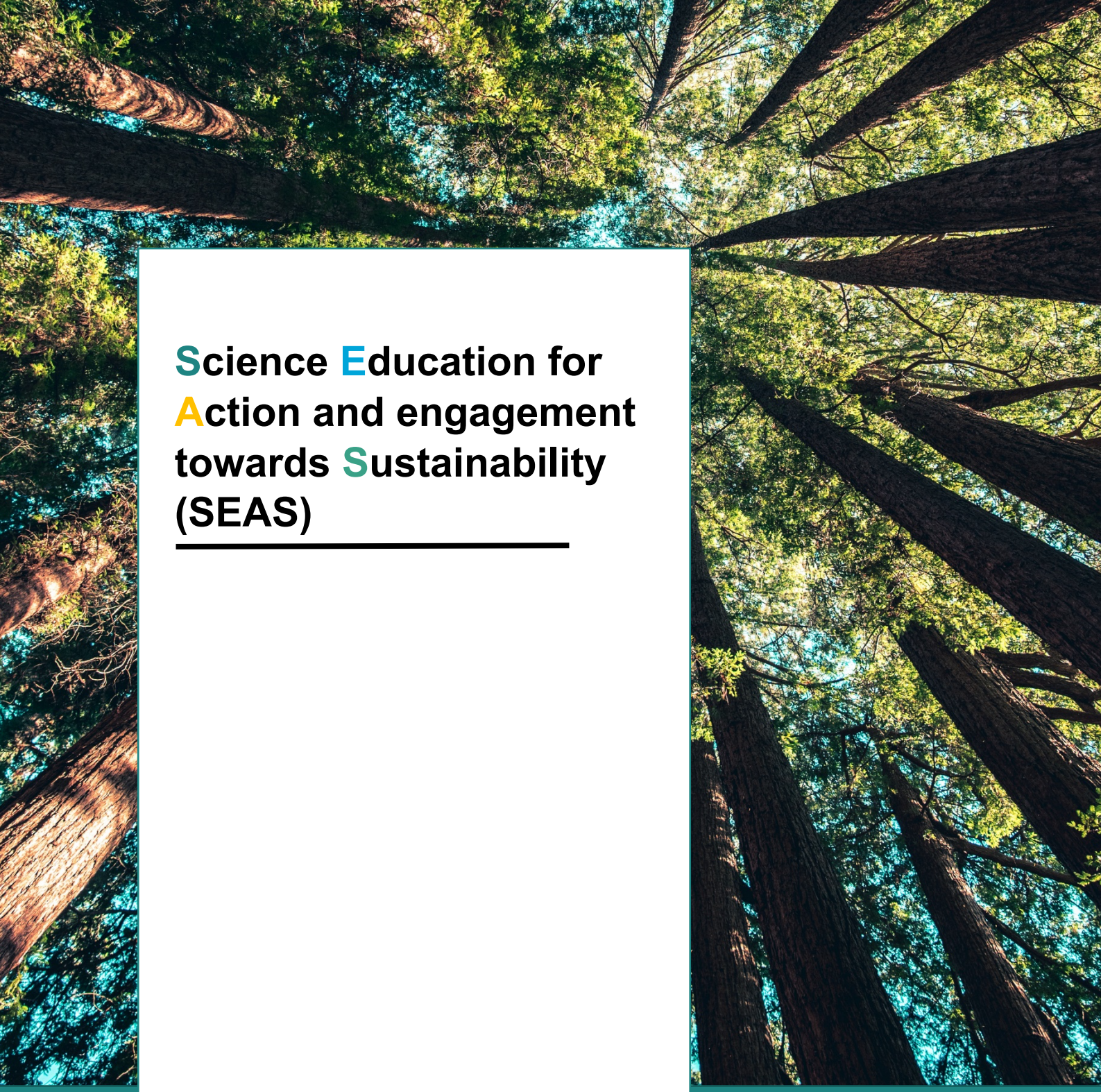


Science Education for Action and engagement towards Sustainability (SEAS)

D4.2.

Updated guideline manual describing the use of each of the SEAS digital tools

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1 Summary

This deliverable documents the three tools to be provided during the two iterations of the SEAS project. Those three tools are LORET, cCHALLENGE, and SenseMaker.

LORET is a didactical tool that represents a methodology for co-creating locally relevant themes and curricula for open-schooling. LORET allows for providing shared reference points for pathways of emerging learning trajectories. Further, as working with LORET involves dialogue and includes stakeholders outside of the school in the process of curriculum development, it is also a tool that facilitates and expands collaboration with partners outside of the school.

cCHALLENGE is an experiential learning tool that facilitates and supports insights and reflections on solutions to environmental problems through a 30-day commitment to one sustainability-related experiment with change. cCHALLENGE can be used to engage teachers, students, families, and communities in individual and collective learning about sustainability issues. By encouraging perspective-taking, it aims to generate learning and activate a greater sense of agency in dealing with complex environmental issues.

SenseMaker is a digital tool that captures stories, or narratives, from groups of people. As an analytical tool it helps respondents to interpret their own stories with the help of a series of a priori defined indicators. In order to assist interpretation of multiple stories, it provides visualisations as a means to indicate complex patterns and trends. At the same time, it offers researchers the opportunity to explore each and every story underpinning the generated macro picture. In the SEAS project, SenseMaker has also been applied as a tool for mining emergent practices by students, and for teachers to reflect on multiple perspectives and conflicts of interest.

2 Document history, future and authorship

This document has been prepared by the leader of WP4 Stefan Bengtsson, Uppsala University based on texts provided by Leif Östman (EduQuality), Katrien Van Poeck (Ghent University), Leonie Goodwin (cCHANGE), Linda Sygna (cCHANGE), Heidi Arctander (cCHANGE), and Karen O´Brien (University of Oslo). Section 2 on LORET was authored by Leif Östman and Katrien Van Poeck. Section 3 on cCHALLENGE was authored by Leonie Goodwin, Linda Sygna, Heidi Arctander, and Karen O´Brien. And Section 4 on SenseMaker was authored by Leonie Goodwin (cCHANGE), Stefan Bengtsson (Uppsala University), and Erik Knain (University of Oslo).

A first draft of the first version of this document (D.4.1) was circulated to the project management team on the 1st of November 2019 for input, and to Alfredo Jornet, as leader of WP2 and WP3, for comments and feedback. Based on that input, Stefan Bengtsson, Leonie Goodwin, Karen O´Brien,

Leif Östman, and Katrien Van Poeck prepared a second version of deliverable D4.1. Leonie Goodwin worked on the first draft, including changes based on comments from Erik Knain, provided as documentation for the Tallinn workshop on the 22nd of November 2019. This deliverable was sent to the internal quality control team for vetting on 9th of December.

As with regards to this second version of the document (D.4.2) the revision process started during the first and second iteration of the implementation. Tool developers EduQuality (Leif Östman and Katrien Van Poeck (UGent)) and cCHANGE (Leonie Goodwin, Linda Sygna) engaged in continuous revisions and local adaptations of their tools. A comprehensive reflection and documentation on the use and revision of the tools in the first and second iteration of the project was started in August 2021, including dialogues between local networks and tool developers, as well as work package leaders (Stefan Bengtsson, Katrien Van Poeck, and Alfredo Jornet) and the project management team (Erik Knain and Alfredo Jornet). Synthesis into a shared updated documentation and guidelines for the use of the individual tools was initiated in October 2021 and continued until the end of December 2021. A synthesis of the tool specific revisions was integrated into a first draft of D.4.2 in January 2022. Tool developers, the work package leader, and the project management team engaged in dialogue and revisions of the first draft during the latter half of January 2022, before the official submission of the first draft at the end of January 2022 to project management for the quality assurance review.

3 Introduction

A main objective for the project Science Education for Action and Engagement towards Sustainability (SEAS) is to develop models for open-schooling implementation that will support schools and out-of-school institutions to collaborate in the promotion of scientific literacy and skills for responsible citizenship among students and citizens in the larger community. SEAS will achieve these ends by establishing, coordinating, and evaluating collaboration among six open schooling networks led by universities and science centres with partners in Austria, Belgium, Estonia, Italy, Norway, and Sweden. The open schooling networks consist of partners across formal, non-formal, and informal science education, and includes, in addition to researchers and out-of-school centres, local schools, civil society organizations (CSOs), and small and medium-sized enterprises (SMEs). As part of these networks and drawing on principles of inquiry-based science learning for transformative engagement, students in formal schools are given the opportunity to engage in addressing real-life, complex sustainability challenges that are identified and dealt with together with participants and stakeholders in the local community. To enable participation, the development of scientific literacies and skills for responsible citizenship, and to foster interest in scientific careers, SEAS develops, explores - and adjusts according to local needs - a set of concepts, digital tools, and methods for enabling and assessing open-schooling science learning collaborations across formal, non-formal, and informal settings.

This deliverable (D.4.2) and its previous version (D.4.1) both labelled "Updated guideline manual describing the use of each of the SEAS digital tools" (D4.1) are to document in written form the tools to be utilized in the SEAS project. Its previous version (D.4.1) includes a brief description of two of the initial tools provided by and to be experimented with in SEAS, their purpose, as well as a more in-depth description of how they can be used. More specifically, the document (D.4.1) included as well as this document (D.4.2) the most recent updated manuals for the LORET tool as well as the cCHALLENGE tool. As both these tools involve specific methodologies and are made accessible through different digital platforms and channels, the documented ways of using them also include recommendations for facilitators, as well as the different steps to be taken as part of carrying out the methods. While these methodologies specify ways in which the tools were originally designed to be used, how these tools are taken up and implemented in SEAS must be integrated to function within the project and to serve SEAS' overall principles, needs, and purposes. This process of integration and adaptation during the first iteration of the project is documented in this updated version of this deliverable "Updated guideline manual describing the use of each of the SEAS digital tools" (D4.2). The theories and technical concepts crucial to LORET and cCHALLENGE are accounted for in the deliverable "A document with the shared pool of SEAS' analytical concepts and methods" (D2.2) that documents a shared pool of SEAS' analytical concepts, where these tool-specific concepts and theories, are related to the key concepts and ambitions of SEAS. Further, the actual utilization of and experimentation with the tools during the first iteration of the project was aligned with the plans, principles, and milestones documented in the deliverable "A plan and milestones concerning challenge implementation for each local network" (D2.1) feeding into the revised documentation in this deliverable. The tools here are seen as a means for conducting and structuring inquiry processes in *ChangeLab workshops* as they were described in deliverable "A guideline document for implementing and following up ChangeLab Workshops" (D2.4).

Initially SEAS aimed at introducing three initial tools: cCHALLENGE, LORET, and SenseMaker. However, the previous deliverable, documenting the tools utilized in the first iteration of the project (D.4.1), focused only cCHALLENGE and LORET. SenseMaker, a tool that allows for the analysis of emerging narratives and emerging patterns in learning, was incorporated in the second iteration of the project. Accordingly, its documentation is provided in this updated version of this deliverable (D4.2). The utilization of SenseMaker in SEAS is aimed to allow for a deepened understanding of the evolving of local networks including which types of tools and how these tools, in general, can be conceived and used to support open schooling initiatives and innovations.

When it comes to meeting SEAS' objective of supporting open schooling initiatives and innovation, the tools described here are differentiated by three distinct needs. First, there is a need for tools that can *account for emerging learning trajectories and changes in existing learning trajectories*. Second, there is a need for tools that *facilitate the management of schoolwork for the innovation of open schooling*. Third, there is a need for tools that *facilitate and expand the collaboration across partners inside and outside the school.*

The function of these three key tools (LORET, cCHALLENGE and SenseMaker) is to *facilitate collaboration across partners inside and outside of the school* and the *management of learning trajectories* across contexts within and among schools. They are designed to support the development of scientific literacy, teaching, engagement, and empowerment of open schooling initiatives addressing sustainability challenges.

LORET in particular, is a didactical tool that represents a methodology for co-creating locally relevant themes and curricula for pen-schooling. LORET allows for providing shared reference points for pathways of emerging learning trajectories. Further, as working with LORET involves dialogue and includes stakeholders outside of the school in the process of curriculum development, it is also a tool that facilitates and expands collaboration with partners outside of the school. In addition, the developers of LORET will also provide Acedu, an online database for documenting lesson plans and other educative materials as developed in and generated through SEAS. The database, which can collect LORET lesson plans but also other outputs of SEAS, was to be developed by the developers of LORET during the second iteration of the project. The development of the online database will have to adapt and be based on the actual outputs of SEAS. The development of a database is to assist and offer ways to innovate school management in the context of open schooling.

cCHALLENGE is an experiential learning tool that facilitates and supports insights and reflections on solutions to environmental problems through a 30-day commitment to one sustainability-related experiment with change. cCHALLENGE can be used to engage teachers, students, families, and communities in individual and collective learning about sustainability issues. By encouraging perspective-taking, it aims to generate learning and activate a greater sense of agency in dealing with complex environmental issues. cCHALLENGE generates a wide range of stories about change that vary over the 30-day experiment.

SenseMaker is a digital tool that captures stories, or narratives, from groups of people. As an analytical tool it helps respondents to interpret their own stories with the help of a series of a priori defined indicators. In order to assist interpretation of multiple stories, it provides visualisations as a means to indicate complex patterns and trends. At the same time, it offers researchers the opportunity to explore each and every story underpinning the generated macro picture. In the SEAS project, SenseMaker has also been applied as a tool for mining emergent practices by students, and for teachers to reflect on multiple perspectives and conflicts of interest.

The document is organized in the following main sections:

- Document history, future, and authorship
- LORET
- cCHALLENGE
- SenseMaker

4 LORET –manual and guidelines

4.1 The history and the reasons behind LORET as methodology and as didactic tool

4.1.1 The history and the progress

The Locally Relevant Teaching methodology – mostly shortened to LORET or LORET methodology – was invented by Leif Östman and Staffan Svanberg in 2004, while working on a project on environmental and sustainability education in Mongolia. Since then it has been used in many countries in Asia, Africa, South-America and recently also in Europe, for instance in the context of the SEAS project. The LORET methodology is thus a model for practicing open schooling within environmental and sustainability teaching.

The inspirational spark to develop the LORET originates from a meeting with the vice-minister of education in Mongolia. While discussing the project on environmental education, he surprised Östman and Svanberg by saying: "Mongolia is performing excellently in the world rankings of students' mathematical competencies. Yet, it looks like mathematics does not really allow us to calculate the good life as we are struggling with a lot of challenges in our local communities. Therefore I want to urge you, in this project, to take this into account in everything you do. Make sure that education for environmental education becomes a trigger to stimulate the achievement of curriculum goals, but also to engage with these challenges in the local communities." Thus, the vice-minister was advocating what we today could call open schooling within sustainability education. Since then, LORET has been used and developed within such context. Through working with teachers in Mongolia and later in many other countries, LORET has been continuously further developed and fine-tuned. SEAS partner EduQuality and Leif Östman have then set up several collaborations to experiment with and substantially revise the methodology to also fit European contexts. The pilot trajectories in the Belgian SEAS open schooling network are crucial part of this development of the LORET methodology.

In order to support Mongolian teachers to use LORET, Svanberg and Östman developed a programme of step-by-step workshops - the LORET workshops. The background for developing the programme of workshops was the worldwide tendency that when schools were reaching out to the community or creating action-oriented activities in schools, these became isolated events with no connection to subject teaching. Thus, planting trees campaigns, the greening of the schoolyard, etc. where not connected to any objectives in the different subject curricula of the country. One of the aims of the workshops was to support teachers in order to make open schooling activities to be grounded in and/or to introduce the knowledge, skills, etc. taught in the schools. Another observation was that when sustainability was introduced in schools' curricula many teachers and parents complained about that these activities were taking away instructional time that would otherwise have been used for relevant and efficient preparation of the students for national tests.

Therefore it became very crucial in the workshops that the open schooling activities where carefully matched and documented to objectives in the curriculum, making it evident that the open schooling activities in sustainability teaching where relevant in relation to the expected learning of the students and that they could be perceived and presented as a way of motivating students to learn prescribed subject knowledge. The balance and connection between engagement with societal problems and efficient realisation of pedagogical aims and objectives are therefore in the foreground of the LORET workshops.

Also, the structure and content of the LORET workshop series has been refined in relation to the European context. Here, the collaboration between EduQuality and the Belgian SEAS open schooling network was crucial. The collaborative work has continuously fed back into the process of developing LORET and into the LORET homepage in order to update the materials, instructions, etc. offered to other partners in SEAS as well as stakeholders outside SEAS. Below we describe in more detail the developmental work done.

4.1.2 Why using the LORET teaching methodology for open schooling?

Experience in the SEAS and other projects indicates that LORET is well-suited, also in a European context, in order to ~~implement~~ practice 'open schooling' ~~initiatives~~ focused on sustainability challenges in collaboration with local community actors. Open schooling connects teaching and learning in schools to practices, concerns and engagement outside the school, in families and communities.

The most important reason for teachers to use the LORET methodology is that it enables them to offer students unique learning opportunities by combining engagement with real-world local societal problems and the realisation of curriculum objectives (Van Poeck and Östman 2020). Thus, in LORET it is crucial that the planned teaching will offer optimal opportunities for students to get meaningful learning outcomes that are required by the curriculum as well as specific highly valued scientific literacy. Furthermore, not only does LORET offer students the chance to develop specific scientific literacy (specific knowledge, insight and skills), it also fosters creativity, and a space for engagement and commitment. In addition, students can get an experience of how different people may each have their own idea of how they can / want to solve a problem. Engaging students in the quest for solutions hence enables educative moments that would not emerge during theoretical lessons or mere reflections in classroom discussion where no 'real' challenge is at stake. When dealing with real-world problems, what is said and done is not non-committal. One has to find a solution together. Not everyone thinks the same. There might be resistance from some. LORET has also the benefit that the students, teachers and the school can become a resource for the local community in tackling sustainability challenges in the local community. The experience of being part of trying to tackle a 'real' sustainability challenge can also have positive effects on students' wellbeing – for example an experience of the possibility to change the world for the better and that themselves can make a difference in such an endeavour – and their motivation for studying as it become visible for them that subject knowledge learned in schools are useful in the 'real world'. For the school and the teachers, the use of LORET can help them to explain and demonstrate to students, their parents, the government, etc. how open schooling in sustainability education goes hand in hand with the realisation of many curricular objectives in a well-considered and scientifically substantiated way.

4.1.3 Why using LORET workshops in open schooling partnerships?

In a nutshell: through following the structure and content of the LORET workshop series, teachers get **support** – both by researchers and colleagues – to make **didactical choices and plans** in order to engage students in an educative inquiry into locally relevant sustainability problems, including developing ideas for solutions and conducting real problem-solving experiments in the local community. The specific content, models, etc. that makes up the LORET workshop series as well as the organisation of the program is described below.

LORET workshops are a specific type of so-called **'lesson design workshop'** (LDW, see further https://www.edu.uu.se/research/curriculumstudies/teplab/Collaboration/). The strength of LDWs, and thus of the LORET workshop series, is found in the three principles that guide them – co-operation, co-production and professional orientation – as well as the research that lies behind the design of the programme.

First, LDWs are set up as a genuine co-operation between didactic researchers, subject content specialists and teachers, each contributing with unique but complementary competences: scientific respectively professional competences.

The second principle is that LDWs are focused on a specific form of co-operation, namely co-*production*. Thus, the outcome of the workshops are educative products, which are a result of a fusion of didactic research expertise and proven professional experience. This approach also means that the co-operation has a clear direction and end in view, two factors that make the co-operation efficient. At the end of the LORET workshop series, teachers have a LORET plan consisting of a series of lesson preparations and teaching materials that is "quality cared" both from a scientific perspective and from a professional perspective, where the latter is activated through a collegial learning process between the teachers participating in the workshops. The neologism of "quality care" is by us …

The third principle is that LDWs always start from a teaching challenge relevant to practitioners, thus it relates to teaching tasks that needs to be developed in order to make students learn more and better. Thus, the workshops focus on a professional challenge, which ensures that the products – LORET plans, lessons plans, etc. – are relevant, concrete, and practically useful. The products can be directly implemented into teaching by the participants and can be shared with other colleagues (see further below).

Another strength of the LORET workshops is that they offers, in and through the process of co-production, opportunities for capacity development of teachers (as well as researchers). This is due to the fact that co-production is organised as an intensive collaboration with specialised researchers in an atmosphere of mutual respect. Thus LDWs can be perceived as a form of hands-on, product-oriented co-productive capacity development. Since it takes its starting point in professional challenges and as the process is product-oriented, the co-production offers many opportunities for relevant and efficient hands-on training and learning.

The last strength of the LDWs that we want to highlight is that the outcome, besides the capacity development, consists of concrete, practically relevant and transdisciplinary quality-cared educative products, which lend themselves to upscaling.

The LORET workshops share with change laboratories the idea of co-production for change. The specificity of LORET workshop is that the focus is on the development of new practices of teaching taking the departure in the main responsibilities of teachers: to care for the students by offering them possibility to actually to take part in activities for change and thereby to experience and learn knowledge, skills and values that can be crucial for both their well-being and their potentiality to become agent of change. The second specific feature of LORET workshops is related to LORET as a teaching methodology, where the main focus is on the educative outcome of open schooling, not on the actual change in local community, thereby reducing the risk of making education, teachers, students, etc. to become just an instrument for others' (political) desire, interest, etc. This danger of instrumentalisation is something that LORET workshops are addressing explicitly since it can have many non-desirable effects perceived from a democratic and equity perspective. In that spirit the LORET workshops as a tool can be characterised as truly educative and democratic in its approach.

4.1.4 Tools for upscaling

Programmes for capacity development are very time-consuming and resource-intensive. In order to legitimise the investment of time and resources, the benefits and impact must move beyond the target group directly involved in the capacity development programme. In order to make up-scaling possible, resource-efficient, and worthwhile, there are three criteria that needs to be fulfilled:

1. First, that the materials that are up-scaled are relevant and quality-cared. To up-scale material that is not of high quality and is not relevant can cause severe damage to the quality of teaching and it can have devastating consequences for students' learning. This criterion concerns upscaling what is worth-while.

2. The first criterion will only be fulfilled if the material is quality-cared form a transdisciplinary perspective, i.e. involving multiple disciplines – didactic research and content research – as well as non-academic, professional perspectives. The second criterion concerns the possibility of up-scaling and it can be divided into three sub-criteria: first, that there exists a professionally relevant material that can be up-scaled, secondly, that there is someone that creates this material, and thirdly, that there are mechanisms available for making a transdisciplinary quality of the material possible.

3. The third criterion is that the means for up-scaling is resource-efficient when it comes to dissemination, reach, and resources.

In order to fulfil these criteria, EduQuality in cooperation with Ghent University have developed an ecology for upscaling. The first element in that ecology are the databases for educative materials that are created. EduQuality develops two types of databases: one to be used at a national level and

one for the international level. The second element in the ecology is the development of two types of transdisciplinary quality-care processes. The first one is devoted to making sure that the material uploaded will be quality cared from both a scientific and a professional perspective. And the other process, which concerns the possibility for continuous refinement, is to make sure that the quality cared material that is published at a database can be further developed, adapted, and quality cared. LDWs are a social innovation that fulfil the first two criteria mentioned above. Adding to that, the databases also contain processes for transdisciplinary quality care which will be put into use if the material uploaded has not been produced in a transdisciplinary co-production maker-space (as for example a LDW). The databases also contain several processes securing the refinement process.

In order to up-scale the production of quality cared material to be uploaded on a database it is crucial that many intermediary actors in the educational system (as for example NGOs and in-service training institutes) become involved in executing transdisciplinary maker-spaces. In the spring of 2022 EduQuality in cooperation with Ghent University will develop a training-for-trainer programme focusing on organizing LORET-LDWs.

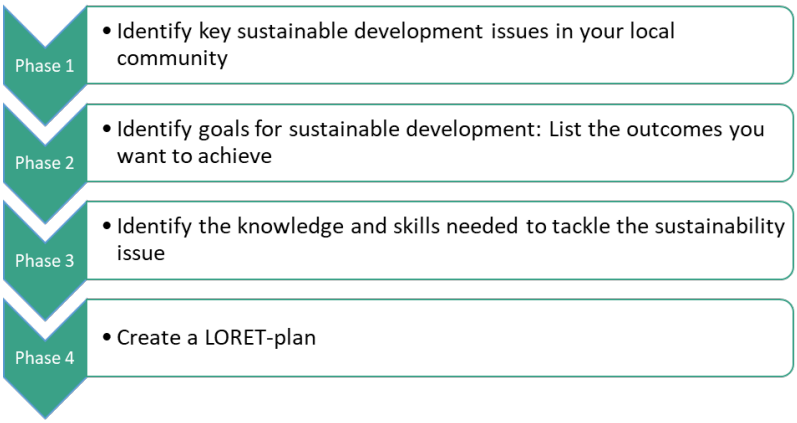
4.2 LORET workshop series

In this section, we present the LORET workshops series as a tool for supporting teachers to design and implement open schooling practices according to the LORET methodology. First, we briefly describe how LORET has been adjusted through trying out, investigating, and revising the methodology and workshops in the SEAS project. Next, we explain in detail the LORET workshops trajectory consisting of 5 workshop meetings preceded by preparatory assignments.

Development and finetuning of LORET through SEAS

As described in detail in D3.1 and D3.2, LORET has been implemented, adapted and finetuned through the activities and assessment in the Belgian SEAS open schooling network. This was, as indicated, done in close collaboration between LORET developer Leif Östman and researchers at Ghent University. The results also have been validated in other contexts through EduQuality's activities. It resulted in a number of important adjustments to the LORET tool: a new structure of series of workshops as well as aiding tools and materials.

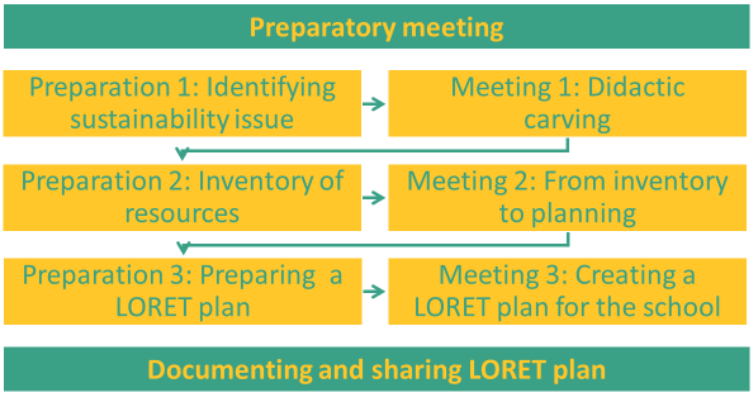
The initial structure of LORET workshop series (Östman et al. 2013) looked as follows:



The following findings and considerations resulted in a transformation of the structure of LORET workshop series:

- the need to add a preparatory meeting to discuss practicalities, grasp the school-specific needs and expectations, etc.
- the need to frame LORET more sharply as a planning tool for teachers to plan their lessons;
- the need to provide a sharper didactical focus;
- the need to give participants time to do some preparatory work so that the work during the sessions can be done more efficiently;
- the need to balance, on the one hand, a clear and systematic way of working with, on the other hand, flexible adaptation to the specific school context.

The result was the following revised structure of the workshop series:



The work of identifying and selecting a locally relevant sustainability problem (former Phase 1) is since this revision done in preparatory assignment 1 and meeting 1. The aim of strengthening LORET as a tool for offering teachers *didactical* support is reflected in the approach to this assignment and meeting: teachers are invited to turn major, societal sustainability problems into *educational content* through what we have called 'didactical carving' (Van Poeck and Östman 2020). This means 'carving out' of the often comprehensive, complex and overwhelming sustainability problems a problem that can offer the students unique educative opportunities. We operationalised this by offering the teachers a tool for didactical carving (see below).

After this step, we move on to the didactical task of selecting suitable teaching content by inviting the teachers to identify resources – in the curriculum of school subjects, in the local environment, in

the local community, etc. – that can fruitfully support the students in addressing the locally relevant sustainability problem (preparatory assignment 2 + meeting 2). The model of a sustainability problem-solving cycle was introduced to support the teacher to identify and select resources that can help their students throughout the whole process of problem-solving: exploring the problem, coming up with possible solutions, implementing solution proposals, and evaluating the problem-solving (see below).

Preparatory assignment 3 + meeting 3 in this revised part of the structure are devoted to creating a LORET plan by identifying connections to curriculum goals; determining the number of lessons that will be needed and the content for each lesson; identifying suitable teaching methods and activities, incl. how students can gather information and take action in the local community; and deciding how to organise the lessons so that the students can effectively integrate the knowledge from the different school subjects.

Further experimentation in the pilot schools, however, resulted in **further revisions** (see D3.2). After introducing the model of the problem-solving cycle, it appeared to be difficult/impossible to plan the whole series of LORET lessons from the start as, at that point, it is not yet possible to know which solution proposals the students will generate and hence to prepare lessons that can support them in that endeavour. As it is, thus, impossible for the teachers to plan in sufficient detail the lessons that will take place after the students have identified and selected a solution for the locally relevant sustainability challenge that they will implement, the making of the LORET plan is split-up in two parts, i.e. two workshop meetings that are preceded by a preparatory assignments. Preparatory assignment 3 + meeting 3 are limited to creating a LORET plan for lessons focused on exploring the problem, generating possible solutions, and selecting a solution proposal to experiment with. The later lessons, focused on implementing solution proposals and evaluating the problem-solving, are planned through preparatory assignment 4 + meeting 4 which take place after the actual implementation of the lessons/activities designed in assignment + meeting 3. Furthermore, a final meeting 5, preceded by preparatory assignment 5, was added to the workshop series structure after the implementation of all lessons in order to provide the participants with opportunities to share experiences and reflections, celebrate joint achievements, discuss whether/how the initial LORET workshop series requires follow-up in the future, and to take better care of the documentation of LORET plans, lesson plans, and teaching materials. The latter is important in view of facilitating the publication of high-quality output (lesson plans and teaching materials) in the SEAS library and, thus, to upscale the impact beyond the participants directly involved.

The structure and content of the revised **LORET workshops series now** looks as follows with – after an intake meeting – 5 workshop meetings preceded by a preparatory assignment:

Preparatory assignments	Workshop meetings
PA1: Identifying locally relevant sustainable development issues	W1: Turning sustainability problems into educational content – didactical carving

PA2: Identifying fruitful resources for supporting the students' inquiry	W2: From inventory to planning
PA3: Preparing a LORET plan – Part I	W3: Creating a LORET plan – Part I
PA4: Preparing a LORET plan – Part II	W4: Creating a LORET plan – Part II
PA5: Documenting the LORET work	W5: Looking back and looking ahead

Some practical guidelines and considerations

The following practical considerations are important to keep in mind at the start of a LORET project:

- At a kick-off meeting (1 hour), the participating teachers are provided with information on the project, on privacy and data protection, etc. and the workshop meetings are scheduled.
- A LORET workshop series can be set up for 1 school or for groups of teachers from several schools at once.
- The 5 LORET workshops (2 hours) with preparatory assignments in between serve as the preparatory work to arrive at a LORET plan at the end of the series.
- Estimate approximately three weeks between each LORET workshop.
- The LORET workshops can take place in person or online.
- The participating teachers form a LORET team of 2 to a maximum of 10 teachers per school.
- The plans and lessons that are co-created in the LORET workshops are uploaded into the SEAS library in order to stimulate sharing with and learn from colleagues.
- Before the start of the collaboration, the agreement of the school is required.

LORET workshops focus on co-creation and thereby explicitly call on the professionalism and experience of the teachers as well as on the findings and expertise from didactic research. At the end of the LORET workshops series, the teachers have a LORET plan consisting of a set of lesson preparations and teaching materials. The LORET lessons and/or LORET school activities are put into practice and experiences are shared.

The process is being tailor-made by and for the participating teachers. As we explain to them in the information letter and intake meeting:

"You decide:

- *WHAT? – You choose the sustainability topic that you would like to work on, we provide support with didactic choices and lesson preparations so that students can take action on problems within this topic that are both manageable and authentic: Real problems they can actually act upon and influence.*
- *WHO? – You choose which/how many teachers will work on LORET, which subjects and which classes will be involved, whether you will collaborate with local partners or not, etc.*
- *HOW? – You choose whether you organise the LORET lessons for one or more classes, via a cross-class project or an activity for the whole school, as a 'theme of the year', etc.*
- *WHEN? – You choose when and how frequently the LORET lessons take place: Concentrated or intensive during a project week? Or spread over the whole school year/term/semester? Choose what fits best for your school."*

Assignments, workshops, and tools

Preparatory assignment 1:

Identifying locally relevant sustainable development issues

The workshop series starts with preparatory work done by the teachers in the LORET team who list locally relevant sustainability problems. As decided in the preparatory meeting, this can be done either with or without the active participation of students and/or local stakeholders.

Workshop meeting 1:

Turning sustainability problems into educational content – didactical carving

The participants select a sustainability problem from the list of identified locally relevant challenges (assignment 1) and turn this real-world problem into educational content through a process of 'didactic carving'. That is, they 'carve out' of this massive societal problem a (sub)problem that will be suitable for the students to work with: a problem that is manageable and susceptible for the students (i.e. they are able to grasp it and can influence how to tackle it in one way or another) and that bears the potential to take them along in an authentic sustainability problem solving process. The teachers are therefore offered a tool based on these two criteria. After explaining the philosophy behind LORET (see above) in the workshop, we present 2 scales – one on the manageability of the challenge, and one on the authenticity of the challenge –, and illustrate them with an example, and invite the participants to, first, brainstorm individually about possible suitable challenges and, then, discuss the results in small group by assessing each proposal with the help of the scales:

1. A manageable challenge:

The problem is way too difficult for the students to understand	1	2	3	4	5	The students have sufficient knowledge, insight and intellectual capacities to be able to understand the problem
The students/school do not have access to information, actors, decision making forums, etc. that are vital for tackling the problem	1	2	3	4	5	The students/school have access to information, actors, decision making forums, etc. that are vital for tackling the problem
The students do not have any possibility to influence actions and decision-making in view of tackling the problem	1	2	3	4	5	The students can influence actions and decision-making in view of tackling the problem: ☐ *Directly* (e.g. implementing practical solutions, realising changes) ☐ *Indirectly* (e.g. through trying to influence policymaking by letters, petitions, negotiating, lobbying)
It will take a very long time before the results of students' inquiry and/or actions become visible	1	2	3	4	5	The results of students' inquiry and/or actions will become visible in the short term

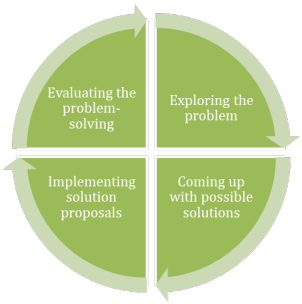
2. An authentic challenge:

The solution for the problem is already available, it just needs to be implemented	1	2	3	4	5	There are no ready-made solutions that can be easily applied to tackle the problem
As a teacher, I already know how to solve the problem	1	2	3	4	5	For me as a teacher, trying to solve the problem would require further inquiry and experimentation
There is one 'right' answer on how to solve the problem	1	2	3	4	5	Trying to solve the problem can be done in different ways that need to be further explored and compared
Solutions for similar problems have already been found in other contexts and can be easily applied here and now	1	2	3	4	5	Although solutions for similar problems have already been found in other contexts, there are no ready-made answers on whether and how these might be applied in the specific local context of the school

Preparatory assignment 2:

Identifying fruitful resources for supporting the students' inquiry

The teachers make an inventory of resources that can help the students to address the problem. They list what the school subjects they teach have to offer in this respect as well as what the school's local environment, and actors in the local community, organisations, media, etc. have to offer.



Here, we introduce the model of the problem-solving cycle. LORET aims to support teachers in the didactical work of taking their students along in an authentic problem-solving process. By guiding the students through the four phases of a full problem-solving cycle, they are expected to encounter a variety of questions with valuable pedagogical potential:

Steps of a problem-solving process	Questions
1. Exploring the problem a. Gathering information b. Analysing information	▪ What is the problem? ▪ How significant is the problem in the local community? ▪ Are there different approaches and opinions regarding the problem? ▪ What do we know about it? ▪ Why is it happening? What are the root causes?
2. Coming up with possible solutions a. Generate possible solutions b. Select a solution proposal	▪ What shall we do about it? ▪ What are alternative ways to solve the problem? ▪ Do the proposed actions have significance when solving the problem?
3. Implementing solution proposals a. Plan the implementation of the solution proposal b. Implement the solution proposal and document	▪ What actions shall we set up? ▪ Where? ▪ When? ▪ With whom?
4. Evaluating the problem-solving	▪ Have we solved the problem or are there still aspects that needs attention?

	▪ In which way did we contribute to solving the problem? ▪ Did the plan work? ▪ What can be improved on what we have done? ▪ What needs to happen next?

Teachers are asked to identify various resources for each phase through the following template:

	PROBLEM SOLVING ACTIVITY			
	Exploring the problem	Coming up with possible solutions	Implementing solution proposals	Evaluating the problem-solving
Subject matter in subject A				
Subject matter in subject B				
Subject matter in subject C				
Resources in the school				
Resources in the local environment (e.g. places, infrastructure, information)				
Resources in the local community (e.g. experts, networks, organisations)				
Other (e.g. media, literature)				

Workshop meeting 2:

From inventory to planning

The participants present their preparatory work and construct a collective mapping of fruitful resources for supporting the students' inquiry. While mapping what the curriculum has to offer, we encourage the teachers to explore the wide variety of school subjects as well as to not limit the attention to theoretical knowledge and insights but to also include practical skills, communication skills, inquiry skills, attitudinal aspects, ethical and democratic competences, etc. A mapping of what the school environment has to offer can include people, organisations, physical places, etc. We also encourage them to look for resources in the media, literature, etc. Thereby, we keep an eye on whether these resources enable us to provide the students with adequate support to apply know-how and skills to understand the sustainability problem; to transfer this knowledge and insight into practical actions that contribute to solving the sustainability problem; to deal with – sometimes contradictory – opinions about what the best solutions for the sustainability problem is; and to take into account the three dimensions of sustainability: the ecological, the social-cultural and the

economic dimension of sustainability. If the result is too much to address in one project or one school year, a prioritisation is made regarding which curriculum and local environment resources will be in focus in the LORET plan.

Preparatory assignment 3:

Preparing a LORET plan – Part I

The teachers reflect on how they can design lessons in which their students first explore the locally relevant sustainability problem and subsequently generate possible ways to solve it (phases 1 and 2 of the problem-solving cycle). Using a template (see below), the participants write down individually their ideas about what lessons they could prepare (in collaboration with colleagues) to guide the students in a quest for solutions to the selected sustainability problem and how to give shape to these lessons. Each for their own teaching practice, they identify connections to the curriculum goals they aim to address, determine the number of lessons they will spend on it and the content for each lesson, identify the teaching methods and activities, and formulate ideas on how to collaborate with colleagues and organise the lessons so that the students can effectively integrate the knowledge from the different school subjects. The inventory of 'fruitful resources' that results from preparatory assignment 3 + meeting 3 is thereby useful to make things more concrete and to structure them in lessons and/or activities connected to the first two phases of the problem-solving process.

The following template is used:

LORET Plan

(Please note all these lessons and activities in the overview table below and indicate a title that reflects their content. Number them in the order in which they will be carried out (L1 = first lesson, L2 = second lesson, A1 = first activity, etc.). Then use the tables provided to describe each lesson/activity in more detail.)

Overview

What is the locally relevant sustainability challenge that the students will work on?	
Make a list of all the lessons and activities that you plan within the LORET project according to the 4 steps of a problem-solving process. *(Indicate the title and number of each lesson/activity in this table – this will be developed in more detail later.)*	
EXPLORING THE PROBLEM	COMING UP WITH POSSIBLE SOLUTIONS
1. … 2. … 3. …	1. … 2. … 3. …

Short description of the lessons

(Copy and paste the table as many times as necessary to describe all planned lessons.)

Title:
Subject:
Purpose/goal of the lesson:
Content of the lesson:
Teaching methods and activities:
Attainment targets/developmental objectives/curricular objectives:
Timing (# lessons/hours):
Teacher(s):

Short description of cross-class and/or school-wide activities

(Copy and paste the table as many times as necessary to describe all planned activities.)

Title:
Short description of the activity:
Purpose/goal:
Students involved: ☐ Whole school ☐ The following classes: …
Teachers involved:
Partners involved:
Timing (# lessons/hours):

Workshop meeting 3:

Creating a LORET plan – Part I

The participants present their preparatory work and bring it together in a collective overall teaching plan. When planning the implementation of that preparatory work it is important that every student is engaged in every step of the search for solutions. Thus, when students from different classes are

involved, they all get the chance to explore (aspects of) the problem as well as to come up with possible solutions – and to implement and evaluate them in the following step.

The collective result is critically examined: Is the teaching content well-chosen? Do the chosen teaching methods and activities foster authentic inquiry? Are ecological as well as economic and social aspects of sustainable development covered? Are students stimulated to integrate knowledge from different school subjects? Will students learn theoretical/abstract knowledge and insights as well as practical skills, communication skills, inquiry skills, attitudinal aspects, ethical and democratic competences, etc.? Are there strong connections to the local community? Etc.

Preparatory assignment 4:

Preparing a LORET plan – Part II

After teaching the lessons planned in workshop meeting 3, the teachers reflect on how they can design lessons in which their students experiment with implementing (one/some of) the generated solution proposals and evaluate their problem-solving process – phases 3 and 4 of the problem-solving cycle. Using a template (see below), the participants write down individually their ideas about what lessons they could prepare (in collaboration with colleagues) to guide the students in implementing and evaluating the problem-solving and how to give shape to these lessons. Each for their own teaching practice, they again identify connections to the curriculum goals they aim to address, determine the number of lessons they will spend on it and the content for each lesson, identify the teaching methods and activities, and formulate ideas on how to collaborate with colleagues and organise the lessons so that the students can effectively integrate the knowledge from the different school subjects.

The following template is used:

LORET Plan

(Please note all these lessons and activities in the overview table below and indicate a title that reflects their content. Number them in the order in which they will be carried out (L1 = first lesson, L2 = second lesson, A1 = first activity, etc.). Then use the tables provided to describe each lesson/activity in more detail.)

Overview

What is the locally relevant sustainability challenge that the students will work on?	
Make a list of all the lessons and activities that you plan within the LORET project according to the 4 steps of a problem-solving process. *(Indicate the title and number of each lesson/activity in this table – this will be developed in more detail later.)*	
IMPLEMENTING SOLUTION PROPOSALS	EVALUATING THE PROBLEM-SOLVING
1. … 2. … 3. …	1. … 2. … 3. …

Short description of the lessons

(Copy and paste the table as many times as necessary to describe all planned lessons.)

Title:
Subject:
Purpose/goal of the lesson:
Content of the lesson:
Teaching methods and activities:
Attainment targets/developmental objectives/curricular objectives:
Timing (# lessons/hours):
Teacher(s):

Short description of cross-class and/or school-wide activities

(Copy and paste the table as many times as necessary to describe all planned activities.)

Title:
Short description of the activity:
Purpose/goal:
Students involved: ☐ Whole school ☐ The following classes: …
Teachers involved:
Partners involved:
Timing (# lessons/hours):

Workshop meeting 4:

Creating a LORET plan – Part II

The participants present their preparatory work and bring it together in a collective overall teaching plan. The collective result is critically examined: Is the teaching content well-chosen? Do the chosen teaching methods and activities foster authentic inquiry? Are ecological as well as economic and social aspects of sustainable development covered? Are students stimulated to integrate knowledge from different school subjects? Will students learn theoretical/abstract knowledge and insights as well as practical skills, communication skills, inquiry skills, attitudinal aspects, ethical and democratic competences, etc.? Are there strong connections to the local community? Etc.

Preparatory assignment 5:

Document the LORET work

After implementing the lessons, the teachers document their LORET plan and lessons – with the help of the templates – so that these can be shared and inspire other teachers. They reflect on what went well, what could be improved, and if there is any need/desire to follow-up the LORET work in a subsequent trajectory with the same or other students.

Workshop meeting 5:

Looking back and looking ahead

In this final meeting, we share experiences and reflections, celebrate the joint achievements and discuss whether/how the LORET trajectory requires follow-up in the future.

4.3 LORET Access and contact

The LORET tool can be accessed via the following website:

http://loret.se/

Main contact for LORET:

Prof. Leif Östman (leif@acedu.se)

4.4 Background material

Östman, L., Svanberg, S. and Aaro Östman E. (2013). From vision to lesson: Education for sustainable development in practice. Stockholm: WWF.

Van Poeck, K. and Östman, L. (2020). The Risk and Potentiality of Engaging with sustainability problems in Education – A Pragmatist Teaching Approach. *Journal of Philosophy of Education*, *54*(4) 1003 – 1018.

5 cCHALLENGE – manual and guidelines

5.1 What is cCHALLENGE?

cCHALLENGE is an experiential learning tool that can serve as an engaging entry point for working with climate change and sustainability issues. It directly addresses the practical, political, and personal spheres of transformative change, while also facilitating both individual and collective learning. Through a 30-day personal change experiment, participants gain insights into both environmental issues and change processes. A transformative program and reflection questions help participants gain insights into how and why each person's potential for impact extends beyond behavioral change.

Teachers and schools play an important role in strengthening students' ability to think critically and engage with contemporary social, environmental, and political problems. cCHALLENGE provides a deeper understanding of climate change and sustainability issues by inviting teachers, students, administrators, families, and communities involved in open schooling initiatives to explore, experiment, take perspectives, share stories, and reflect. Through this 30-day experiment with change, participants can gain valuable insights into how to contextualize sustainability issues in their lives, regardless of the subject, level, or area of expertise.

cCHALLENGE is a tool that facilitates an integrated understanding and experience with the behavioral, technical, societal, cultural, and individual/collective aspects of sustainability problems and solutions, and ties this to the participants own lives and context. This addresses the needs identified in SEAS for tools to facilitate and expand a more integrated approach to sustainability education and the collaboration between schools and local contexts (see Introduction) as part of democratizing inquiry. Further, as cCHALLENGE connects personal development and learning and can be delivered in a variety of ways (e.g., digital, pen and paper, via different learning platforms), it can speak to partners outside the school context. It thereby addresses the identified need in SEAS for tools to facilitate innovation in open schooling by opening up learning processes to communicate and connect learning that normally takes place "inside" schools.

cCHALLENGE can be run on a digital platform where the participants can read and share insights, reflections and experiences through blog posts or it can be run as a Pen and Paper version where the participants share insights through hand-written reflections, art, multi-media, or in-class conversations.

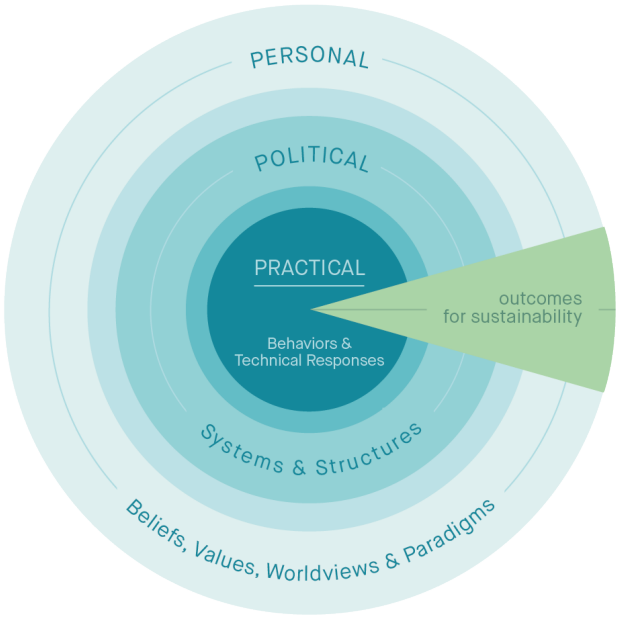
Learning through experience

The core of cCHALLENGE is a 30-day change experiment, where each participant chooses and commits to a personal change experiment related to sustainability. A cCHALLENGE is carried out by a class or several classes, community or group, and learning, insights, experiences, and stories are shared. The individual change experiment is a great starting point for critical reflections and dialogue.

Participants are encouraged to explore how their actions, conversations, and engagement influence (and are influenced by) others, as well as how systemic factors can facilitate or impede change.

Participants are also encouraged to share their experiences and insights with others. This approach to experiential learning draws attention to the role of social and cultural norms, structures, and systems in processes of change. It also provides insights into how assumptions, beliefs, and values influence how society is organized and the goals that are prioritized.

Over the course of the thirty days, participants receive research-based information, inspiration, and reflection questions based on a heuristic known as The Three Spheres of Transformation.



The Three Spheres of Transformation (O'Brien and Sygna, 2013[1,2,3] Sharma 2007[4]) model is a means for understanding the changing relationship between individual agency, collective agency, and political agency.

Approaching climate change and sustainability issues from multiple perspectives can trigger new conversations among students, teachers, friends, and families about both the problems and solutions. It also introduces a practical way for schools to emphasize the connections between sustainability and other interdisciplinary concepts such as citizenship and life mastery.

cCHALLENGE is flexible and adaptable to the curriculum, so it can be employed in a variety of school subjects and initiatives.

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[1] O´Brien, K. and Sygna, L. (2013) Responding to Climate Change: The Three Spheres of Transformation. *Proceedings of Transformation in a Changing Climate*, 19-21 June 2013, Oslo, Norway. University of Oslo. ISBN: 978-82-570-2000-1

[2] O'Brien, K. (2018) Is the 1.5°C target possible? Exploring the three spheres of transformation. *Current Opinion in Environmental Sustainability (COSUST).* Vol 31: April 2018, 153-160. DOI:10.1016/j.cosust.2018.04.010

[3] IPCC (2014) Chapter 20: Climate-resilient pathways: adaptation, mitigation, and sustainable development. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1122.

[4] Personal to Planetary Transformation by Monica Sharma in Kosmos Journal, 2007. Download at: https://www.kosmosjournal.org/article/personal-to-planetary-transformation/

Why focus on change?

The dominant narratives on climate change and sustainable development highlight the practical actions that individuals, groups, and organizations can take to reduce greenhouse gas emissions, limit pollution, protect biodiversity, save water, and so on. Technical and managerial solutions are emphasized, together with green values and environmentally friendly behaviours. While such approaches are important, they tend to be partial and fragmented. Furthermore, they are not producing results and outcomes consistent with the U.N. Sustainable Development Goals (SDGs).

Instead of focusing on what each person does or does not do for the environment, or the size of their ecological footprints, cCHALLENGE focuses on *change* within the wider context of sustainability issues. By approaching change as an experiment, participants are continuously encouraged to explore, reflect, and ask questions such as "what if", "why" and "why not". Many pose critical questions about behavioral changes and begin to question and contextualize the black-and-white perspectives that are frequently offered as solutions to issues like climate change (e.g., no meat, no flying, no consumption, no driving). A shift in perspective and focus can help participants see things differently, which can help them to identify larger and more meaningful roles for themselves and others in addressing complex social and environmental issues.

CHALLENGE is designed to trigger critical thinking and activate agency, inspiring participants to better understand and engage with change. This is important, as climate change and environmental problems often come across as complex and abstract. They can easily be perceived as overwhelming, and the psychological and emotional dimensions are receiving increased attention. cCHALLENGE encourages participants to investigate and explore change, not just at the individual scale, but also at the societal scale. It does this by focusing on the relationship between individual change, collective change, and systems change.

Experiential learning can help to shift the narrative. By inviting students, teachers, families, and communities to experiment with change, authentic stories are created and spread in conversations and dialogues. The cCHALLENGE creates a space for reflection on the systems and structures, barriers and alternatives needed for sustainable transformation, including how these relate to their own contexts and lives. cCHALLENGE sparks interest and engagement in a gentle, subtle, and long-lasting way by emphasizing the following:

Transformative learning: Reflection and critical thinking are key in empowering people of all ages with knowledge, skills, and a sense of political agency. Rather than treating people as "objects to be changed" in the name of sustainability, cCHALLENGE helps participants to experience how they can create changes in their own lives, in their families, in their school, in their community, and in politics. Such a shift in perspective can be empowering and have lasting impacts in other areas and domains.

Sharing stories, creating new conversations, and inspiring others: When someone makes a change in their own life, it often sparks either positive or negative reactions from others. By sharing stories and experiences with friends and family, discussing and reflecting with others, participants become aware

of the power of social and cultural norms. They also become aware of the power they hold to influence and inspire others through conversations and stories.

Lasting change – from the inside out: Lasting change involves shifts in perspectives that enable people to view problems and solutions in new ways. New insights and "ah-ha" moments can be transferred to other situations and contexts. Making connections and perceiving relationships is critical to active engagement with the types of change needed for sustainability.

A flexible tool for educators

The cCHALLENGE is a tool and learning program that gives educators an opportunity to work with climate change and sustainability in a practical, engaging, and integrated way. It represents an experience-based, interdisciplinary approach to learning that can be linked to learning outcomes in a range of subjects, including science, social science, language, mathematics, history, art, citizenship, and health. Finding entry points for exploring sustainability issues in multiple subjects can help both teachers and students identify interdisciplinary themes and make the links between environmental and social issues.

There are a variety of ways to run a cCHALLENGE in a school or local community. For example, students may choose a change experiment that relates to the sustainability challenge identified in the SEAS ChangeLab workshops or by using LORET in these workshops.

In turn, the cCHALLENGE round can be connected to one or more curriculum objectives in a single subject, or across several subjects. Competence goals can be addressed in subjects such as Geography, History, Arts and Crafts, Mathematics, Social Studies, Natural Sciences, and Physical Education. For example, a Physical Education challenge could focus on mobility and sustainability. A Social Studies project could focus on a topic such as food waste and explore policy measures to address it. Language subjects (native or foreign) can be used in communicating reflections. For example, students might choose a sustainability-related challenge and then share their reflections in a language subject.

cCHALLENGE can also be used as a social and collaborative tool in the classroom, either within classes, or across classes or subjects. It enables students (and teachers) to get to know each other in new ways and to connect in a deeper way. It is also flexible enough that school administrators, families, stakeholders, and the wider community can get involved. Thus, it offers the opportunity to foster new collaborations and generate conversations around climate change and sustainability issues and solutions more broadly and equally.

Development and finetuning of cCHALLENGE through SEAS

Over the course of the SEAS project, the cCHALLENGE tool has been developed and finetuned in a number of significant ways based on feedback provided by the consortium partners, educators, and students.

The goal of applying the cCHALLENGE in an open schooling context is to create a learning process in which students can explore different perspectives on the challenges of and possibilities for solutions to sustainability. cCHALLENGE aims to provide students with an embodied experience of change, helping them gain a systemic understanding of how transformations can occur. This method thus goes beyond approaches limited to behavioral changes (changing habits) aimed at reducing environmental impacts, to draw attention to those dimensions often invisible yet critical in understanding transformation, such as social norms, cultural narratives and political structures, as well as to beliefs, values and worldviews. As such, development and finetuning has occurred to all aspects of the cCHALLENGE approach and methodology. For example:

A new Pen and Paper version of the cCHALLENGE has been developed and piloted. This nine-page pdf is a simplified version of the cCHALLENGE, together with teaching support materials. This new tool makes it possible for teachers to implement and lead a lighter version of the cCHALLENGE in their class(es) with cCHANGE providing capacity building and support to the educators.

Capacity building workshops, manuals, and teaching support materials were developed and have been incorporated into the planning and delivery of cCHALLENGE projects. In Italy, Norway, and Belgium, teachers established methods for connecting the cCHALLENGE to different subjects in the curriculum. This approach has been incorporated into cCHALLENGE teacher workshops and capacity building sessions.

Regarding the digital platform element of cCHALLENGE, the platform itself was improved in terms of user experience and visual appearance. The content of the platform and Transformative Program were edited and refined to better target the upper secondary school target group. And finally, the content and Transformative Program was translated into Dutch and Estonian.

The cCHANGE team also finetuned its capacity in providing one-on-one coaching to students via the digital platform.

5.2 Elements of a cCHALLENGE

cCHALLENGE can be run with a digital platform where the participants create a profile and can write and read each other's stories, sharings, and insights throughout the 30-day period. The transformative content is delivered via SMS or email every three days.

The other option is to run the cCHALLENGE Pen and Paper version where the participants share insights through class room conversations, art, and other classroom activities. The transformative content is delivered by the teacher at their pace, supported by a digital package consisting of posters, videos, reflection questions, and presentations.

Project design, training, and toolbox

In the weeks prior to the start of a cCHALLENGE, cCHANGE and the coordinating teacher/project manager collaborate on preparing and tailoring the project. This includes framing and coordinating practical details such as registrations and consent forms. This co-creation and preparation step is essential for a successful project.

In this pre-phase, cCHANGE will also provide the educator with support, perspectives, and tools to successfully guide the students throughout the project. This includes:

- An online training seminar with the coordinating teacher(s) to explain the cCHALLENGE approach, including the research behind it.
- A toolbox with instructions, teaching materials, resources, exercises, and an overview of the Transformative Program and the content it covers.

Choosing the challenge

Before registering, students, teachers, and other participants should choose one change to experiment with for 30 days. It is important for motivation and ownership that participants choose their own challenge, but it should also align with the topic, themes, and processes chosen by the school and/or local network in the ChangeLab workshops.

This process is an opportunity to talk to students about what is possible, what interests them, what is important to the local community, and what they consider to be challenging (and why). Examples of challenges will be given to the students for inspiration, such as:

- Avoid plastic packaging
- Do not use screens for 1 hour every night
- Experience nature for 30 minutes or 1 hour a day
- Pick up garbage on the way to school
- Talk to someone about climate change every day
- Eat vegetarian meals 3 or 5 days per week

- Bike or walk to school every day
- Do not buy anything new during the project
- Reduce food waste
- Recycle waste

Teachers should encourage students not to choose exercise- and health-related challenges, as this can shift the focus away from climate change and sustainability issues and introduce a competitive element that puts pressure on vulnerable students. Some students may choose unconventional challenges, such as dumpster diving, and any legal and food safety issues related to such experiments should be discussed. Challenges involving substantial changes to diet should also be carefully monitored.

Kick-off workshop

A kick-off workshop with the students and others can be organized to mark the start of the challenge. cCHANGE can provide guidance and potential exercises for running one of these workshops.



Different delivery methods

There are two ways to deliver a cCHALLENGE in a school or local community:

1. The Pen and Paper version of cCHALLENGE is a digital package consisting of a weekly sheet each containing part of the Transformative Program content and reflection questions and exercises. Teachers can use this sheet to lead classroom discussions and activities. The digital package also contains videos, presentations, and posters to support teachers during the 30-day experiment.

2. In the digital platform version, participants register via a URL, create a profile, and share their learning as blog posts. Participants are encouraged to explore how their actions and conversations influence and are influenced by others and share their findings regularly as

short written texts. The Transformative Program content is delivered every third day via SMS, email, or pdf, and is also available on the digital platform.

Transformative Program

During the 30-day cCHALLENGE, students receive information, inspiration, and reflection questions from cCHANGE. We call this the Transformative Program. This content, initially developed by cCHANGE co-founder, Professor Karen O'Brien, gently encourages students to go deeper; asking them to reflect on practical and logistical challenges, social norms, systems, and structures, as well as the values, beliefs, and assumptions that hinder or enable change.

The content in the Transformative Program provides a valuable foundation for conversations inside and outside of the classroom.

When cCHALLENGE is delivered via the Pen and Paper version, the Transformative Program content is split up into weekly topics and delivered by the teacher. When cCHALLENGE is delivered via the digital platform, the transformative content is delivered every three days directly to participants via SMS, email, or pdf files.

Reflecting and sharing

During the cCHALLENGE, participants reflect upon and share their experiences with each other, at school, with family and friends, and the wider community. This includes stories about successes, frustrations, research discoveries, and insights. Participants often experience how they can engage with the community and influence others and change through this sharing.

Students can share their stories in a variety of ways during the cCHALLENGE:

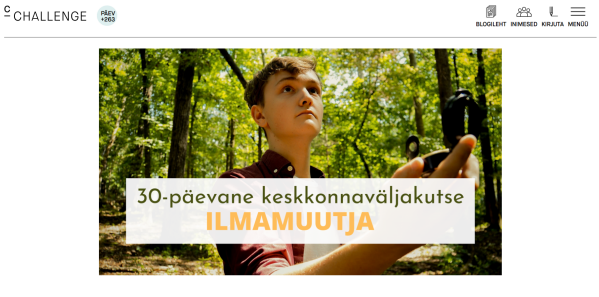
1. *Digital Platform*

   The digital platform can serve as the project's home. Each student gets their own profile page and can post about their experiences and thoughts. Reflections can be written in text and illustrated with photos, images, or YouTube videos.

   The digital platform can be private or made open to the public. Posts in public rounds can be shared via social media to disseminate stories to the wider community.

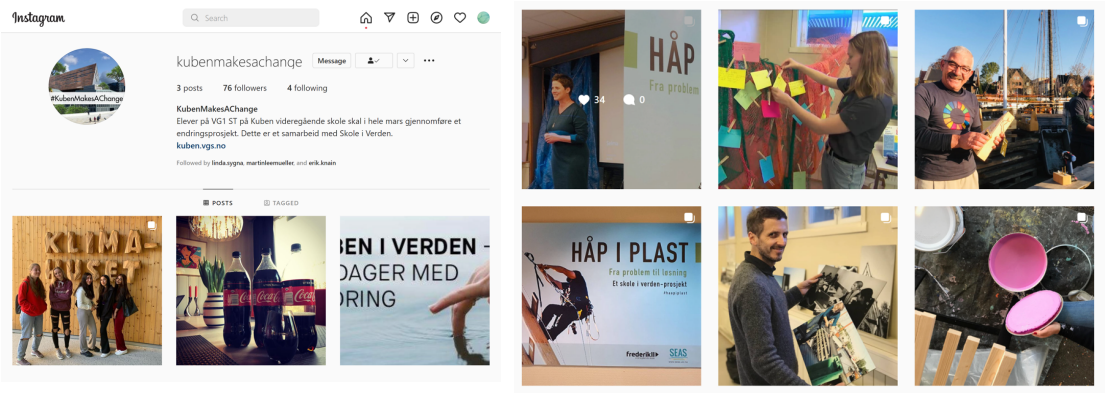


NEW POSTS FROM THE PARTICIPANTS



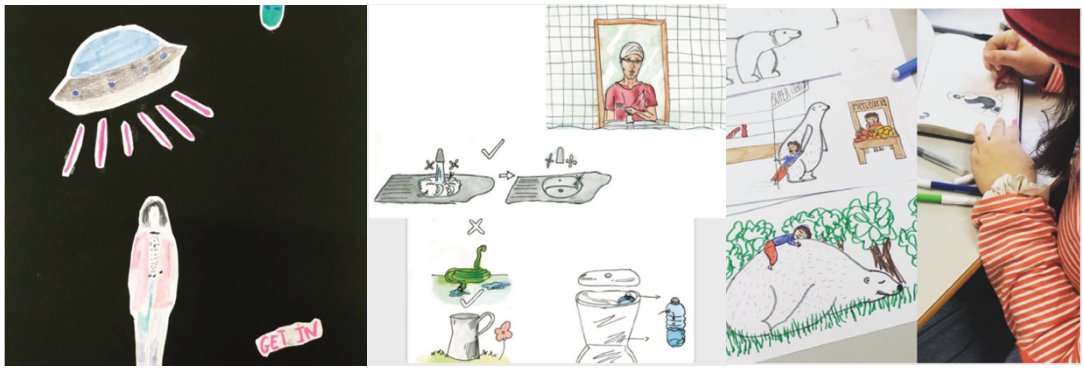
LOE OSALEJATE POSTITUSI

Insights, experiences and stories can also be shared on other digital communication platforms. Students can post their reflections on Canvas, Google Teams, Microsoft Teams, Slack, or in other social media channels like Facebook or Instagram.



2. *Pen and paper version - Through hand-written reflections, art, multi-media, or in-class conversations*

Storytelling and sharing are at the centre of the cCHALLENGE. This can happen in a multitude of ways. Educators can explore different methods, such as drawing, painting, multi-media, handwritten diaries, postcards, dialogues, debates, and in-class discussions. These can be nested within the curriculum and the chosen sustainability focus and draw on the Transformative Program and reflection questions as a starting point.



Project reporting

Project reporting can be a valuable exercise to communicate to the school and wider community the impacts and benefits of the project. If desired, cCHANGE can support and work with the project leader/school to analyze and summarize the results of their cCHALLENGE and present it in an informative and interesting way. For example, cCHANGE can provide participant surveys to distribute and assist with analyzing reflections and crafting a narrative. This can be discussed on a project-by-project basis so that the reporting is tailored to the context.

5.3 Running a cCHALLENGE

Below are some tips on how to get the most out of a cCHALLENGE project when running it in open schooling environments.

Integrate inquiry practices into schoolwork as much as possible: Integrating inquiry processes associated with the cCHALLENGE into classroom activities and the curriculum is a key factor for success. Teachers of the various subjects could, for example, run learning loops and structure learning activities, inquiry practices, or lectures on topics such as:

- Citizenship/channels of influence (Social Sciences)
- Resources/renewables (Geography)
- Sustainable Development (Natural Sciences)
- Or other topics that relate to the various subjects and the various cCHALLENGEs the students have chosen.

The learning loops should ideally take into account which challenges the students have chosen. The cCHALLENGE will ideally exemplify some of the mandatory curriculum criteria associated with various subjects.

The week before: Know Your Why! Before the 30-day cCHALLENGE begins, students should, through ChangeLab workshops, have chosen their challenge and be able to reflect on why they have chosen it. When appropriate, students should be supported in seeing the relationship between their challenge and the larger topic being studied in the curriculum.

The class should prepare for the project together and build a sense of commitment around it. This can be done, for example, by signing a "contract" that they undertake to take an active part in the project and post a certain number of times (e.g., at least once a week) or by taking a group photo and posting to social media with relevant hashtags. You could also get each student to share what challenge they have chosen and why.

Create a space where all levels of knowledge and engagement are welcome, and all choices validated and equally good. It is not about who reduces the most CO_2.

Ensure participants read and follow the Transformative Program: During the 30 days, students must try to read and immerse themselves in the Transformative Program and discuss it with teachers, fellow students, friends, and family. Setting time aside for a regular weekly discussion, as discussed in the next point, is a highly recommended way to do this.

Set up a regular forum for the group to check in with each other and share insights: Autonomy, competence, and relatedness are basic human needs to sustain changes in habits. cCHALLENGE enables these to emerge, but teachers are key to providing a facilitated, supportive process within the class structure to encourage and help the students and gently push them to explore past the boundaries of their cultural comfort zones.

Teachers can help the students explore their own agency and provide positive feedback through regular sharing forums. This is an important part of the cCHALLENGE. Educators should encourage students to share with each other.

Classroom and/or group discussions are valuable opportunities for students to inspire each other and keep each other motivated. Students will feel seen and heard and experience that their stories have an impact on others around them. They will experience that their stories are stories that people can recognize and can inspire others to action. Secondly, the sharing of stories is important for building a sense of community in the group and enhancing collective learning. Student motivation and engagement will be enhanced if they can connect their learning to a wider context.

Help students explore, inquire, and do research: Students should be encouraged to think critically about their change experiments, address current debates (for example, related to vegetables wrapped in plastic, or recycling, carbon emissions) and do research and gather data to identify the environmental benefits and impacts, advantages, disadvantages, etc. They should also reflect on barriers and alternatives and the factors that promote or impede change. Learning to switch perspectives is an important skill to cultivate, in order to strengthen adaptability, empathy, and resilience.

Expect a decrease in motivation around week 3: Experience shows that challenges (regardless of the chosen experiment) tend to become more difficult after a few weeks. This occurs after the initial excitement and novelty wears off, and when the interest of friends and family subsides. Participants may also have experienced some failure and frustration. It is important to discuss these experiences and emphasize that this is a critical stage in change processes. Self-reflection about resistance to change and awareness of "change fatigue" play an important role in succeeding with sustainability experiments.

5.4 Practical Questions

How many can do the cCHALLENGE at one time?

The cCHALLENGE can be run in a single class or year level. A single class is good, but many educators have also had a good experience with two or more classes doing it at once - grouping the students into smaller groups where they can read each other's reflections in class. We can discuss different size groups and how to cultivate a culture in which everyone feels seen and heard.

How much time do I need to allocate to this each week?

The cCHALLENGE does not involve a great time commitment if it is well planned and integrated into classwork. Ideally, the cCHALLENGE will align with other educational goals and will not add too much to the teachers' workloads.

Time needs to be allocated for preparing for the project with the cCHANGE team, including an online training session, and check-in calls during the challenge.

At least 30-45 minutes should be allocated for discussion and reflection each week in class during the 30-day period. Some time also needs to be allocated to providing the students with feedback on their reflections.

Is it compulsory for the student to reflect?

We recommend that it be compulsory for the students to reflect on their experiences. Reflection is a very important part of the cCHALLENGE. Verbal reflections in the group are good but written reflections are also powerful. Ideally, students should write reflections at least one to two times per week. Writing time could be incorporated into the class discussion time.

How do I decide on the delivery method? Should I choose the digital version or the Pen and Paper version of the cCHALLENGE?

The delivery method you chose is dependent on the students' age, time availability, and teachers' engagement, competence, level of flexibility, and confidence in delivering content related to sustainability issues.

The Pen and Paper version could work as an easy introduction on how to work with sustainability and change in schools. The digital platform is a great possibility to connect and learn from each

other but requires a level of engagement from both students and teachers to realize its fullest potential.

Grading

Keeping the content of cCHALLENGE posts 'evaluation-free' fosters a more collaborative experience.

A reflection paper in one or more subjects can be done after the 30 days is over to assess what the students learned about how their challenge related to relevant topics e.g., resource-use, sustainability, or citizenship.

The written reflections could form part of the assessment, for example if students are required to post a certain number of posts during the project or if the writing of the reflections are part of a language class.

5.5 Guidance on coaching students during a cCHALLENGE

Climate change and sustainability issues can bring up strong feelings and emotions, such as hopelessness, grief, overwhelm, confusion, anxiety, and anger. It is important that students can bring up these emotions and impressions during their reflections, and that teachers support them to feel a sense of agency and constructive hope. cCHANGE will offer some resources regarding how to hold this and support the students through these emotions.

Providing the students with feedback on their reflections is important.

Through feedback they will feel:

- Seen and heard
- Supported
- That their perspective is valued
- That their experiment is important

Giving timely feedback is also a chance to continue bringing them back to the Transformative Program and to encourage them to explore different perspectives on their challenges.

Some tips on feedback:

Avoid judging and criticizing

The goal is to see them, to acknowledge their experience, and to encourage them to reflect more deeply. Avoid telling them they have been bad or have failed. cCHALLENGE aims to awaken their own sense of judgement rather than looking to others for approval.

Do not shame them or push them

This 30-day experiment with change is not about being perfect, and the students should not feel guilty about not managing to keep up with their challenge. Instead, encourage students to reflect on why they have not been able to keep to their challenge and to consider under which circumstances it has been challenging. Perhaps their challenge is too difficult or too easy. Maybe the systems around them are making it too difficult. Raising these issues in the classroom helps students reflect on what needs to be in place in society to make change possible.

How can you acknowledge the serious of the problem but also give the students hope and engage them?

It is important to recognize the scale and the urgency in responding to issues such as climate change. At the same time, is also important to help students to take broader and deeper perspectives that help them to recognize and engage with the potential for transforming society in an equitable and sustainable manner.

Just listening to their concerns is a very important first step. After that there are a number of resources around how to respond to anxiety around this issue.

Holding both realistic concern and hope can be motivating. Research has found that people who have a constructive, realistic sense of hope tend to believe individual action against climate change can be effective, support climate policies, and say they will engage politically.[5] Constructive doubt is also associated with support for climate policies and an intention to take political action. The combination of constructive hope and constructive doubt is an especially powerful predictor of political action. "This finding implies that recognizing that we could reduce climate change, but that people are not doing enough and thus we may fail, is highly motivating".[6]

As a teacher, should you emphasize your own opinion?

Transformative learning involves recognizing that there are multiple perspectives and interpretations of environmental issues and moving away from right vs. wrong views. Experiments should provide a safe space for students to reflect and discover things for themselves, at their own pace. Inquiry-based approaches and posing questions that help students reflect is preferable to clear advice. It is better to let the students be the researchers, exploring the topic, and 'sowing seeds' for reflection.

[5] Ojala, M. (2012) Hope and climate change: the importance of hope for environmental engagement among young people, Environmental Education Research, 18:5, 625-642.

[6] *DeWeerdt, S. (2019) "The nuanced dance of hope and doubt in climate change mobilization" Anthropocene. Downloaded at: http://www.anthropocenemagazine.org/2019/05/a-little-gloom-a-little-brightness-is-the-best-recipe-for-climate-action/*

5.6 Access and contact

The Pen and Paper version of the cCHALLENGE tool and a range of supporting teaching resources, are available for download via the SEAS project website (https://www.seas.uio.no/publications-reports/).

The digital version requires more coordination and planning. If you are interested in exploring the use of the digital version and accessing teaching support materials, please contact Leonie Goodwin (leonie.goodwin@@cchange.no).

More general information about cCHALLENGE is available via the following website: https://www.cchallenge.no/)

5.7 Background Material

Bentz, J. and O'Brien, K., 2019. ART FOR CHANGE: Transformative learning and youth empowerment in a changing climate. Elem Sci Anth, 7(1), p.52. DOI: http://doi.org/10.1525/elementa.390

Leichenko, R., Gram-Hanssen, I. & O'Brien, K. Teaching the "how" of transformation. Sustain Sci (2021). https://doi.org/10.1007/s11625-021-00964-5

Leichenko, Robin M. & O'Brien, Karen (2019). Climate and Society: Transforming the Future. Polity Press. ISBN 9780745684383. 250 p.

O'Brien, K., Hochachka, G. & Gram-Hanssen, I. "Creating a Culture for Transformation" (2019). In Climate and Culture: Multidisciplinary Perspectives on a Warming World. (Eds. Feola, G., Geoghegan, H., and Arnall, A., Cambridge University Press. ISBN 9781108505284 https://doi.org/10.1017/9781108505284

O´Brien, K. and Sygna, L. (2013) Responding to climate change: The three spheres of transformation. Proceedings of Transformation in a Changing Climate, 19- 21 June 2013, Oslo, Norway. University of Oslo (pp.16-23). ISBN 978-82-570-2000-2.

6 Sensemaker® – manual and guidelines

Delivered online or via an app, SenseMaker® captures stories, or narratives, from groups of people. In a further step, respondents interpret their own stories with the help of a series of indicators. At the backend SenseMaker includes visualisations which can be used to reveal complex patterns, trends, and anomalies that would not be visible using conventional analysis. At the same time, researchers can explore each and every story underpinning the macro picture. SenseMaker can furthermore be applied as a tool for mining emergent practices by students, and for teachers to reflect on multiple perspectives and conflicts of interest.

A SenseMaker capture was developed and implemented in the SEAS project to obtain a deeper understanding of perspectives, interests, concerns, and sense of agency relating to climate change and sustainability issues among students, educators, and other stakeholders. It has been brought into the SEAS project with multiple goals in mind:

- Allowing researchers and respondents to analyze emerging narratives.
- For the respondents in the various sustainability challenges and local networks - the tool will be useful for monitoring emerging patterns and gaining agency over one's own learning.
- For consortium partners - SenseMaker opens up for synthesis and comparison across networks, facilitating comparable and systematic measurements of empowerment and engagement, as well as comparison of attitudes towards adaptation and transformation.

Below, we begin by introducing the SenseMaker tool generally and outlining some theoretical underpinnings, its features, and benefits and limitations. This is followed by a description of the steps that can be followed when implementing a SenseMaker project, and then more specific information around how the SenseMaker capture was designed and developed in the SEAS project.

6.1 Introduction to the SenseMaker tool

The Cynefin Centre SenseMaker® tool is a research-based software-as-a-service, developed by Professor Dave Snowden, a Welsh management consultant and researcher in the field of knowledge management and the application of complexity science. Snowden is also known for the development of the Cynefin framework, a conceptual framework used to aid decision-making, and he is the founder and Chief Scientific Officer of The Cynefin Centre (https://cynefincentre.com), a management-consulting firm specializing in complexity and sensemaking for social good.

SenseMaker draws on the Cynefin Sensemaking Framework (Snowden and Boone, 2017)[7] and aims to explore and understand the ambiguous dynamics of complex social systems by capturing and making sense of people's attitudes, perceptions, and experiences.

It is used by researchers and decision-makers for monitoring and evaluation; mapping ideas, mind-sets, and attitudes; and detecting trends and weak signals.

Benefits to researchers and decision makers:

SenseMaker links micro-narratives with human sensemaking, in this way decision makers are able to listen deeply and capture the dreams, fears, concerns, ideas, trends, and early warning signs of changes within a group of people. They can identify patterns and themes in the stories and identify collectively held beliefs and contradictions.

This rich data that emerges gives a richer and less biased snapshot of reality than data offered by more traditional methods, such as surveys and interviews and supports analyzers/leaders to make sense of complex, ambiguous, and rapidly changing environments, to form insights into meaning making, to find effective opportunities to intervene in a system, and to monitor changes. (website: https://sensemaker.cognitive-edge.com/).

Applications:

Originally developed as a narrative-based mixed method tool to inform response options in organizations, SenseMaker is now increasingly being used in trans- and interdisciplinary academic domains and in the facilitation of complex development and social intervention planning across various disciplines and sectors.

Van der Merwe et al. (2019)[8] found the most documented uses of SenseMaker in the following three areas:

(i) monitoring, evaluation, and measuring impact;

(ii) mapping of ideation cultures, mind-sets, and attitudes; and

(iii) detecting trends

[7] Snowden, Dave and Boone, Mary E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review.* Nov 2007. https://hbr.org/2007/11/a-leaders-framework-for-decision-making

[8] Van der Merwe, SE. et al. (2019). Making Sense of Complexity: Using SenseMaker as a Research Tool. *Systems.* 7:2. doi:10.3390/systems7020025

How it works:

SenseMaker collects first-hand narratives from respondents and combines these with quantitative data and pattern visualization. This quantitative data is created by the respondents themselves who self-define the narratives they have provided by signifying the responses they gave.

Through this self-signification, SenseMaker is able to combine the qualitative data with the respondent's own self-generated quantitative data. Importantly the power of interpretation sits with respondents, not with third parties e.g., researchers, who interpret the qualitative data on behalf of the respondents.

More specifically, research questions are built into the SenseMaker instrument as "signifiers" i.e., concepts that anchor the plotting of respondents' micro-narratives in space. Building on these signifiers, a signification framework is created. This consists of predetermined questions that guide the inquiry, solicit micro-narratives, and clarify respondents' interpretations of the narratives they provide.

Signification takes place when respondents answer questions about the micro-narrative they shared. Numerical coordinates are associated with the signifiers in the backend. This means qualitative and quantitative data can be assessed in parallel.

When the set of signifiers from all of the respondents are plotted, they display mathematical patterns that reveal a map of the social landscape. This becomes the basis for exploring the relevance of patterns, underlying relationships, norms, and dynamics in the social system being investigated (van der Merwe, 2019).[9]

Theoretical base:

Conceptually SenseMaker is grounded in insights gleaned from complex adaptive systems and the cognitive sciences applied to the analysis of social systems. Specifically, it combines:

Sensemaking and narratives

Sensemaking is a cognitive process in which people structure the unknown, to understand and explain the world, and to inform action. Through sensemaking, information is interpreted and meaning assigned. Sensemaking informs behavior at both the individual and collective scales. In addition, all sensemaking processes are informed by culture, prevailing narratives, knowledge systems, and experiences (van der Merwe, 2019).[10]

There is a growing interest in studying processes of human sensemaking, and narratives can be particularly useful for this. People make sense of the world through the construction of

[9] Ibid
[10] Ibid

narratives - the everyday micro-narratives or "small stories" they tell in social interactions (van der Merwe, 2019).[11]

The data extracted from these daily micronarratives (snippets from daily work or private life) can reveal what informs decisions, actions, interests, and principles and, may be useful for discovering what is considered public truth and preferable behavior in a particular context (van der Merwe, 2019).[12] Sensemaking, narrative, and culture are interwoven and give feedback to one another in complex ways. The patterns that emerge in the narratives of individuals, groups, or organizations are avenues for systemic meaning-making. The sensemaking approach abductively explores connections and patterns between the elements to understand the systemic relationships.

Several sensemaking research methods exist, of which SenseMaker is one.

Complexity

Sustainability challenges are complex, cutting across the individual, cultural, and the societal contexts, involving science, politics, and ethical concerns, where the science is often underdetermined for any specific action and there are conflicts of interests involved. Many heuristics help humans to reduce complexity, but inevitably people tend to disagree on how to perceive and go about sustainability issues. Within educational research, the issue of complexity has been explored as an inevitable aspect of open systems (Osberg & Biesta 2010, Biesta, 2010)[13]. Open systems interact with their environment in non-deterministic ways.

When dealing with complexity, Snowden and Boone (2007)[14] suggest interacting with the system through what they call "probing" or —small safe-to-fail experiments. As a result of this probing, managers sense patterns that are emerging from the system and can respond in ways that either encourage or discourage undesirable system behavior. Each response initiates the next probe, in an ongoing adaptive cycle.

How SenseMaker differs from other reductionist/traditional approaches:

Traditional and reductionist approaches to analyzing social complexity can be limited in the explanations they provide as they ignore key dynamics and features of complex adaptive systems. Some key differences between SenseMaker and reductionist and traditional approaches, such as surveys, are listed in the table below.

[11] Ibid
[12] Ibid
[13] Osberg, D. and Biesta, G. (2010). *Complexity Theory and the Politics of Education.* The Netherlands: Sense Publishers.
[14] Snowden, Dave and Boone, Mary E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review.* Nov 2007. https://hbr.org/2007/11/a-leaders-framework-for-decision-making

How SenseMaker differs from traditional survey methods:

Traditional Survey Methods	**SenseMaker®**
Numbers that lack context.	Numbers come with context of stories, the latter. which can be accessed directly when needed.
Seeks opinions or evaluations of people which are usually not immediately actionable.	Seeks descriptive narratives (observation or experiences), which are immediately actionable.
Uses direct questions which people can game (or gift the expected right answer.	Use of indirect prompting questions force people to think and elicit answers that tend to be more honest and revealing.
Questions are based on a pre-existing hypothesis therefore results contain only the insights that we thought to ask for.	Narrative elicitation questions are pre-hypothesis and therefore allow unexpected insights to emerge.
Reliance on traditional statistical analysis which 'drowns out' weak signals until they become significant, at which point it may be difficult and expensive to intervene.	Visualizations in SenceMaker present alternative and diverse points of view and make weak signals visible.
Usually once-off or administered periodically, therefore results may become outdated quickly, or opportunities may be missed to intervene early when new behaviours emerge.	Continuous capture allows for continuous monitoring.
Data requires analysis before becoming useful, therefore there is a time lag between capture, analysis and intervention.	Data is available in real-time and visualizations make patterns accessible.

(Source: Anne Caspari 2020)[15]

SenseMaker also differs significantly from other narrative-based research methods such as immersive field-based observations and in-depth interviews, which can result in a mixing of the views, voices, and values of the researcher with the respondents'.

This points to three important design principles underpinning SenseMaker 1) democratisation, 2) empowerment, and 3) collective intelligence. Key to this, is that signification of the data occurs at the point of origin i.e., the participant. That is the originator of the story is given the power to interpret it. This process (known academically as distributed ethnography (van der Merwe, 2019))[16] seeks to democratise the data collection process, resulting in epistemic justice (SenseMaker website, 2021)[17].

Through this self-signification, SenseMaker removes ethnographic coding and expert re-interpretation, as respondents assign meaning to their own micro-narratives. This enables large scale exploration of diverse groups, reduces researcher bias, and allows for more objective analysis, while at the same time it can "rehumanize" the data by bringing in the respondents' voices. (Van der Merwe et al, 2019).[18]

[15] Caspari, Anne. (2020). *Sensemaking/Sensemaker collecting micronarratives in cities.* Integral Urban Series on Thriveable Cities. Volume 21: Coming of Age in a Post-COVID19 World: Dare to Dream. https://issuu.com/paulvanschaik/docs/uh21-dare2dream

[16] Van der Merwe, SE. et al. (2019). Making Sense of Complexity: Using SenseMaker as a Research Tool. *Systems.* 7:2. doi:10.3390/systems7020025

[17] CognitiveEdge (2021) *SenseMaker – Why SenseMaker?* SenseMaker website, accessed 17 March 2021. https://sensemaker.cognitive-edge.com/why-sensemaker/

[18] Van der Merwe, SE. et al. (2019). Making Sense of Complexity: Using SenseMaker as a Research Tool. *Systems.* 7:2. doi:10.3390/systems7020025

Some possible limitations:

Van der Merwe et al. (2019)[19] list the following possible limitations researchers should consider to assess and manage risk implications to their research objectives, some of these include:

- The initial investment in becoming familiar with the approach sets a high barrier to entry; however, with experience, the tool becomes easier and more cost effective to use.
- Mager et al. (2018)[20] advise to only embark on a SenseMaker study if key stakeholders are prepared to actively engage in sensemaking, value hearing different voices, and would be receptive to the whole distribution of patterns, including outliers. At the same time, it is important to manage expectations, as some respondents may assume that telling their stories will lead to tangible responses, which may not be the case.
- Contrasting responses have been reported from the application of the SenseMaker method. Respondents often welcomed the opportunity to share their concerns. On the other hand, it has also been reported that respondents did not complete surveys and projects were abandoned (Casella et al. 2014).[21]
- Various ethical issues may arise in the use of SenseMaker. The researcher needs to consider whether this form of research makes participants vulnerable by revealing information that might be used against them.
- Even though respondents provide their own stories and rate them, there may be power asymmetries involved in terms of who has access to the overall patterns and the interpretation of results. It is possible to overcome this by feeding the data and patterns back to the respondents, so they can see the overall collective picture for themselves.
- There are varying opinions about the validity of quantifying social phenomena. The SenseMaker approach may be criticized as "scientism" (Hayek, 1942)[22] as it applies techniques from natural sciences, to social science research. Critics could argue that as social phenomena cannot be quantified or measured meaningfully, the numerical data and quantitative diagrams derived from SenseMaker can be seen as weak. Van der Merwe et al. (2019)[23] suggest that SenseMaker results should not be overanalyzed, held lightly, and verified through other measures, as they are indicative at best.

[19] Ibid

[20] Mager, F.; Smith, B.; Guijt, I. *How Decent is Decent Work? Using Sense Maker to Understand Workers' Experiences*; Oxfam: Oxford, UK, 2018.

[21] Casella, D.; Magara, P.; Kumasi, T.C.; Guijt, I.; Van Soest, A. (2014). *The Triple-S Project Sense Maker Experience: A Method Tested and Rejected (Triple-S Working Paper 9)*; IRC International Water and Sanitation Centre: The Hague, The Netherlands, 2014.

[22] Hayek, F.A. Scientism and the Study of Society. Part I. *Economica* 1942, *9*, 267–291.

[23] Van der Merwe, SE. et al. (2019). Making Sense of Complexity: Using SenseMaker as a Research Tool. *Systems.* 7:2. doi:10.3390/systems7020025

- Turning to the data collection method, Miller and Horst (2013)[24] found that when people are asked to construct micro-narratives on an electronic devices, the effects of the technological acceleration may lead to a loss of depth and meaning. Kurtz (2013)[25] found that giving respondents adequate reflection time during the narrative collection process results in richer data. Consideration should be given to the careful design of the data collection process.

6.2 Designing and Implementing a SenseMaker capture



The four steps in SenseMaker projects (van der Merwe, 2019)[26]

Step 1: Initiation – Design and setting up the tool.

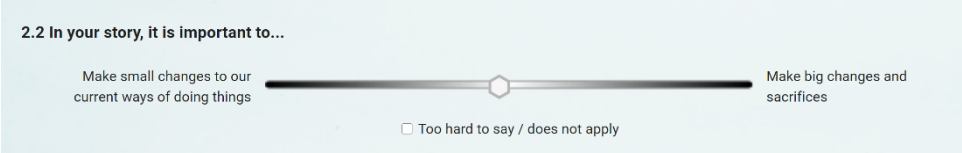
This step includes the conceptual design, detailed design, creating the signification framework, and preparing for online data capture.

[24] Miller, D.; Horst, H.A. The digital and the human: A prospectus for digital anthropology. In *Digital Anthropology*; Horst, H.A., Miller, D., Eds.; Bloomsbury: London, UK; New York, NY, USA, 2013; pp. 3–38.
[25] Kurtz, C.F. *More Work with Stories, Advanced Topics in Participatory Narrative Inquiry*; Creative Commons: Mountain View, CA, USA, 2013.
[26] Van der Merwe, SE. et al. (2019). Making Sense of Complexity: Using SenseMaker as a Research Tool. *Systems.* 7:2. doi:10.3390/systems7020025

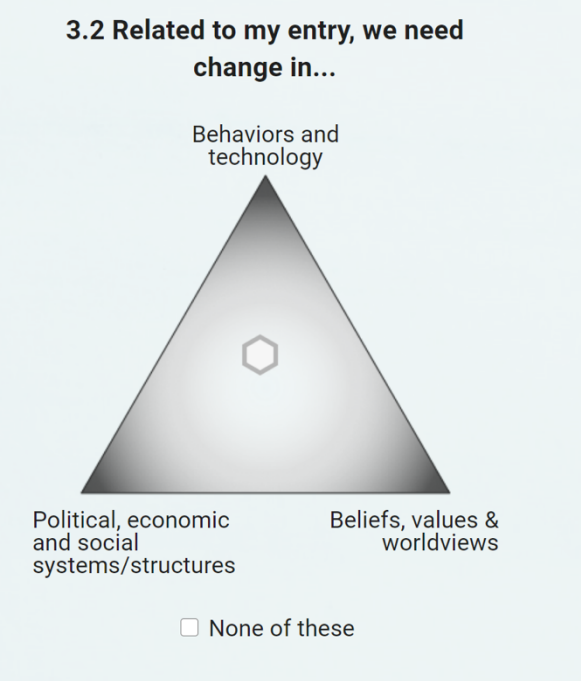
During conceptual design, the research questions and overarching goals of the capture are agreed on, in addition to some of the theories that will underpin the design of the framework.

During detailed design, the capture designers:

- Design the prompt (i.e., the question) that asks respondents to supply the micro-narrative. This is an open-ended question that invites respondents to provide an observation or anecdote.
- Design the self-signification interactive widgets including the triads and dyads based on relevant theories (see the figures under for examples of dyads and triads used in the SEAS capture) and the multiple-choice questions (these clarify aspects of the anecdote or provide respondent demographics.) User input from the triads and dyads provides numerical data that can be statistically analyzed and visualized, while results from the multiple-choice questions are used to filter and further explore the data.



Example of a dyad: A dyad widget consists of a slider used to indicate the relative strength of a concept, quality, belief, or outcome along a continuum between two opposite extremes, where the extremes are described as either mutually negative, positive, or neutral. Dyads are used to explore underlying beliefs, test a disguised hypothesis, or to measure the strength of assumed modulators.



Example of a triad: A triad widget is a triangle with labelled corners and is used to convey the relative importance of three concepts. Triads are useful to probe trade-offs and reveal subtleties and undercurrents in the system. Respondents are invited to place a dot in a triangle to indicate the relative strength or influence of the concepts in the corners relative to their anecdote. The indicated position in the triad will return three numerical results which always sums to 100, representing the relative weight of the named corners.

The final phase in the Initiation step is usability testing, translation, and online deployment.

Step 2: Story Collection – Implementing the narrative collection strategy and capturing data.

Step 3: Sense-making - Explorative pattern analysis and collective sensemaking of the meaning behind the patterns.

In this step, researchers/decision-makers note links or contradictions between patterns and interesting clusters of narratives. Statistical correlations can also be investigated (however the SenseMaker analysis is not suitable for measurements or inference on causality).

This bottom-up exploration of the data can be complimented by a top-down process that asks guiding questions and identifies which combinations of signifiers are relevant to those questions.

Decision-makers can also drill down into each narrative to get insights into what is informing the patterns and make their own interpretation of the meaning behind the data.

At this point, one can begin to identify possible interventions i.e., clusters of stories where the situation might be nudged in a beneficial direction through encouraging "more stories like these, fewer stories like those".

The exploratory analysis step above can then be followed up by collective sensemaking sessions with the respondents themselves to solicit reflections on the emergent patterns and what underlies them. This participative, reflective process can be very valuable for getting alignment, buy-in, building agency, and empowering groups.

Step 4: Response – Amplify the positive and dampen the negative to nudge the system in the desired direction.

Based on the insights gained, researchers/decision-makers can look for opportunities to respond through small safe-to-fail intervention strategies to achieve "more stories like these, fewer stories like those".

Another guiding principle in sensemaking work, is the concept of fractal intervention: whereby action potential exists at all levels, from the highest level to the lowest, with formal and informal influencing factors and constraints. According to David Snowden's Cynefin Framework (Snowden and Boone, 2007)[27], in the complex domain, change takes place by changing framework conditions and attractors, promoting conditions that are considered advantageous, and dampening negative factors. Change in the whole collective is always a result of the total of all shifts in everyday behaviour, relationships, and attitudes in a direction that is desirable. The small step is a key unit and can lead to very different ways to intervene.

6.3 SenseMaker in SEAS

The utilization of the SenseMaker tool in SEAS aims to obtain a deeper understanding of perspectives, interests, concerns, and ideas relating to climate change and sustainability issues among students, educators, and other stakeholders.

The SenseMaker tool has been brought into the SEAS project with multiple goals in mind:

- Allowing researchers and respondents to analyze emerging narratives.
- For the respondents in the sustainability challenges and local networks - the tool will be useful for monitoring emerging patterns and gaining agency over one's own learning.

[27] Snowden, Dave and Boone, Mary E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review.* Nov 2007. https://hbr.org/2007/11/a-leaders-framework-for-decision-making

- For consortium partners - using SenseMaker opens up for synthesis and comparison across networks, facilitating comparable and systematic measurements of empowerment and engagement, as well as comparison of attitudes towards adaptation and transformation.

In the section below, we outline the objectives and process of designing and developing the pilot of SenseMaker in the SEAS project.

Step 1: Initiation

1.1. Conceptual Design

In the autumn of 2020, the first initial pilot SenseMaker capture was developed in close collaboration with cCHANGE, University of Oslo partner, Anne Caspari at EZC.Partners[28], and Beth Smith at The Cynefin Centre. In this phase, the group discussed the goal of the first pilot capture, context, potential respondents, and their degree of participation. The group also identified some ideation and theoretical constructs upon which the signification framework would be built. The usefulness of the results can be strongly influenced by the fit of the constructs decided upon in this phase.

The goal was to seek stories that provide insights into the current attitudes of young people about their sense of agency in relation to climate change and sustainability challenges. This includes, for instance, personal agency and political agency, and the extent to which they experience hope versus despair and detachment versus empowerment regarding the present and future and their narratives related to climate change and transformations to sustainability.

1.2 Detailed Design: Creating the signification framework

Once the group aligned on the concepts it wanted to explore, they began establishing the signification framework and preparing the online instrument for data capture.

In Part 1, respondents are asked to contribute their micro-narratives, i.e., reflections on their lives and how climate change and sustainability affect them.

The framework starts with an open-ended question that asks respondents to relay an observation or an anecdote related to climate change and sustainability. Considerable time was spent considering this first question, because this sets the boundaries for the responses that follow.

[28] EZC Partners: https://ezc.partners/

In this case, the opening question is:

> *Think about an issue or event that relates to climate change or sustainability. Please share ONE story from your personal experience that describes how you relate to this issue in your daily life. Your experience may be positive or negative, minor or significant, or routine or special. Briefly describe your example, incident, or story here:*

This open-ended question is followed by a request to summarise the story in one or a few words.

The next two parts contain questions for clarification, in which respondents self-signify their narrative via triads, dyads, and multiple-choice questions. So, Part 2 contains four dyads exploring respondents' beliefs:

- Around the frequency of climate change impacts.
- The need to address climate change through small or big changes and sacrifices.
- Their ability to take action to address climate change and sustainability issues in their environment (their school, their family, their city).
- Their sense of agency generally and how much power they perceive they have to change things.

Then Part 3 contains six triads addressing based on these concepts/theories:

- Three Horizons Framework (Sharpe, 2013)[29]
- The Three Spheres of Transformation (O'Brien and Sygna, 2013[30,31,32], Sharma 2007[33])
- Needs
- Interest/concern

[29] Sharpe, B. *Three Horizons: The Patterning of Hope.* Triarchy Press Ltd: Dorset, UK, 2013.
[30] O´Brien, K. and Sygna, L. (2013) Responding to Climate Change: The Three Spheres of Transformation. *Proceedings of Transformation in a Changing Climate*, 19-21 June 2013, Oslo, Norway. University of Oslo. ISBN: 978-82-570-2000-1
[31] O'Brien, K. (2018) Is the 1.5°C target possible? Exploring the three spheres of transformation. *Current Opinion in Environmental Sustainability (COSUST).* Vol 31: April 2018, 153-160. DOI:10.1016/j.cosust.2018.04.010
[32] IPCC (2014) Chapter 20: Climate-resilient pathways: adaptation, mitigation, and sustainable development. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1122.
[33] Personal to Planetary Transformation by Monica Sharma in Kosmos Journal, 2007. Download at: https://www.kosmosjournal.org/article/personal-to-planetary-transformation/

- Agency – Personal sense of agency
- Obstacles

Part 4 probes their beliefs, sense of agency, and their visions in relation to the future more deeply with the following open questions:

> *Part 4: With the story you shared in mind, think about the following:*
>
> *4.1 Imagine an ideal future 25 years from now. How was that created or achieved? How did we get there? Write your answer here:*
>
> *4.2 If things continue as they are now, what do you think the consequences will be in around 25 years? Write your answer here:*
>
> *4.3 If you could ask a single question of the decision makers and people in power, what would it be? Write your answer here:*

Part 5 is a series of multiple-choice questions aiming to clarify aspects of the anecdote and capture some respondent demographics. Consideration was given to the various categorizations that would be useful to filter results during the analysis, e.g., age, gender, location, or feelings linked to the anecdote.

6.4 Access and contact

The SenseMaker tool requires support, training, and assistance to design and implement. For more information contact Anne Caspari at EZC Partners and/or Beth Smith at The Cynefin Centre.

Emails: anne.caspari@ezc.partners / beth.smith@cognitive-edge.com

6.5 Background material

Articles:

Lynam, T., and C. Fletcher. 2015. Sensemaking: a complexity perspective. *Ecology and Society* 20(1): 65. http://dx.doi.org/10.5751/ES-07410-200165

Van der Merwe, SE. et al. (2019). Making Sense of Complexity: Using SenseMaker as a Research Tool. *Systems*. 7:2. doi:10.3390/systems7020025

Presentations:

Caspari, Anne. (2020). Sensemaking/Sensemaker collecting micronarratives in cities. Integral Urban Series on Thriveable Cities. Volume 21: Coming of Age in a Post-COVID19 World: Dare to Dream. https://issuu.com/paulvanschaik/docs/uh21-dare2dream

Reports:

Mager, F., Smith, B. and Guijt, I. (2018) "How Decent is Decent Work? Using SenseMaker to understand workers' experiences." Oxfam Research Report May 2018. 32 pages. https://oxfamilibrary.openrepository.com/bitstream/10546/620476/1/rr-decent-work-sensemaker-310518-en.pdf

Snowden, D. and Rancati, A., Managing complexity (and chaos) in times of crisis. A field guide for decision makers inspired by the Cynefin framework, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-28844-2 (online),978-92-76-28843-5 (print), JRC123629. https://ec.europa.eu/jrc/en/publication/managing-complexity-and-chaos-times-crisis-field-guide-decision-makers-inspired-cynefin-framework

Videos:

AcademiWales (2016) Dave Snowden – How leaders change culture through small actions. YouTube. https://youtu.be/MsLmjoAp_Dg (ca. 1hr & 11 mins).

Cognitive Edge (2019) Introducing SenseMaker ®, YouTube. https://youtu.be/SkRe7Xg7pk4 (ca. 7 mins).

TEDx University of Nicosia (2018) Complexity, citizen engagement in a Post-Social Media time. YouTube. https://www.youtube.com/watch?v=JkJDyPh9phc (ca. 18 min 30 secs).

Science Education for Action and engagement towards Sustainability

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