Open-ended scenarios — Participatory and Responsive

Science Education









Index of Contents

Open-ended scenarios – Participatory and Responsive Science Educa	ationp3
The Jury Method for Open Schooling	p 6
The Consensus Method for Open Schooling	p 8
The Co-creation Method for Open Schooling	p 10
Foundation of the Open-ended scenarios	p 12
Deliberative democracy	p 13
Responsible Research and Innovation	p 14
The Sustainable Development Goals	p 15
Applying the foundations to open schooling	p 16
Guiding principles for implementing the open-ended scenarios	p 18

Open-ended scenarios — Participatory and Responsive Science Education

The open-ended scenarios are an experiment adapting participatory methods to open schooling. It is a novel approach stimulating student's interest in science by approaching it from a societal and action-oriented perspective.

Through these methods science is understood in the context of the surrounding society as the focus is on real, locally relevant challenges decided upon by the students or local actors from their community. Students learn to gather and navigate relevant knowledge and apply it to come up with holistic solutions that are well-informed, knowledge-based, and take a point of departure in societal needs and values. A process that has shown to be very motivating for the students.

The open-ended scenarios do hereby not follow the scientific method as the main goal is to involve students in participatory processes aimed at decision making. The students use knowledge obtained with scientific methods when dealing with the local challenge they are working with and in their interaction with scientists. The purpose is to introduce students to participatory methods that will help them assess problems and solutions and take decisions based on scientific evidence together with evidence gathered from experiential knowledge.

The open-ended scenarios are designed to engage different participants throughout the process. Students get to interact with a wide range of relevant

experts, family members, and decision-makers, which is an opportunity for them to learn about the connection between science, local challenges in their community, and decision-making processes.

Through the steps of the open-ended scenarios the students go through a process of finding a local challenge, creating a foundation of knowledge, interacting with experts, and coming up with holistic solutions.

All open-ended scenario methods can be used in both school lessons and extra curriculum activities. As this is a novel approach, the open-ended scenarios are meant to be experimented with by teachers willing to try a different approach as well as to put an effort into engaging the local community in the process.

Each method is structured around the open-ended scenarios framework which is built with a point of departure in the different stages of a participatory process – from finding and formulating a challenge, creating a shared foundation of knowledge, dialogue, to finally come up with suggested action points.



To collaboratively develop

alternative solutions

To contribute to **local**

decision making processes

Three participatory methods have been adapted to open-ended scenarios by the Danish Board of Technology – **Citizen Jury, Consensus Conference, and Co-creation**. They all take a point of departure in many years of experience with developing and implementing participatory processes. The methods are adjusted to an open schooling context with input from CONNECT project partners and the <u>CONNECT User Advisory Board</u> – all of which include professionals with experience within the field of science education and open schooling. These three methods are introduced in the following sections.

The Jury Method for Open Schooling

The Jury Method for Open Schooling is inspired by the participatory method *Citizen Jury*, a method for citizen engagement designed for providing input for decision-making processes.

The purpose of the method is to have citizen critically assess and review different possibilities for actions on a specific challenge and decide on the best solutions. In this method, the focus is on disagreements and choices. The method is thus well suited for challenges with clear options for action that participants can choose between.

The method was chosen as it is well-known and well-tested in different policy contexts on different topics. It moreover engages a small group of participants which made it translatable to a school context.

When going through the Jury Method for Open Schooling, students go through a similar process as the citizen in the *Citizen Jury* – they consult experts, deliberate, as well as formulate and prioritise recommendations for action. A process for deciding on a challenge to work with and research of the topic has moreover been added at the beginning of the process to engage the students as early as possible.

The Jury Method for Open Schooling was the very first open-ended scenario and was developed as a pilot for testing the concept.

[/] Learn more about the Jury Method for Open Schooling <u>here</u>.

[/] Find the available materials in the **CONNECT Platform**.

[/] Materials are also available in Portuguese.

TOPICS	The Jury Method is useful for local or regional challenges in various topics. As in the Citizen Jury, it is recommended to work with a challenge that affects the students directly as well as a challenge that has specific action points to choose between.	
LEARNING OBJECTIVES	1/ Understanding of local challenges 2/ Understanding of how to address challenges they find interesting 3/ Research 4/ Stakeholder mapping 5/ Understanding conflicts of interests 6/ Communication skills 7/ Formulating and writing policy recommendations, 8/ Understanding policy levels.	
OUTCOME	Open letter with prioritised policy recommendations.	
ESTIMATED TIME	24 teaching hours.	
AVAILABLE MATERIALS	Teacher's guide, student sheets.	
THE JURY METHOD IS WELL SUITED FOR	Policy Formulation Dialogue Consulting Empowering.	

STEP	ACTION	PARTICIPANTS
FRAMING	Discuss and decide on local challenge	Students, families
QUESTIONS	Formulate questions	Students
KNOWLEDGE AND OPINIONS	Desk-top research	Students, experts
DELIBERATION	Dialogue with experts Students	Students, families, experts
RECOMMENDATIONS	Formulate and prioritise recommendations	Students
DISSEMINATION	Send open letter with recommendations	Students, policy-makers, media, experts

BEST PRACTISES

The Consensus Method for Open Schooling

The Consensus Method for Open Schooling is inspired by the participatory method *Consensus Conference*, also a method for citizen engagement designed for providing input for decision–making processes.

The purpose in this method is, as in the Jury Method, to put the citizens into focus with their critical assessment of different perspectives on the specific issue. The method is however more focused on navigating broader issues and reaching negotiated consensus for possible actions. The Consensus Method for Open Schooling is thus well suited for complex challenges with a broader spectrum of variable options for action.

The method was chosen as it is also a well-known and well-tested method in different policy contexts on different topics. It also targets a small group of participants making it translatable to a school context. It was moreover chosen as the focus on broader and often more controversial challenges gives students the opportunity to navigate conflict of interests and reach agreements through dialogue and compromises.

When going through the Consensus Method for Open Schooling the students follow the same process that citizens experience in the *Consensus Conference* – they decide on a challenge they find relevant, research the challenge at hand, consult experts, discuss, and agree upon a set of recommendations for actions.

The Consensus Method for Open Schooling was designed taking into account the experience and feedback gathered after the implementation of the Jury Method for Open Schooling as well as the input provided by CONNECT project partners and the CONNECT User Advisory Board, all experienced with open schooling.

[/] Learn more about the Consensus Method for Open Schooling here.

[/] Find the available materials in the **CONNECT Platform**.

[/] Materials are also available in Portuguese.

TOPICS	Often used for controversial, conflict-ridden, and complex issues, often broad challenges that can be narrowed in by the participants. The method can be used for local, regional, or national challenges.
LEARNING OBJECTIVES	1/ analysing everyday problems 2/ research 3/ agenda setting 4/ stakeholder mapping 5/ collaborating 6/ communicating 7/ tructuring knowledge-based arguments 8/ navigating conflicts of interests 9/ drawing conclusions 11/ peer-reviewing.
OUTCOME	List of well-informed, knowledge-based, and negotiated recommendations that are agreed upon by the students.
ESTIMATED TIME	15-27 teaching hours.
AVAILABLE MATERIALS	Teacher's guide, student sheets, family information sheets, expert information, presentation on process.
THE CONSENSUS METHOD IS WELL SUITED FOR	Policy formulation Programme development Research activity Dialogue Consultation Involving Collaborating Empowering.

STEP	ACTION	PARTICIPANTS
FRAMING	Discuss, research, and decide on local challenge	Students, families, experts
QUESTIONS	Formulate questions	Students, experts
KNOWLEDGE AND OPINIONS	Expert panel	Students, families
DELIBERATION	Dialogue	Students
RECOMMENDATIONS	Formulate and prioritise recommendations	Students, families, (experts)
DISSEMINATION	Send open letter with recommendations	Students, policy- makers, media, experts

BEST PRACTISES

- / Climate change and pollution (Greece)
- / <u>Creating and using maps for problem-solving (Greece)</u>
- / Global warming and chemical pollution (Greece)
- / The historical context of epidemics and pandemics (Brazil)
- / Language in the journalistic-media field and newspaper literature (Brazil)
- / Obelisk of COVID-19 (Brazil)
- / Organic functions of alcohol in times of pandemic (Brazil)
- / Memes and cartoons: Brazilian way in the COVID-19 pandemic (Brazil)
- / Renewable energy sources (Greece)
- / Resignifying the spaces of architecture and urbanism in times of COVID-19 (Brazil)
- / <u>Vaccines-reinforcement of the body's immunity (Brazil)</u>

The Co-creation Method for Open Schooling

The Co-creation Method for open schooling is inspired by different co-creation approaches. Co-creation is, unlike the *Citizen Jury* and the *Consensus Conference*, not a specific method but an approach which includes many different methods for multi-stakeholder engagement in innovative spaces.

The purpose is to bring different societal actors together to innovate and generate concrete socially responsible and desirable solutions for a specific challenge. The Co-Creation method for Open Schooling thus differs from the Jury Method for Open Schooling and the Consensus Method for Open Schooling as it is not a process where citizens critically assess certain information to decide on recommendations for actions but rather a process of citizens taking part in innovation processes along with other societal actors. The Co-creation Method for Open Schooling is thus well suited for problem solving and challenges where new solutions needs to be generated.

The method can be used in many different contexts and not necessarily only in a policy context. The initiator as well as the recipient of the proposed solutions – the final result, can also vary depending on the topic.

The co-creation approach was chosen as it is a well-used approach that is applicable in many different contexts, like in research and innovation processes, providing a different approach to innovation. It was moreover chosen as it offers a quite different approach than the *Citizen Jury* and *Consensus Conference*, offering the students a different form of interaction with stakeholders where collaboration rather than consultations is in focus.

A workshop with stakeholders is at the core of the Co-creation Method for Open Schooling. Here the students collaborate with different stakeholders on generating and refining ideas for possible solutions. In the process leading up to workshop the students take part in the planning and preparations. Unlike the two other methods the students are in this method engaged in suggesting challenges, but the final framing of the challenge and questions is done by the teacher in collaboration with a local decision-maker. This is to engage a relevant decision-maker early in the process as well as to ensure the relevance of the proposed solutions.

The Consensus Method for Open Schooling was also designed taking into account the experience and feedback gathered after the implementation of the Jury Method for Open Schooling and the Consensus Method for Open Schooling as well as the input provided by CONNECT project partners and the CONNECT User Advisory Board, all experienced with open schooling.

TOPICS	Challenge-based problems that require innovation of new and concrete solutions.
LEARNING OBJECTIVES	1/ Understanding scientific issues in the context of society 2/ understanding different forms of knowledge 3/ understanding conflict of interests and how to approach an issue from different perspectives 4/ research 5/ interdisciplinary cooperation 6/ drawing well-informed conclusions 7/ facilitation 8/ communicating well-informed and knowledge-based results.
OUTCOME	Set of proposed solutions developed through cooperation anddialogue.
ESTIMATED TIME	6 hrs. and 50 min. – 11 hrs. and 55 min. depending on how the processes is planned.
AVAILABLE MATERIALS	Teacher's guide, student sheets, family information sheets, invitation for decision-makers, invitation for stakeholders, presentation on process.
THE CO-CREATION METHOD IS WELL SUITED FOR	Research activity Innovation, Policy formulation InvolvingCollaborating.

STEP	ACTION	PARTICIPANTS
FRAMING	Discuss, research, and decide on local challenge	Students, families, experts
QUESTIONS	Formulate questions	Students, experts
KNOWLEDGE AND OPINIONS	Expert panel	Students, families
DELIBERATION	Dialogue	Students
RECOMMENDATIONS	Formulate and prioritise recommendations	Students, families, (experts)
DISSEMINATION	Send open letter with recommendations	Students, policy-makers, media, experts

[/] More information on the Co-creation Method for Open Schooling will be available <u>here</u> from October 2022.

[/] All materials will be available in the ${\color{red} {\tt CONNECT~Platform}}$ from October 2022.

Foundation of the Open-ended scenarios

Besides the participatory methods adapted for the open-ended scenarios, they are also inspired by conceptual frameworks of Deliberative Democracy, Responsible Research and Innovation (RRI) as well as by many years of experience with developing and applying participatory methods in different contexts.

The following sections provide an overview of the elements from Deliberative Democracy and RRI that have inspired the open-ended scenarios. Both can be elaborated to a much greater extent, but in the following sections elements that are important in the context of understanding the open-ended scenarios are highlighted. Afterwards a short overview of the link to the Sustainable Development Goals is offered.



Deliberative democracy

Deliberative democracy is a tradition of participatory approaches aiming at putting deliberation and dialogue at the centre of decision-making processes. The purpose is to create sustainable and common solutions on a well-informed and democratic foundation. By engaging citizens and allowing them to influence decision-making processes varied knowledge and viewpoints come into play resulting in legitimate and long-term results (The Danish Board of Technology).

Different participatory methods have been developed to reach such results, each developed to accommodate different types of challenges, stages of the decision-making process and desired outcomes. Common to these methods are that they build on different criteria needed to create a legitimate deliberative process. The group of participants should for instance be sociodemographic representative in terms of gender, age, level of education and ethnicity. The aim of mirroring the surrounding society in the participant group is to ensure that all perspectives, including otherwise underrepresented groups, are included (The Danish Board of Technology, OECD).

This also means acknowledging different forms of knowledge and their importance for decision-making process. The citizens contribute with their own knowledge and experiences from society, which is valid and important for the process in itself. The deliberative process should moreover include a process of creating a shared foundation of knowledge on the challenge in focus, from which the citizens can discuss and come up with recommendations for the challenge. Here it is important that they are introduced to different perspectives and conflicting opinions from different disciplines and sectors, to create a wholesomeunderstanding of the challenge. Citizens should also be able to influence which experts they will hear from in the process (The Danish Board of Technology, OECD).

It is important that deliberative processes make room for well-structured dialogue between participants, both for absorbing and understanding the newly acquired knowledge on the challenge, for discussing how to interpret this knowledge, as well as for putting it into action and coming up with solutions that consider different interests and needs. This also means that it should be a facilitated process ensuring that all participants get to share their opinion and have an equal influence on the final outcome (The Danish Board of Technology, OECD).

A deliberative process is moreover an action-oriented process. The overall purpose is to provide input for decision-making processes. Relevant decision-makers will ideally use the input provided to act upon the challenge at hand at the end of the process. A clear purpose as well as a clear idea of th desired outcome from the beginning of the process is important to move towards actual impact and action at the end of the process. This includes a clear understanding of the political uptake and commitment to the outcome. A clear political mandate and understanding of how the outcome will be used at the end of the process is also important to motivate the participants (The Danish Board of Technology, OECD).

Responsible Research and Innovation

The open-ended scenarios moreover emerge out of the tradition of Responsible Research and Innovation (RRI), a concept derived from European policy on research and innovation. RRI includes six agendas: gender, ethics, governance, open access, science education and public engagement. The public engagement agenda has particularly influenced and inspired the development of the open-ended Scenarios.

The concept of RRI sets out to broaden the perspectives in research and innovation (R&I) and create a stronger connection to the surrounding society, by integrating more interdisciplinary approaches as well as by being more aware of social, environmental, and economic factors when dealing with specific challenges. RRI hereby builds on the idea that by engaging with different societal actors in R&I activities, the broader effect and social consequences of these activities and their results will be taken into consideration to a much greater extent (von Schomberg 2011). Engaging with the surrounding society will hereby also create more legitimate R&I that is in line with what society desires and can accept (von Schomberg 2011). The aim is moreover to create mutual responsiveness where R&I leads to results that are socially desirable while the surrounding society becomes more capable of taking part in and share the responsibility of R&I activities and how the results are used (von Schomberg 2011). The purpose of RRI is moreover to make a closer connection between R&I and policy processes, creating strong and well-informed decision-making processes that take a point of departure in scientific knowledge and thorough analyses (von Schomberg 2011).

The Sustainable Development Goals

The open-ended scenarios are not directly built on the Sustainable Development Goals but can be seen as closely linked to particularly goal 16 Peace, Justice and Strong Institutions as well as goal 17 Partnerships for the Goals. Subgoal 16.6 sets out to create "transparent institutions at all levels" and subgoal 16.7 sets out to "ensure responsive, inclusive, participatory and representative decision-making at all levels" (SDGS 16).

Subgoal 17.16 sets out to create strong "multi-stakeholder partnerships that mobilize and share knowledge, expertise, technology and financial resources" and subgoal 17.17 to "encourage and promote effective public, public-private and civil society partnerships" (SDGS 17).

The very purpose of these participatory processes is to create responsive, participatory, and representative decision-making processes, also as a mean to create more transparent institutions.

The focus on public engagement in RRI also sets out to create more responsive R&I that builds on multi-stakeholder partnerships, creating a closer collaboration between sectors, responsive solutions, and more transparent R&I institutions.

The open-ended scenarios hereby teach the students about responsive, inclusive, participatory, and representative processes as they learn to navigate and include different forms of knowledge, understand scientific knowledge in the context of the surrounding society, as well as using it for creating solutions that are socially desirable. The students learn to understand the connection between science, local challenges, and decision-making processes, creating an understanding of transparent institutions and the added values of collaboration across sectors.

Besides goal 16 and 17, the open-ended scenarios can also be linked to other goals depending on the topic chosen by the students.



Applying the foundations to open schooling

The purpose of the open-ended scenarios is to combine the elements of deliberative democracy and RRI with open schooling through participatory processes. The aim of this novel approach is to create new ways of approaching science education by engaging all types of students but particularly those who are not typically intrigued by more traditional science education.

The aim behind the open-ended scenarios is that by putting societal challenges that the students find interesting and relevant at the centre of their science education will motivate and engage their interest in science. By working with relevant and current societal challenges, understanding these challenges through the lens of science, and applying it to come up with responsive and holistic solutions will hereby intrigue their interest in science and the possibilities found herein. Science is thus understood and used in the context of what the students find motivating and interesting in their own society. An important element of the open-ended scenarios is therefore to engage the students in the first step of the process – in coming up with a local challenge to work with to ensure this element of working with challenges that motivates the students' engagement.

This also includes turning the approach to knowledge on its head. Instead of learning different skills they can later apply on societal challenges, the students learn to gather relevant knowledge and apply it in the context of the specific challenge they are working with. They moreover learn to collect knowledge from different perspectives and use it to create responsive solutions. By doing so the students move from education to participation, providing the students with an understanding of the connection between what the students learn in school (science), their local community (challenges and local knowledge) and local decision–making processes. Hereby understanding how both science and decision–making can be responsive to the surrounding society, its challenges, and priorities, through participation.

Adaptation of methods

The open-ended scenarios are an adaptation of the participatory processes and the underlying elements of deliberative democracy and RRI. Hereby meaning that the elements hereof has been adjusted to create the best educational process possible. The open-ended scenarios are developed with a point of departure in participatory methods and has been developed as close to the methods as possible, but some compromises have been made to fit the open schooling context. The composition of students will for instance in some schools be representative of the surrounding society with students from families with diverse backgrounds in terms of educational background and ethnicity. Whereas in other contexts the composition of students might be not be as diverse, compromising the element of representation.

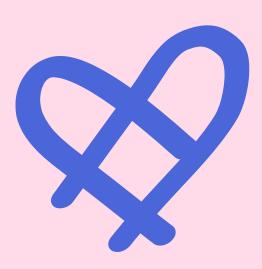
The open-ended scenarios have hereby been developed with an awareness of finding a balance between staying close to the participatory methods adapted while adjusting to the open schooling context, making a process that is educational and implementable in this context. This also means, particularly as it is a novel model and an experiment, that it is also up to the individual teacher to create a process that is implementable in their specific educational context.

Based on these elements described above as well as on the experiences from the implementation of the open-ended scenarios four guiding principles has been developed to support the further use and implementation of the open-ended scenarios helping the teachers the navigate and adjust the process.

Guiding principles for implementing the open-ended scenarios

Four guiding principles has been developed with the purpose of guiding the open-ended scenario implementation by elaborating the foundation of the processes, creating a better understanding and knowledge of the purpose, aim and goal of the open-ended scenarios. As the open-ended scenarios are an experiment and a novel approach they are also meant to be experimented with. There are thus no minimum requirements when going through an open-ended scenario method, but there is a purpose behind the approach which should be aimed at when implementing the methods. The following four guiding principles are the fundament of the method and can be used as a guiding tool for adjusting the process, if necessary.

As the open-ended scenarios themselves, the guiding principles take a point of departure in the participatory methods adapted for the open-ended scenarios as well as in Deliberative Democracy and Responsible Research and Innovation. They can moreover be seen as related to the Sustainable Development Goals. All four principles should be seen as interlinked.



KNOWLEDGE

The process and its outcome should take a point of departure in a shared, well-informed, and knowledge-based foundation, which includes different forms of knowledge, perspectives, and opinions. This also means letting the societal challenge at hand determined the knowledge gathered and not the other way around.

This means:

- / Including knowledge from different scientific disciplines.
- / Including opposing and conflicting perspectives.
- / Acknowledging different forms of knowledge, hereby including knowledge from outside academia experts are not only found at the universities.
- / Using the societal challenge at hand to guide the different forms of knowledge and perspectives included in the process.
- / Being open-minded and willing to explore new paths that might occur when exploring the societal challenge.
- / Time for understanding, absorbing, and discussing collected information.

DIVERSITY

It is important to include a diverse group of participants in the process, who will apply the knowledge gathered to create solutions that are responsive to the surrounding society and takes a point of departure in different societal interests.

To create a democratic and representative process it is important that all participants have an equal influence on the process and its outcome. Students and family members can be representative for the local community.

This means:

- / Reflecting upon gender, ethnicity, as well as educational background (of parents) and how it can influence the process.
- / Making sure that everyone gets an equal say in the process and its outcome, despite the above.
- / If possible, put together groups that are diverse in terms of the above.

ACTION

The process should lead to action on the societal challenge at hand. The purpose of the process is to create proposed solutions that can be used by relevant decision-makers to act upon the challenge at hand. The process is thus also a matter of applying the knowledge gathered to not only learn about the challenge but to use it to come up with actual solutions.

This means:

- / Making sure the purpose is clear.
- / Making sure that the results are action-oriented with recommendations for actions or proposed solutions.
- / Engaging local decision makers early in the process can help ensure the political commitment.
- / Engaging the local media can help create awareness and enhance a pressure for action on the issue.

CONNECTION

The process is all about understanding connections by moving from education to participation. The aim is to teach students about the connections between challenges faced in their local community, what they learn in school (science), and decision-making processes. Hereby teaching the students to understand problems from a holistic perspective and understand science in the context of society and policy. The purpose is to motivate students who are not typically motivated by more traditional forms of science education, but also to create a fundament for approaching science responsibly for our future scientists.

This means:

- / Making sure that the process takes a point of departure in knowledge, diversity, and action.
- / Making sure that the challenge decided upon is locally anchored and relevant for the students.



Students & scientists solving real-problems

The Danish Board of Technology (2020). Borgerinddragelse. Available here: https://tekno.dk/method/borgerinddragelse/ (23 Aug. 2022).

OECD (2020). Good Practice Principles for Deliberative Processes for Public Decision Making. Available here: https://www.oecd.org/gov/open-government/good-practice-principles-for-deliberative-processes-for-public-decision-making.pdf (23 Aug. 2022).

von Schomberg, R. 2011. Prospects for Technology Assessment in a framework of Responsible Research and Innovation. In: Dusseldorp, M., Beecroft, R. (Eds.). Technikfolgen Abschätzen Lehren: Bildungspotenziale Transdisziplinärer Metoden. Vs Verlag, Wiesbaden.

SDGs 16 (2017). Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels. Available here: https://sdgs.un.org/goals/goals6 (2 Aug. 2022).



www.exus.co.uk

EXUS



OU Uk www.open.ac.uk



DBT Denmark www.tekno.dk





IRSICAIXA Spain www.irsicaixa.es/en/ livinglabhealth



MSc Uk www.shop.masteryscience.com



VUT Romania www.valahia.ro







UNEB Brazil www.portal.uneb.br





PUCPR Brazil www.pucpr.br



RDE Greece www.pdekritis.gr

