Something powerful is happening in our schools

Unleashing Education's Transformative Power Through Open Schooling
Insights from three years of SEAS research

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SEAS

Science Education for Action and Engagement towards Sustainability

Unleashing Education's Transformative Power Through Open Schooling

Insights from three years of SEAS research

www.seas.uio.no
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Something powerful is happening in our schools.

Schools are where we learn to **connect** with the world around us, where our shared experiences shape our attitudes and perspectives.

When we build **bridges** between schools and our communities, we connect different parts of society through creativity, imagination and learning.

In communities across the world, teachers are preparing their students for the **outside world** by bringing it into the classroom.

This is open schooling.

Open schooling is powerful because when real-life is brought into schools, students have the opportunity to practice and develop the critical skills needed to be responsible citizens.

As teachers, principals and families, this is how we can nurture curious minds, build awareness and equip our young people with the tools and confidence to navigate real world challenges with empathy and understanding.
The researchers of the SEAS project have developed a set of concepts and practical tools that unleash education's transformative power as societies adapt to the threats of the Anthropocene:

1. Find creative collaborations between your schools and the local community.
2. Support you and other teachers to put open schooling into practice in your school.
3. Empower learners to think critically and engage with other perspectives.

Our resources are guides that are designed to help you find ways that work for you!

When the capacity to care ignites the desire to create a more equitable and sustainable world, this is how real change happens.

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Table of content

Schools as agents of change in the anthropocene

Schools as agents of change in the anthropocene

The world is inevitably changing, and with it, society's educational needs. The dawning of the Anthropocene is a paramount challenge across all aspects of society, demanding that we critically re-evaluate established ways of thinking, teaching, and learning about sustainability. It demands that we envision and co-create more life-affirming ways of educating and of inhabiting our biosphere. This critical time of great dangers opens new challenges and opportunities for educators, who face the task of preparing the coming generations to claim their roles as responsible and caring citizens who contribute to actively transforming societies toward truly sustainable ways of living.

An inquiry into open schooling.
The international research consortium SEAS – Science Education for Action and Engagement toward Sustainability – has explored ways in which open schooling initiatives can help articulate and realize the transformative potential of education, as educators and learners alike come to terms with ongoing, larger transformations in the world. Open schooling aims to engage the larger community in transformational action involving science, leading to new forms of scientific literacies and education. We have documented a variety of expressions this might take. It may involve co-creating arenas where the generations can meet in active listening and critical dialog. It may involve establishing hands-on projects between schools and out-of-school actors, including policy makers, NGOs, local businesses, transnational industries, artists, experts, researchers. It may

involve developing one-time science-and-art projects. It may involve returning periodically to concrete sustainability questions concerning local terrains, whether they are rivers, mountains, sea sides, cityscapes, or cultural landscapes. It may also involve exploring possibilities for lasting institutional, societal, moral, or political change.

Research-based insights on and for transformative science education. Drawing from three years of research across six European countries, we document a range of practices, insights, and tools which have emerged from the rich experiences of these six de-centralized, local open schooling networks. We show how open schooling initiatives open possibilities to learn, not merely for sustainable development, but indeed from and through sustainable development. The findings reported and resources offered in this document, however, do not claim to produce simple, straightforward answers or easy recipes. They are principally oriented toward shared inquiry. They endeavour to open up complex questions of transformation for actively re-negotiating what it means to learn, to critically reflect, to empower, and be empowered through education. They engage and can be seen as narratives of and for change. Ultimately, they open up educational questions concerning the relationship between individual moral choices, larger societal structures, and non-negotiable planetary boundaries.

An action-oriented guide

This guide into our research aims to provide you with insights and resources that should help you participate in and further unleash the transformative potential of education at a time in which change is required at all levels of society. This guide starts with **a brief introduction to SEAS' overall approach to transformation**, and how we apply this understanding to innovation in schools. We then present insights to inform **three main areas of change** that anyone aiming at engaging in open schooling innovations ought to address:

> 1. change concerning the **establishment** of open schooling collaborations;
> 2. change concerning **teachers' empowerment**;
> 3. change concerning **learner's sense empowerment**.

Finally, we provide **a list and links to the main tools and resources developed throughout the SEAS project**, which have been developed to support you embark in this great adventure of rewriting our futures, through education, towards more sustainable and humanizing ends.

SECTION 2
Unleashing transformation
SEAS' overall approach

Unleashing transformation SEAS' overall approach

To better understand how to design, investigate, and re-design open schooling innovations, and how to mobilize schools for the large-scale transformations necessary to respond to the threat that the Anthropocene's crises pose, SEAS draws upon the heuristic of three spheres of transformation – the political, the practical, and the personal (Fig. 1). The heuristic is based on a literature review of theoretical research in the social sciences, accounting for how social transformation happens. The model was originally designed to address climate change, more specifically to discuss whether and how meeting the 1.5°C target is possible. In SEAS, we draw on the model also to understand the processes of change that schools need to go through to enable truly transformational learning.

The circle at the centre of the model refers to the sphere of life in which changes happen at the level of behaviours and technological solutions.
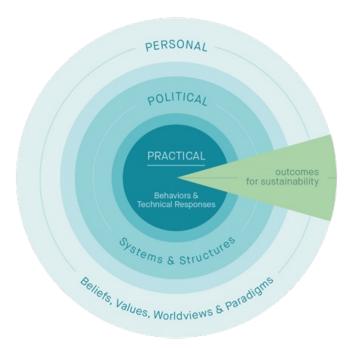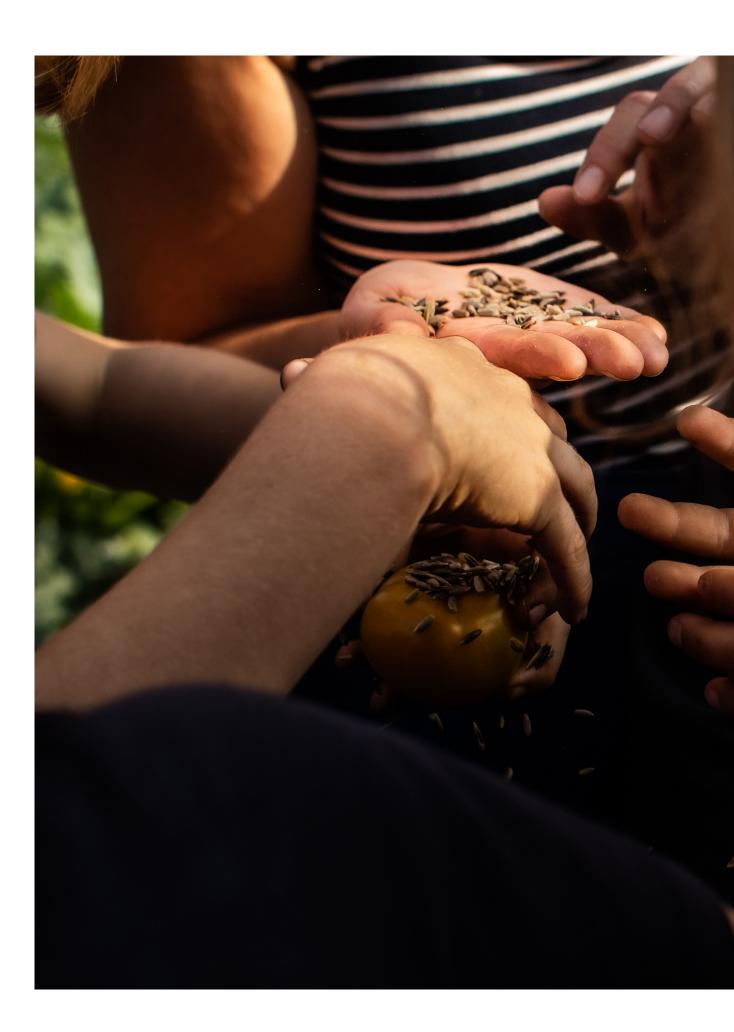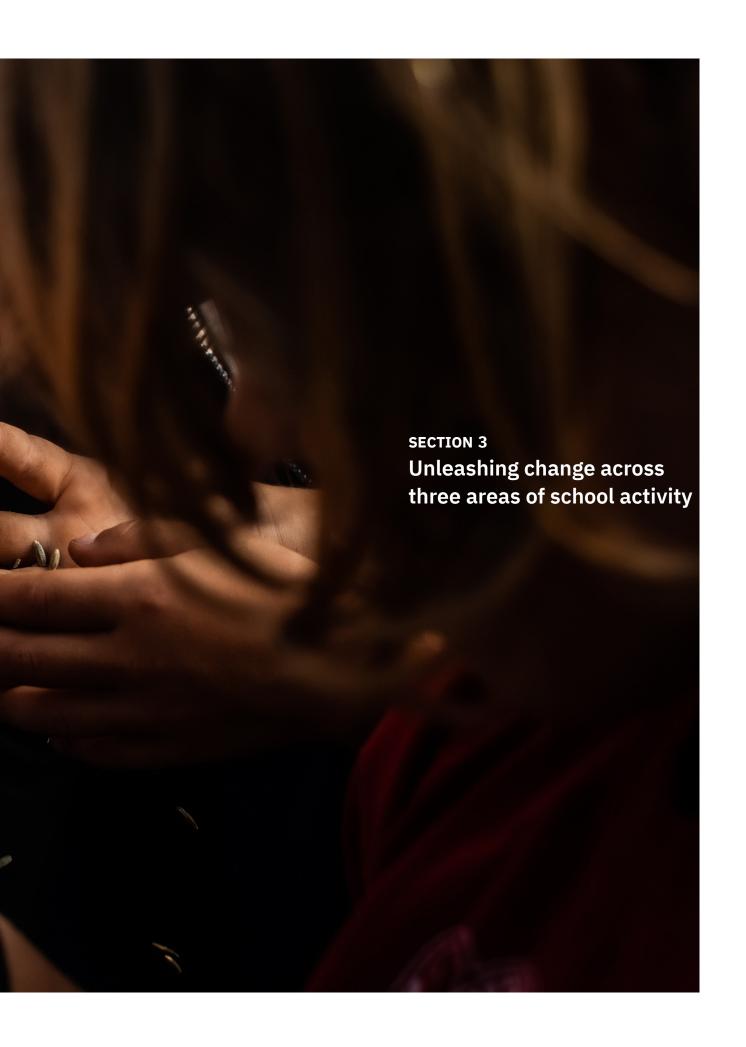

Fig. 1. The Three Spheres of Transformation

This is the sphere that is typically addressed first in conversations of climate change mitigation: changing the ways we behave as individuals and changing the technological means of production and consumption. These changes include finding alternative energy sources and technological solutions that allow us to reduce gas emissions. They include also shifting behaviours and consumption habits such as eating less meat or flying less. While this sphere is vital to reach sustainability goals, our capacity to achieve changes in this sphere is dependent upon the broader political and personal frames within which these technical and behavioural opportunities can flourish. The political sphere refers to the systems and structures of human influence. That includes social and institutional norms and rules that regulate what is legitimate and what is illegitimate. Public or private incentives, juridic frames, and political programs set the stage for the possibility of certain habits and technologies to thrive in the practical sphere.

These political structures, in turn, are framed within broader worldviews and paradigms that characterize given societies at given times in history. These involve generalized beliefs and values that societies develop through broader cultural discourses and imagination. Such generalized beliefs and values set the background against which more specific political structures are made possible – and, by extension, also habits and specific behaviours. For social transformation to surpass the critical thresholds where single gestures, impulses, or actions make a difference, all three spheres need to be considered.

These three overlapping spheres become means to understand transformational processes, both in society and in schools as they engage in open schooling. It is against the backdrop of their dynamic interplay that we report on challenges and opportunities in open schooling innovation.

Applying this model in the context of supporting open schooling innovations involves considering how to enable transformation across all three dimensions. It involves taking measures to enable changes in the practical sphere, such as behavioural and technical solutions for teaching and learning; changes in the school's political systems and structures that would support such technical and behavioural solutions (political sphere); and changes in the values, beliefs, worldviews, and paradigms that inform and provide meaning and orientation to the school's educational mission (personal sphere). This might mean, for example, 1) considering which new tools and practical measures for teaching complex sustainability issues are put into practice (i.e., the practical sphere), 2) what new organizational structures and policies are established to facilitate teachers' and students' participation, say, revised timetables or adjusted assessment goals, (i.e., the political sphere), and 3) what new forms of understanding the school's function and its educational potential emerge in a collaboration network (i.e., the personal sphere).

SECTION 3

Unleashing change across three areas of school activity

Unleashing change across three areas of school activity

Area 1: Establishing Open Schooling Collaborations

The first area of opportunities and challenges one finds when engaging in open schooling innovations exists at the interface between the school and the broader (local, global) community. In open schooling, students and teachers explore possibilities for learning both inside and outside received horizons of what schooling means, and of what schooling can achieve beyond the school's traditional boundaries. This expanding of the school's boundaries demands exploring and experimenting with the ways in which the school relates to out-of-school actors and issues. Through open schooling, students and teachers may encounter professional actors, surprising ideas, novel perspectives, innovative practices, engrossing topographies, or unexpected learning arenas, each of which may present opportunities for deeper, transformational learning. Open schooling makes schools porous to the world, and the world semi-permeable to the work of schools.

Opportunities for transformation open from two complimentary directions. **First, opportunities may come from the inside and outwards.** Open schooling may present opportunities for schools to develop abilities to look at what is happening outside their institutional horizon, and to recognise that there exists a shared space not only of problems, but indeed of attempts to reimagine how humans relate to and act within the biosphere. In this view, schools may recognize themselves as

relevant actors inside larger systems, and as places where cultural changes can and should be taken into action. **Second, opportunities may come from the outside and in.** Ideas, experiences and values from out-of-school settings might enter school cultures, including real-life, complex SSI themes which have the potential to influence and to shape not only curricula, but indeed larger school structures.

Such openings – of schools to the world, and of the world to schools – do not typically happen easily or without friction. Establishing open schooling collaborations entails specific dilemmas, which can pave the way for genuine opportunities. Schools may find that they need to engage in open-ended inquiry cycles of their own, to create seed conversations that might help identify topics of concern, possibilities for intervention, or openings for innovation inside the structures, schedules, and habits that make school culture rich but also difficult to transform from within. Schools and out-of-school actors might need to come together to identify what objectives they share at the outset, and to explicate what tools they might use – or develop – to achieve those shared objectives. A vital observation is that open schooling partnerships often – though clearly not always – emerge as constructive, concrete responses to perceived problematic situations, at various scales of complexity. Establishing open schooling collaborations is no unidirectional process, and it involves transformations in both school and out-of-school actors.

▌Key Insights

A1.1 Establishing shared goals to expand horizons. A core insight concerns the primary relevance of the process of establishing shared goals among partners, which go beyond the respective partner's typical objectives. As innovation spaces, open schooling initiatives expand the horizons of what it is that schools and others are creating together. Co-design processes ought to be aware of the crucial need of careful translation between stakeholders from formal education and out-of-school contexts. Careful translation can help reach a point of articulating shared visions. and require of negotiating and translating. This process clearly reaches into, and potentially mobilizes, transformative potential in socio-material practices and conditions, including practical, political, and personal conditions, both for each partner and across the collaborative network. It also raises important dilemmas with regards to finding an adequate balance between the goals of achieving social change outside of schools, and the educational mandate of schools.

SEAS has developed a resource to support collaboration through a ChangeLab methodology. It elaborates on principles and concrete measures to facilitate negotiating shared goals in open schooling collaborations.

LORET (Locally Relevant Teaching) is a tool to facilitate teachers' collaboration with out-of-school actors, identify sustainability challenges that can then

be integrated in concrete teaching plans.

A1.2 Emerging contradictions and tensions as transformative opportunities. As part of the process of establishing and conducting open schooling in collaboration with multiple actors, becoming aware of and analysing the tensions and/or contradictions that emerge is key to stimulate meaningful transformative processes. These tensions and contradictions emerge when traditional schooling is challenged through the facing of more complex realities. As elaborated in the ChangeLab methodology, it is possible to capitalize on those emerging tensions to make development possible across the three spheres of transformation.

Some of the analyses of actual collaborations have revealed specific tensions and contradictions emerging in the field, including tensions between the school (typically disciplinary) curriculum coverage on the one hand, and the social relevance of the (naturally interdisciplinary) local sustainability topic.

A1.3 Considering the intrinsic (rather than instrumental) value in the collaboration. Empirical studies conducted as part of SEAS have shown that out-of-school partners may conceptualize the value of open schooling collaborations in two different ways: 1) instrumental and 2) intrinsic. In the instrumental approach, the value of the collaboration is conceived in terms of gains achieved through the collaboration, without it requiring establishing or negotiating shared goals. In this approach, partners focus on what they can obtain from the collaboration without

necessarily engaging in a more in-depth co-creation of shared objectives. In the intrinsic approach, the value of the collaboration is conceived in terms of jointly generated shared goals which participants value and which motivate the collaboration.

When examining what teachers value in open schooling collaboration, some of the specific recurring values include the fact that interventions bridge reflection with action, that teaching is experienced as more relevant and authentic, or that teaching becomes a means to de-centre and challenge traditional educational practices and for developing agency.

A1.4 Time, resource allocation, division of labour, and internal and cross-institutional coordination are key aspects when establishing open schooling collaboration. Participants embarking on establishing open schooling collaborations, particularly teachers, typically require structural support internally to meet the demands the complex collaboration posits. An important aspect of this is the need to consider, discuss, and problematize explicitly what internal coordination structures need to be in place to ensure that such collaboration can mature from the initial idea phases and into expressions which will enable success for the entirety of the collaboration. This is true regardless of whether the initiative concerns a one-time inquiry cycle, periodical interventions across a semester, or even collaborations that unfold dynamically across several school years. In assessing the potential of open schooling collaboration to thrive, it is crucial to find functional and sustainable divisions of labour that is agreed upon.
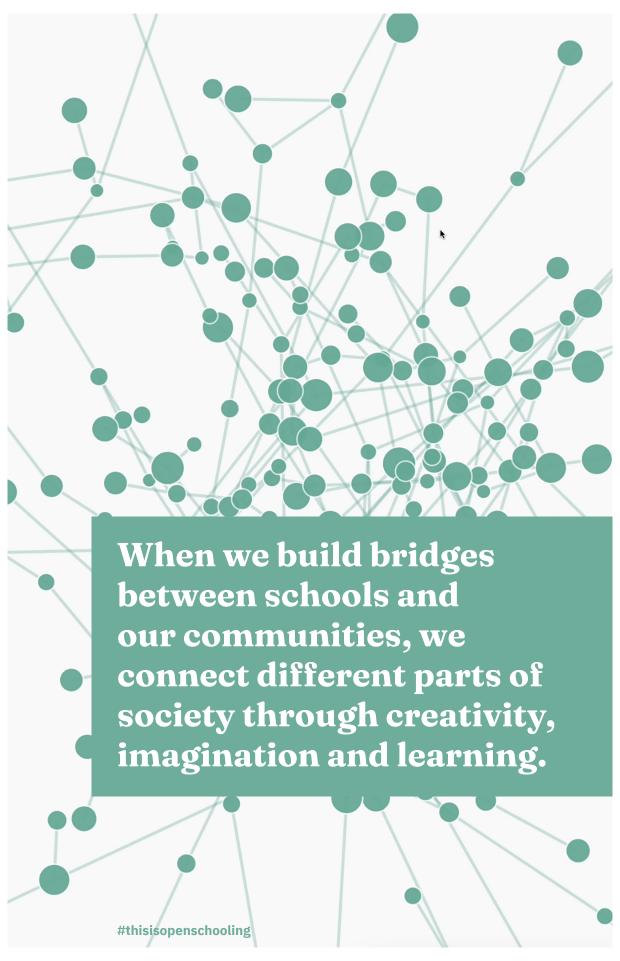
These need to make sense to, and be agreed upon by, all parties involved.

A1.5 Involving school leadership structures. We have also observed that the way school leadership structures get involved in facilitating and coordinating the collaboration with out-of-school partners can be crucial. Again, we have documented that there is no one "right" or "wrong" answer to be found with regards to whether members of the leadership need to be the ones coordinating, or whether it is teachers who directly should take care of the collaboration. Context trumps recipe. But we do have evidence that the degree and quality of a school leadership's involvement in open schooling designs plays an important role with regards to assessing the success of open schooling. Some documented cases show that there is an advantage for teachers to be in control and have direct access to the external collaborators – as long as their relative autonomy is integrated in their lesson planning practices and their allocated time resources. In these cases, the involvement of school leadership has resulted in diminished agency and a sense of alienation on the part of the teachers. In other settings, we have seen the advantages in delegating the coordination with external partners to assigned members of the leadership, thus taking off the coordinating load from teachers' shoulders. Across those cases, we find a value in open dialogue and relatively strong degrees of internal cohesion and integration.

A1.6 Formal agreements may play a pivotal role between schools and out-of-school stakeholders. Agreements that formalize the collaboration between school and out-of-school actors may offer a visible and transparent structure for the cooperation, one which ensures accountability and continuity. They may also enhance the engagement of the involved actors. Involving students directly in the processes of articulating collaboration agreements with out-of-school stakeholders can be a powerful educational tool. Closing formal agreements on desired change can pave the way for tangible, substantial change. Creating opportunities to master such a skill can help students become change agents. However, not all open schooling networks will organize around formal agreements, and not always are they required.

A1.7 Emerging contradictions and tensions in the collaboration are attended to and harnessed as transformative opportunities. There is another key to stimulating meaningful transformative processes, particularly in relation to unlocking the process of establishing and conducting open schooling in collaboration with multiple actors. One must expect, become aware of, and ultimately analyse what tensions and contradictions might emerge. Such tensions and contradictions may arise, say, between a school's assessment demands on the one hand, and the requirements or conditions imposed by the locally relevant (social and/or sustainability) challenge on the other. These tensions and contradictions are likely to emerge when traditional schooling is challenged through complex realities. Our work shows that they ought not to be avoided or side-lined, but rather problematized openly. In fact, we

argue that they contain crucial, indeed transformative potential. Successful open schooling collaborations attend to and capitalize on experienced tensions to make development possible across the three spheres of transformation. In the mentioned example, the tension may be reinterpreted actively as opportunity: First, to change the curricular demands, and second, to reconceptualize the locally relevant challenge as an opportunity for teaching and learning.

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Area 2: Supporting Teachers

Educators consistently mention the need for substantial transformation. As professionals, they find themselves inside complex webs of institutional demands, political guidelines, time pressures, power structures, and the day-to-day demands of meeting and guiding their learners. It is from inside such complexity that teachers may experience working with larger sustainability challenges as difficult. Specific practices which can lead to specific goals may be difficult to identify, and teachers may struggle to relate practices meaningfully to larger visions. They too may experience variations of anxiety or disempowerment. Translating such experiences into specific goals, and again into specific practices, can be demanding in the context of established school cultures, which can be slow to adapt. As challenging can be the task of integrating demands of disciplinary teaching (in sciences and other disciplines) inside such transdisciplinary collaborations as open schooling often are. Established school culture can pose serious challenges to the fruition of open schooling collaborations. A recurring theme across our networks is that established school culture can hamper the teachers' possibilities to sustain open schooling collaborations over time. Posed as a question, we might ask, what conditions can we identify to help and make open schooling collaborations sustainable inside the context of schools?

Open schooling collaborations challenge established roles and assumptions, including the role of the teacher, the role of leadership, and the role of schools within 'the world'. To challenge such roles and assumptions means to open them for ongoing revision. We identify a range of aspects that may be opened for revision. These include:

a. What is it to be knowledgeable?
b. What is it to be competent?
c. What is the role of consolidating practices?
d. How can one relate to a school's constraints?
e. How is it possible to organize collaboration between teachers?
f. How does one navigate the dynamic field between disciplinary tradition and interdisciplinary innovation?
g. How can one develop sustainable support structures across the various strata within schools: from leadership through administration to the teachers?

Clearly, these are multi-level processes. Developments inter-act on various scales, and in ways non-linear and non-determinable. As with the other findings, here too we posit that part of the value of open schooling lies in the ways in which such collaborations open such questions for revision in the first place, concretely and inside living webs of practices and practitioners. Identifying relevant dilemmas, challenges, and questions is a vital part of transformative processes. It consolidates diffuse intentions, narratives, worries, motivations, constraints, and needs around a set of shared objectives and understandings. The challenges and opportunities of supporting teachers are interrelated. Open schooling collaborations can create arenas for open-ended, shared inquiry. Such arenas do not give easy, one-

size-fits-all answers. But they do pose opportunities to articulate constraints, and to help identify pressure points, critical thresholds. This is how openings for transformation are not imposed from outside but can originate from within.

Key Insights

A2.1 Teachers are encouraged to explore the relevance of opening boundaries. Shared inquiry may take the form of setting up creative, safe spaces where teachers (and other school personnel) are welcome to explore and experience themselves as boundary people. Teachers may be invited to cross horizons of understanding, to test critical thresholds, to leave comfort zones created by consolidated perspectives on what it is to be a teacher, what it is to teach a discipline, and so forth. To invite teachers to become boundary people is to invite them to step into an Open – itself a place of transformative potential! In shared inquiry, that Open may or may not be peopled with others – school leaders, learners, out-of-school stakeholders, researchers. In fact, we have seen teachers – alongside learners – step into an Open peopled with non-humans, embarking on shared inquiry with other animals.

A2.2 Disrupting teaching and learning habits. Another way of considering the transformative power of open schooling collaborations is by attending to how these initiatives can pose meaningful disruption to existing practices, habits, and structures. Disruption can become meaningful and allow stakeholders

to articulate and confront dilemmas more clearly and more openly, thus making it possible to explore what transformational potential might lie inside each of those dilemmas. The establishment and implementation of open schooling collaboration can offer meaningful disruption to such practices as lesson planning, questions of how to prepare for class, questions concerning what it means to be knowledgeable in a school subject, the role(s) of being a teacher, the careful use of limited resources (including time), how to manage student workloads, or how to create opportunities inside existing structures and schedules.
Our research network has documented the value of identifying and supporting practitioners to address dilemmas resulting from disrupting habits that take place as educators strive to recognize, articulate, and transform emerging dilemmas of practice.

A2.3 Open schooling initiatives integrate professional development formats supporting teachers' explorations and consolidation of ideas. Teachers may find themselves caught in tight, complex, day-to-day schedules which do not consistently allow for real-time reflexivity on their own practices. Often, open schooling challenges the way teacher planning is otherwise normally organized in schools. To make open schooling initiatives feasible, "sanctuaries" are needed, spaces of shared reflection, especially where researchers and/or other actors involved in the open schooling collaboration participate as co-researchers and co-designers of the reflective process. The shared reflexivity

opens opportunities between practice and theory. Professional roles may open in the process, inviting teachers to experiment with becoming "learners", "co-designers", "co-researchers", or, indeed, "dreamers and visionaries of alternate futures".

The Greenhouse formats allow assessment to take place in real-time, as an integral part of the co-design.

A2.4 Balancing authentic activities with disciplinary demands. Teachers may face a dilemma between balancing, on the one hand, the hands-on aspects of 'authentic' activities and, on the other hand, the 'learning' of relevant disciplinary knowledge ('learning goals'). This dilemma involves re-calibrating and re-assessing notions familiar to teachers, such as practical work, inquiry, and teaching practices.

A2.5 Recognizing teachers as experts in their craft. Open schooling interventions, particularly during innovation stages, typically unfold across a triad of "schools", "out-of-school actors", and "researchers". Inside the triad, we have noticed that teachers may approach the researchers with certain 'positive stigmas', meaning teachers may approach researchers with certain positive biases concerning the degree and depth of the researchers' knowledge. Teachers may consider researchers to be particularly well-qualified inside a given area of knowing. While this may or may not be the case, we have paid particular attention to the importance of levelling the playing field. Open schooling, in the interpretation of SEAS, considers knowledge production to be a shared doing, and learning to

be a reciprocal process of open-ended inquiry. Successful open schooling projects will pay attention to affording to teachers the role of experts in their field

A2.6 Structures and systems are in place to carry and support teachers. This alludes to an earlier discussion in this assessment framework, namely the importance of integrating open schooling collaborations in school culture, particularly in and through leadership. Teachers who experience that their engagements with open schooling initiatives are not backed by leadership, not integrated thoroughly in existing school culture, or unable to transform school culture such that deeper integration becomes possible, may express strong motivational swings between feeling inspired and feeling deflated, even to the point of burning out. We document that this may at times be closely related to lacking structures of in-school support. Successful open schooling initiatives recognize the possible dilemmas concerning a balance between bottom-up engagement – the work and creativity that relies on the teachers' own initiative and (limited) energy – and top-down management, which involves the direction, mandate, and structural support that leadership can provide. Recognizing, anticipating, and expressing such dilemmas can be seeds to transforming them.

A2.7 Open schooling can support and accelerate in-school adaptative organizational processes. Open schooling initiatives can help mediate between teachers and school leadership, as schools try to come to terms with the ins and outs of adapting to the

existential demands of an ongoing socio-ecological pan-crisis. Recent years have made it evident that transformation and adaptation are no luxuries but necessities across all cultural spheres. When it comes to schools, teachers and leadership stand at the long frontier of that adaptation, as it must play out daily in the lived context of practice, existing culture, structures, and systems. It is clear also that teachers and leadership do not always face the same specific challenges and opportunities. Conflicts of interest can emerge even as both sides interpret their professional roles to make the most sense of the complexities and potentials of those roles. This is where open schooling collaborations can create mediating spaces where such adaptative work can take place. Greenhouse formats are one concrete example of such mediating spaces.

A2.8 Transformation can be an emergent property. Teachers may find themselves confronted with emerging possibilities that come from external actors, unexpected twists, or unforeseen inquiry lines that come from the students, and for which the teachers could not possibly be fully prepared when students went out and about investigating complex socio-scientific issues. Crucial aspects here include establishing solid collaboration, planning for students' end products, and planning for students' reflection opportunities. Emergent properties can be facilitated; they can be prepared, anticipated, fostered. But they cannot be fully predicated, designed, or planned for. Therein lies their potential to be transformational.

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Area 3: Empowering Learners

We observe that learners and teachers alike recognize the need for substantial transformations toward sustainable futures, including radical reductions in CO_2 emissions, including novel ways of relating to mobility, work, production, food, housing, and including also changes in politics, culture, values, and indeed worldviews. Meanwhile, learners and teachers report variations of a general, often diffusely articulated sense of feeling disempowered in the face of the enormity, scale, speed, and complexity of the challenges upon us. Students and teachers struggle to envision transformations in real-life contexts, and to articulate what role – if any – they might be able to play. They struggle to articulate what specific forms agency might take across personal, practical and political spheres of transformation. They report lacking concrete entry points into how to proactively contribute to such transformations. At times, they report a need for more scientific knowledge. At times, they report a wish to deepen insights, skills, or practical experiences. At times, they experiment proactively with articulating languages clear and spacious enough to mobilize the imagination for novel ways of learning, thinking, acting, and indeed caring. Teachers are however not empty-handed. They may have experiences of inquiry-based teaching, field work and visits to science education providers out of school, as well as interdisciplinary cooperation in their school. These are vital grounds for open schooling designs exploring complex sustainability concerns, in designing learning trajectories that bridges within- and out-of- school experiences.

Here, too, we highlight the importance of identifying shared objectives and tools. Our research documents how open schooling interventions can lead to transformations in the students' self-perception. Carelessness may transform into caring. Ignorance, into knowing. A diffuse sense of concern may find itself articulated, channelled, and mobilized toward expressions of agency or motivation. A lingering and vaguely articulated sense of alienation may find itself received by a community of learners, across the continuum of the specific open schooling context. Such a community of learners, in turn, may embolden participants to articulate their voice more affirmatively, and to explore it in greater depth and nuance, including aspects of 'knowing' proper, but including also aspects regarding action, engagement, or normativity.

Key Insights

A3.1 In open schooling, learners need to be actively supported in their inquiry processes. Support may come in many forms. It may include knowledge resources, methods for collecting evidence, opportunities for discussing data and for interpreting experiences, templates for writing, instruments for measurements, access to expertise, and more. A key challenge in open schooling is to make the inquiry a continuous experience across different participating settings and organisations. Key qualities

in learners' inquiries include the following: 1) Shared inquiry affords learners active engagement outside the classroom; 2) learners are encouraged to follow their own questions and interests; and 3) learners may conduct research on real-world challenges with the support and active intervention of out-of-school partners.

A3.2 Learners work in action-oriented cycles. Action-oriented cycles allow learners to inquire into questions concerning "what", "why", "where" and "how". Such cycles call for didactical collaboration and planning ("didactical carving") across settings and organizations. Teachers and out-of-school educators need to consider ways to facilitate such that such cycles are integrated into the open schooling activities, and consider the didactical opportunities that are embedded within the locally relevant issues being addressed. Successful open schooling projects generate awareness around the two-sided nature of the locally relevant issues through a didactical carving approach. On the one hand, educators and learners explore and identify the educational potential in the activities that are taking place to remediate or address locally relevant issues (e.g, connecting those issues to broader disciplinary and inter-disciplinary issues). On the other hand, it involves being open to surprise and to seeing how the local or global realities being explored challenge existing understandings in the curriculum or in the teachers' or students' conceptions, and how those understandings afford or not action and agency.

A3.3 Creating closed and public fora to help learners voice their emerging concerns. When students work with complex, often existential questions concerning the state of the planet and prospects for civilizational collapse, they may express responses of overwhelm, disempowerment, or even disengagement or denial. Our local networks have worked with facilitating opportunities for the students and the teachers to voice such concerns amongst themselves and to external actors, in closed and public fora, depending on the issue at stake. In keeping with the decision to co-design open schooling collaborations as opportunities for shared and open-ended inquiry, we have found that recognizing such moments of dissonance can help re-interpret them as opportunities for learning, and indeed for broadening significance, deepening ownership, and fostering problem-solving. We document several instances where inquiry-based learning embedded in transdisciplinary collaboration is successful. This is particularly the case when:

a. shared inquiry affords students active engagement outside the classroom;

b. students are encouraged to follow their own questions and interests and

c. students may conduct research on real-world challenges with the support and active intervention of out-of-school partners.

Teachers and other adult participants in open schooling collaborations must take great care to offer learners opportunities to strike a balance between added complexity that can be experienced as overwhelming and discovering liberating potential, between a sense

of responsibility and a sense of being overburdened, between developing a sense of ownership for the work and being offered the necessary support and guidance.

A3.4 Helping learners empower themselves ought not to instrumentalize those learners for extrinsic goals. We strongly emphasize the imperative that any attempts to empower learners ought to go hand in hand with self-critical questions concerning how to avoid reducing learners to instruments for externally determined demands. How to co-design, articulate, and perform open schooling education programs such that students can engage with urgent sustainability challenges but do so on their own premises, based on independent and mature value judgments, and embedded in a pluralistic education?
A crucial aspect for intervention here, our work suggests, lies in critically exploring alternative ways of thinking, speaking, acting, mobilizing, politicizing, problem solving, in tandem with the learners. Strategies for change can thus emerge from within deeper and more complexly integrated scientific literacies.

A3.5 Multiple disciplinary subjects are involved in articulating and facilitating the inquiry. Inquiry is recognized as a key characteristic of many school subjects, including natural sciences, aesthetics, and social sciences. Concerning science education, for example, inquiry is typically rooted in the scientific method. Science is treated as a means to approach empirical phenomena in the world, and science's methods are considered relevant

to solve problems. Inquiry, here, is both a learning goal ("learning about characteristics of science") as well as an approach to teaching and learning. However, sustainability challenges often have learners needing to confront degrees of complexity that science education alone is hard-pressed to unpack and inquire into. The kind of inquiry relevant for such complex challenges (i.e., "wicked problems") demands integrating interdisciplinary and transdisciplinary fields of knowledge, as well as confronting ethical and political aspects. Even questions concerning non-anthropocentric ontologies, epistemologies, or morals may become an important part of the inquiry.

A3.6 Agency- and community building aspects need to be integrated as core competences of disciplinary relevance for students. This involves explicitly and carefully integrating cognitive-intellectual aspects of learning with affective, social, and experiential dimension s. This is because for knowledge to become relevant to action, it needs to draw direct bridges with our will and affects, which moves us as knowledgeable actors. This is how transformational engagement may foster complex learning opportunities that are grounded in deep caring, a development of empathy that is often absent in educational efforts. It is also how open schooling collaborations can open questions concerning non-anthropocentric ontologies, epistemologies, and ethics. By connecting knowledge to the broader needs of our communities – including

the biotic community – students develop a sense of belonging and commitment that empowers and mobilises them.

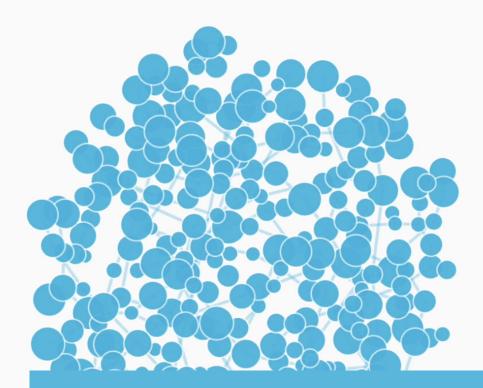**A3.7 Expressions of agency can be heterogeneous and express themselves differently in different circumstances.** We observe that it is possible to conceptualize students' expressions of agency as moving across a continuum between these following categories: "criticizing" (e.g., identifying and criticizing littering in the school forest and inadequate municipal waste management routines);
d. "resistance";
e. "explicating";
f. "envisioning" (e.g., deliberating on ways to manage the school forest better); and
g. "committing" (e.g., developing a draft agreement for the various actors of an open schooling network).

Here, too, we document a trade-off or dynamic tension. On the one hand, open schooling facilitates opportunities for learning in the context of real-life sustainability challenges, in fact, on exploring concrete possibilities for impacting policy, tweaking discourses, redirecting attention, or regenerating landscapes, in effective collaboration with other local actors. This, in fact, may be considered a prerequisite for certain types of learning outcome, such as action-oriented scientific literacy, increased motivation, or transformative engagement. On the other hand, open schooling may face the serious challenge of making activities inclusive enough for all students in a school community (itself a kind of opening), so that all might gain comparable experiences and insights,

and participate on equal terms.

A3.8 Exploring the learners' personal relevance matters. Empowering learners both as individuals and as participants in collectives (whether 'communities' or 'commons') typically involves helping learners identify a personal relevance in any given open schooling theme. Individual learning trajectories may be idiosyncratic to a certain degree, but in the context of open schooling, individual trajectories can get woven in and out of one another. Learners might be allowed to explore for themselves what ability, motivation, willpower, analytical insights, artistic skills, or rhetorical strengths they can develop, and to influence positively their own lives and the lives of others, both human and nonhuman. Individual learning processes can thus unfold in the larger context of collaborative processes. In such environments where students are supported in integrating and transforming knowledge resources, experiences, ideas and perspectives across different settings, it is important that the teacher have the ability to look for traces of such resources in students' texts.

By interacting with their communities, students can learn about issues of local and global importance in a tangible way.

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Summary of Key Insights in the three areas of school activity

Area 1: Establishing Open Schooling Collaborations

A1.1 Establishing shared goals to expand horizons.

A1.2 Emerging contradictions and tensions as transformative opportunities.

A1.3 Considering the intrinsic (rather than instrumental) value in the collaboration.

A1.4 Time, resource allocation, division of labour, and internal and cross-institutional coordination are key aspects when establishing open schooling collaboration.

A1.5 Involving school leadership structures.

A1.6 Formal agreements may play a pivotal role between schools and out-of-school stakeholders.

A1.7 Emerging contradictions and tensions in the collaboration are attended to and harnessed as transformative opportunities.

Area 2: Supporting Teachers

A2.1 Teachers are encouraged to explore the relevance of opening boundaries.

A2.2 Disrupting teaching and learning habits.

A2.3 Open schooling initiatives integrate professional development formats supporting teachers' explorations and consolidation of ideas.

A2.4 Balancing authentic activities with disciplinary demands.

A2.5 Recognizing teachers as experts in their craft.

A2.6 Structures and systems are in place to carry and support teachers.

A2.7 Open schooling can support and accelerate in-school adaptative organizational processes.

A2.8 Transformation can be an emergent property.

Area 3: Empowering Learners

A3.1 In open schooling, learners need to be actively supported in their inquiry processes.

A3.2 Learners work in action-oriented cycles.

A3.3 Creating closed and public fora to help learners voice their emerging concerns.

A3.4 Helping learners empower themselves ought not to instrumentalize those learners for extrinsic goals.

A3.5 Multiple disciplinary subjects are involved in articulating and facilitating the inquiry.

A3.6 Agency- and community building aspects need to be integrated as core competences of disciplinary relevance for students.

A3.7 Expressions of agency can be heterogeneous and express themselves differently in different circumstances.

A3.8 Exploring the learners' personal relevance matters.

Knowledge resources and tools to support open schooling

Knowledge resources and tools to support open schooling

Throughout the three years of implementation, the SEAS project has generated a wealth of knowledge resources and tools that draw from the experiences and systematic analyses of open schooling collaborations across six European countries.

These insights thus draw from collaborations that have involved a total of 37 primary and secondary schools (with secondary schools being majority), including 3956 students, 266 teachers, and 177 out-of-school organizations or partners from the public and the private sectors—including environmental organizations, local and national governmental instances, museums and cultural centers, and companies.

The SEAS knowledge resources and that document and have sprung from these varied collaboration networks include the following list.

1. Knowledge resources for those who want to know more about how to establish and manage open schooling collaborations connecting the school with community partners

The SEAS project has developed a guideline that lays out steps and guiding principles to be considered when first establishing open schooling partnerships in any given community.

Plan and milestones concerning challenge implementation in open schooling networks

Complementing the above-mentioned guideline, SEAS has developed a Change-Lab methodology for facilitating transformative collaboration in school-community partnerships. The guideline includes theoretical and practical principles aimed at supporting the establishment and development of consortiums aimed at having transformative impact, in both schools and the local communities.

A guideline document for implementing and following up Change-Lab Workshops

2. Knowledge resources for those interested in the empirical and analytical insights gained on the

opportunities that open schooling opens for transformational education

Two Annual Local Assessment Reports document from-the-field experienced challenges and opportunities that emerged during open schooling activities carried on in the 6 participating countries. Drawing from a diversity of mostly qualitative methods and approaches, each local network contributes invaluable insights gathered during and following the implementation of open schooling projects, including insights on challenges and opportunities connected to the practical implementation, as well as connecting to the pedagogical and didactical questions that emerge when students address real local and global sustainability challenges.

First Annual Assessment Report (2020-2021)

Second Annual Assessment Report (2021-2022)

Three Global Synthesis Reports take the empirical insights gained through the SEAS annual local assessments and develop them further into more general theoretical and action-oriented models that can inform both academics and practitioners interested in understanding the mechanisms underlying open schooling activities across three levels, including collaboration across school and society, models on how students learn in open schooling contexts, and models on how teachers can both support students and be supported to carry on open

schooling at its best:

Report on models for the establishment and implementation of open schooling partnerships

Report on models on transformational engagement, scientific literacies, and motivation

Report on models of teaching and learning scientific literacy

3. Resources for informing the assessment/evaluation of open schooling innovations

With the goal of informing future projects, both national and international, aiming at implementing and evaluating open schooling innovations, the SEAS project has developed an Assessment Framework that educators, school leaders, researchers and/or policy makers can use to evaluate their open schooling implementations. The resource provides evaluation criteria as well as an overall framework that also can be used to guide the type of activities that can be wise to implement in an open schooling context.

Open Schooling Assessment Framework

4. Policy making recommendations

More specifically addressing policy-makers, a white paper has been developed that summarizes insights gained through the SEAS project and turns them into down-to-earth

recommendations on how to build social and political structures necessary to support collaborative innovation at the interface of the school and society, and aimed at empowering both teachers and learners to become agents of change through education.

[White paper on policy recommendations](#)

5. Digital tools to support open schooling

A guideline manual describing the use of two core tools used in SEAS: the cChallenge tool, that facilitates 30-days change challenges, and the Locally Relevant Teaching (LORET) tool, which supports teachers in connecting and integrating their open schooling ambitions to their teaching planning activities.
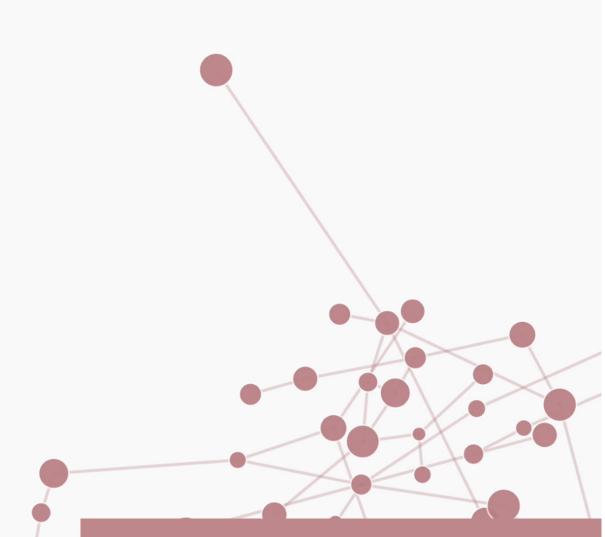
[Guideline manual describing the use of each of the SEAS digital tools](#)

External links to the tools that have been explored in the SEAS project include the following:

https://www.cchallenge.no

https://loret.se

https://thecynefin.co/sensemaker/

Building bridges between schools and local communities is not an overnight transformation. It's a culture shift - and the movement is already underway.

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www.seas.uio.no
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