science Sparrings, as these have offered an opportunity to influence policy-making in areas where they know there is a genuine need. From this perspective, Science Sparring has been seen as a clear operating model for effectively channelling research knowledge into policy-making.



DIVE DEEPER

How can the impact of Science Sparring be monitored?

Monitoring the impact of Science Sparring is important for the method's development and credibility. Impact and short-term outcomes can be monitored in several ways and over different time periods. The long-term impact of Science Sparring as a knowledge brokering method has been monitored and evaluated once.⁶² On the operational side, there have been efforts to refine the method through continuous iteration and feedback from participants.

Immediate feedback after the Science Sparring

A feedback survey conducted immediately after the policy red teaming workshop provides information on participants' experiences, the quality of interaction, and the practical arrangements of the process. It is an important way to gather participants' anonymous feedback on how well the process met their expectations and whether it was useful for their work.

Feedback discussions with the policy-makers or other knowledge users

A call or meeting with the person who presented the knowledge need shortly after the process helps assess whether the Science Sparring succeeded in addressing its objectives and the original knowledge need.

Long-term monitoring

Impact often becomes visible months or even years later. Following up with the policy-makers who presented the knowledge need, and with the participating researchers, can reveal:

- Whether the knowledge shared in the Science Sparring workshop has influenced policy preparation.
- Whether participants have made use of the contacts established during the process, contributing to a longer-term science-policy engagement.
- Whether Science Sparring has influenced how participants think about the interplay between science and policy.

Tips for planning the monitoring process:

- Establish follow-up methods already when making initial plans for organising a Science Sparring.
- Document the objectives of the Science Sparring clearly so that the impact can be assessed against them.
- Recognise that effects can be both direct (knowledge influencing policy documents) and indirect (changes in thinking or understanding, expanded networks).

9 FURTHER INFORMATION AND MATERIALS

9.1 FOR APPLYING POLICY RED TEAMING

Alhanen, K. (2024). *Dialogikirja*. Into Kustannus.

Hoffman, B. (2017). *Red Teaming: Transform your Business by Thinking Like the Enemy*. Piatkus.

Royal Society (2023). *Red teaming large language models (LLMs) for resilience to scientific disinformation*. The Royal Society. science-x-ai-red-teaming-workshop-note.pdf

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9.2 ON SCIENCE SPARRING

Guyer, L. (2025). *Systematizing science-policy interactions: A description of formats from Switzerland and Finland*, ETH Zürich, [doi.org/https://doi.org/10.3929/ethz-b-000728374](https://doi.org/10.3929/ethz-b-000728374)

Kuosmanen, J. & Kärkkäinen, T. (2023). Science Sparring: An Emerging Science-for Policy Interaction Model for Systemic Policy Issues. Policy Brief, *UN Science, Technology and Innovation Forum*. sdgs.un.org/sites/default/files/2023-05/B77%20-%20Kuosmanen%20-%20Science%20sparring.pdf

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9.3 EXAMPLES OF SCIENCE SPARRING PROCESSES CONDUCTED BY THE FINNISH ACADEMY OF SCIENCE AND LETTERS

Please note: An up-to-date list of Science Sparring sessions can be found at: acadsci.fi/en/science-and-policy/science-sparring/

Measures to improve education learning outcomes, **Ministry of Education and Culture**, 2026

Knowledge base for promoting capital-driven industrial competitiveness, **Finnish Ministry of Economic Affairs and Employment, Finnish Ministry for Foreign Affairs**, 2025

Knowledge base for civil society policy, **Finnish Ministry of Justice**, 2025

The impact of tipping points on emergency supply, **National Emergency Supply Agency, Operation Arktis**, 2025



Requirements set by the sustainability crisis for journalism and science communication, Helsinki Institute of Sustainability Science **HELSUS**, 2025

High-impact climate actions in regional administration, **ELY Centres**, 2025

Knowledge base of physical activity, sports and elite sports, **Finnish Ministry of Education and Culture**, 2025 (acadsci.fi/en/science-and-policy-category/science-sparring-supported-the-evidence-base-for-promoting-physical-activity-sports-and-elite-sports/)

Monitoring and Evaluation Plan for Government R&D funding, **Finnish Prime Minister's Office**, 2024

Systems mapping on demographic change, **Finnish Prime Minister's Office**, DEMOGRAPHY program, 2024

Implementation of the Restoration Regulation, **Finnish Ministry of the Environment, Finnish Ministry of Agriculture and Forestry**, Science Panels, 2024

Anticipation of the Biodiversity Act, **Finnish Ministry of the Environment**, 2023

Ecological connectivity, **Finnish Ministry of the Environment**, 2023

National Climate Adaptation Plan, **Finnish Ministry of Agriculture and Forestry**, 2022

Architectural Policy Program, **Finnish Ministry of Education and Culture, Finnish Ministry of Economic Affairs and Employment, Finnish Ministry of the Environment**, 2021

Roadmap to Fossil-Free Transportation, **Finnish Ministry of Transport and Communications**, 2021

Nature Conservation Act reform, **Finnish Ministry of the Environment**, 2021

Public Sector Strategy, Finnish Ministry of Finance, Association of Finnish Municipalities, 2020

National Transportation Plan, **Finnish Ministry of Transport and Communications**, 2020

Climate Regulatory Impact Assessment, **Finnish Ministry of the Environment, Finnish Ministry of Justice**, 2020



DIVE DEEPER

Explore our articles on the impact of Science Sparring

Policy red teaming with scientists already across two governmental terms, autumn 2025:
acadsci.fi/en/news/policy-red-teaming-with-scientists-already-across-two-governmental-terms/

Science Sparring supported the evidence base for promoting physical activity, sports, and elite sports, spring 2025: acadsci.fi/en/science-and-policy-category/science-sparring-supported-the-evidence-base-for-promoting-physical-activity-sports-and-elite-sports/



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TOOLS

RESEARCHER: HOW TO PREPARE FOR SCIENCE SPARRING

Science Sparring differs from traditional forms of science advice, like participating in expert hearings, which you may be familiar with. Instead of responding to policy-makers' questions, you will work with policy-makers to collectively find ways to improve the policy draft.

1 UNDERSTAND WHAT IS EXPECTED FROM YOU

In Science Sparring, you are part of a multidisciplinary group of experts whose goal is to systematically and proactively **identify risks and opportunities related to a policy draft**. You are expected to bring a constructive but critical approach to reviewing the policy draft.

Science Sparring is always anchored in policy-makers' knowledge needs, meaning that the framing of the process is design to respond to policy-makers' needs. If you identify significant challenges with the framing, discuss them with the knowledge broker before the workshop.

In Science Sparring, participating policy-makers also bring their own expertise to the process. Listen to their challenges and reflect on how your expertise could support addressing them.

2 REVIEW THE POLICY DRAFT AND PREPARE FOR THE DISCUSSION

Review the policy draft or other boundary object using the guiding questions provided to you before the workshop. If no guiding questions have been given, approach the material critically from the perspective of your own discipline: What gaps do you identify? Is anything unfounded from the standpoint of research knowledge?

The boundary object is often a policy draft and is therefore not public. **Treat it confidentially.**

Knowledge brokers may organise a brief orientation call before the workshop. During the call, ask clarifying questions and get to know the knowledge brokers and other participants.

3 PARTICIPATE IN THE WORKSHOP ACTIVELY AND PROVIDE CONSTRUCTIVE CRITIQUE

The knowledge broker's role is to facilitate the discussions during the workshop in a way that ensures that everyone's perspectives are heard. The group of researchers has been selected from a range of disciplines and career stages.

In the workshop, **specify what type of knowledge your contributions are based on**, that is, whether your views draw on peer-reviewed research or expert judgement more broadly.

4 UNDERSTAND WHAT HAPPENS AFTER THE WORKSHOP

A summary of the workshop discussions will be compiled and validated with you and the other participating researchers before it is published. This light validation round (approximately one hour) ensures that no misinterpretations of the discussions have entered the synthesis and made their way into the summary.



POLICYMAKER: HOW TO REFINE YOUR KNOWLEDGE NEED

A well-defined knowledge need ensures that Science Sparring supports your needs and policy preparation as effectively as possible. The following questions may help in defining the knowledge need:

1 ARTICULATE THE POLICY-MAKING CONTEXT

What policy-making context has prompted the knowledge need? What is central to the policy-making process linked to this knowledge need? What political and administrative constraints affect the preparation process?

2 DEFINE THE PREPARATORY DOCUMENT TO BE REVIEWED

What kind of preparatory document is used for Science Sparring? What knowledge has already been utilised? What additional information is expected from the Science Sparring?

3 SPECIFY WHICH OF THE FOLLOWING BEST DESCRIBES YOUR KNOWLEDGE NEED

-  **A need to understand the problem.** Identifying the scope of the problem, the causal relationships involved, and potential intervention points. This means complementing the problem definition by identifying new perspectives and challenging assumptions.
-  **A need to critically examine a policy's evidence base.** Identifying weaknesses in the evidence base, problematic interpretations, and potential new perspectives, and incorporating complementary information sources into the evidence base.
-  **A need for anticipatory evaluation.** Challenging impact mechanisms and underlying assumptions, complementing an impact assessment, and identifying measurement challenges.

4 CONSIDER WHAT KIND OF KNOWLEDGE AND TYPES OF EVIDENCE ARE NEEDED?

Is there a need for peer-reviewed research or expert assessments? Does the need require specific details or a broad systemic understanding of the phenomenon?

Is there a need for an overview of the current situation, an analysis of underlying causes, or an assessment of future developments?

What kind of knowledge about the phenomenon has already been utilised in the preparation? What is the current knowledge base of the preparation, and what complementary perspectives are expected from Science Sparring?

WHAT DOES A GOOD KNOWLEDGE NEED LOOK LIKE?

Science Sparrings' knowledge needs, formulated as objectives:

The objective is to assess the knowledge base underlying the preparation, implementation, and monitoring of a civil society strategy, and to identify potential gaps before formulating a vision for civil society.

*Knowledge base for civil society policy,
Finnish Ministry of Justice, autumn 2025*

The objective is to identify the direct and cascading impacts of tipping points on Finland and their implications for security of supply.

*The impact of tipping points on emergency supply,
National Emergency Supply Agency, Operation Arktsis,
autumn 2025*



5 INDICATE WHICH SCIENTIFIC DISCIPLINES YOU WISH TO HEAR FROM

Do you need understanding from more theoretical or applied sciences? Is your goal to include the widest possible range of perspectives? Are there specific disciplines you would like to be included?

KNOWLEDGE BROKER: HOW TO FIND THE RIGHT EXPERTS

Identifying the right researchers to participate is one of the most labour-intensive parts of organising a Science Sparring. If possible, allocate around two weeks for this process. The following steps and questions help when reaching out to potential participants.

1 PRESENT THE CONTEXT

What type of knowledge and expertise is needed, and who has articulated the knowledge need? What is the aim of Science Sparring? What is the role of knowledge brokers in the process?

2 EXPLAIN WHAT SCIENCE SPARRING IS

For example, tell a researcher that:

"Science Sparring is a knowledge brokering method, in which researchers comment on policy drafts and critically scrutinise them against the best available evidence. Workshop participants are expected to familiarise themselves with the policy draft or other background material beforehand."

TIPS FOR IDENTIFYING THE RESEARCHERS

Start early: Contact researchers at least four to six weeks before the first workshop, if possible.

Familiarise yourself with each researcher's area of expertise: Consider in advance what they could contribute to the process and verify this directly with them.

Be flexible: Offer researchers the opportunity to suggest colleagues who might participate instead, for example, if their schedule is challenging or they feel their expertise does not match the knowledge need.

Describe the process clearly: From the first point of contact, aim to build a relationship of trust with researchers by describing the timeline and workload in detail. Let them know when they will hear from you, and who to contact if questions arise.



3 DESCRIBE THE BOUNDARY OBJECT AND RATIONALE FOR WORKSHOP SUMMARY

What kind of policy draft or background material will be used as a boundary object in the Science Sparring? What kind of summary will be produced after the workshop, why, and where will it be published?

4 GO OVER THE PRACTICAL ARRANGEMENTS

When will the participants receive the background material? When, where, and how will the workshop be held? When are the participating researchers expected to comment on and validate the discussion summary?

How much of a researcher's time does participating usually take?

- Reviewing the background material (approximately two hours)
- Workshop (typically runs for half to one full working day)
- Commenting on the discussion summary (approximately one hour)

5 LISTEN TO THE RESEARCHER

Ask the researcher:

"How does the knowledge need relate to your own expertise? Would this type of work be of interest to you? Which aspect of the knowledge need could you best contribute to? Are there other researchers or disciplines that should be included in the process?"

Participating in a workshop requires a significant time commitment from all participants. To be purpose-driven, it needs careful planning.

1 CLARIFY THE CONTEXT AND OBJECTIVES

What is the aim of Science Sparring? Do policy-makers want a particular aspect of a policy draft addressed? What constraints apply to the workshop (e.g. schedule and venue facilities)?

2 CONSIDER THE PARTICIPANTS' EXPERTISE AND GROUP DYNAMICS

What is each researcher's area of expertise? How might they interact in a group setting? What power dynamics exist among the participants, and how should these be addressed in the workshop?

3 SELECT METHODS FOR GUIDING THE DISCUSSIONS

A need to understand the problem

- Dialogue about the nature of the problem, followed by in-depth exploration of the topic in small groups.
- Possible tool: A visual system map of the problem, which participants complement by identifying knowledge gaps and uncertainties.

A need to critically examine the knowledge base

- In-depth small group discussions that identify assumptions and knowledge gaps in the preparatory work and critically examine them from the perspective of research knowledge.
- Possible tool: WHAT IF analysis, where considering the possibility that the assumptions underlying the preparation work are unfounded.

A need for anticipatory evaluation

- Systematic and dialogic review of the indicators and data sources used in monitoring from the perspective of research knowledge.
- Possible tool: Vulnerability analysis in small groups, identifying those areas in the operating environment where epistemic uncertainties exist.

At the start, allocate time to go over the workshop's objectives and ground rules, and to set the scene. Bear in mind that discussions always take longer than planned.

TIPS IF THE DISCUSSION STALLS

1. Draw on the Science Sparring methodology and illustrate how the discussion progresses

For example, *"We have now built a good understanding of the topic and gained a comprehensive picture of the nature of the problem. Let's now delve a little deeper and turn our attention to knowledge gaps and assumptions."*

2. Revisit the objective of the entire process

For example, *"Good observations. Let us note these down and return to them if time permits. Let's now focus on today's objective, which is X."*

3. Restructure the discussion

For example, *"Let's take a brief moment for individual reflection and have everyone write down their thoughts on paper,"* or *"Let's take a short break to stretch our legs and return to the topic in a moment."*



4 PREPARE FOR ALTERNATIVE DIRECTIONS IN THE DISCUSSION

Do the participants have differing interests or strong preconceptions related to the topic? Are there particularly sensitive topics or questions associated with it?



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