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MULTIPLIERS – Multiplayers Partnerships to
ensure meaningful engagement with Science and Society

MULTIPLIERS

Report on Identified Good Practices and Needs Analysis

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Index of acronyms

D	Deliverable
EU	European Union
GA	Grant Agreement
GDPR	General Data Protection Regulation
OSC	Open Science Community
OSS project	Open-school science learning projects
RRI	Responsible Research and Innovation
STEM	Science, Technology, Engineering, Mathematics
STS	Science, Technology and Society
WP	Work Programme

Acronyms used to identify consortium members

Ref.	Organisation	Acronym
P1	Rheinische Friedrich-Wilhelms-Universität Bonn	UBO
P2	University of Cyprus	UCY
P3	Universitat Autonoma de Barcelona	UAB
P4	Univerza v Ljubljani (University of Ljubljana)	UL
P5	Umeå Universitet	UMU
P6	European Forest Institute	EFI
P7	IREN SpA	IREN
P8	EU CORE Consulting	EUCORE

1 Executive Summary

The MULTIPLIERS project, capitalising on an international consortium made of eight Beneficiaries, aims at triggering a process for facilitating the transition of schools into innovative and open collectors of new ideas, practices and scientific approaches. The project aims to offer the communities in which the Beneficiaries are embedded a space for open, inclusive, and inquiry-based learning on science issues that have an impact on citizens' lives.

This will be achieved by establishing multiplayers' partnerships (Open Science Communities, hereinafter referred to as 'OSCs') involving schools, families, civil society organisations, informal education providers, policymakers, media, industry, and a vast range of science institutions based in six EU countries, very different in terms of their geographical and economic situations (namely Germany, Cyprus, Spain, Slovenia, Sweden, and Italy). The OSCs will jointly agree upon a socio-scientific issue to be tackled and develop real-life projects to be implemented in schools.

According to Work Package No. 2 'Establishment of the OSCs' network and co-design of MULTIPLIERS Open Schooling approach', which is led by UCY, the consortium is requested to submit this deliverable (D2.1), for the purpose of providing a summary of (a) the findings of the analysis performed on existing good practices on Open Schooling approaches, and (b) the outcomes of the needs' analysis and shortcomings in the Open Schooling field performed in the MULTIPLIERS countries. This report is amongst the first outputs, appearing in the fifth month of the project's lifetime. The aim of this report is to identify relevant good practices and the current needs in consultation among the project partners and the OSCs and provide an operational definition of Open Schooling for consideration in the future steps of the project's implementation. This analysis will be also used to define a common approach for the implementation of the MULTIPLIERS activities and evaluation tools to verify its effectiveness. The results from this analysis are presented in the pages to follow.

This deliverable sets out a thematic synthesis of relevant prior work that has been carried out on open schooling and science education. It elaborates the corresponding needs, at this moment, of the educational systems in which we work. It also develops the conceptual framework that will guide subsequent project activities.

2 Introduction

This document presents the 'Report on Identified Good Practices and Needs Analysis' as deliverable D2.1.

The MULTIPLIERS project aims to expand opportunities for science learning by fostering cooperation between students, schools, families, local communities, civil society organisations, informal learning providers, universities, the media, policymakers, and industry. To achieve this, the project will establish novel learning partnerships, the Open Science Communities (OSCs), initially in each of the following project countries: Germany, Cyprus, Spain, Slovenia, Sweden, and Italy. Each OSC will involve the diverse stakeholders mentioned above to innovatively engage different societal actors in the science learning process. During the project implementation and after its completion, the consortium will support creating new OSCs in the partner countries, as well as in other EU countries which will be guided and consolidated by the six initial OSCs.

In each OSC, open-school science learning projects will be developed collaboratively with science professionals in order to bring to the students real-life cases regarding contemporary challenges/socio-scientific issues (e.g., air pollution, biodiversity and ecosystem services, vaccination, forest use Vs forest protection, anti-microbial resistance, clean water and sanitation). Hence, the students will collaborate with several stakeholders to explore different perspectives and improve their understanding while being involved in scientific practices (e.g., argumentation, problem-based activities, collecting and analyzing data, modelling). Having gained first-hand experiences and an insight into inquiry-oriented practices, students will become knowledge multipliers; they will present, share, and deepen their knowledge and experiences in activities by actively involving their families and the wider community, through dedicated local events (including open-school/local action days or citizen science activities), and through designing and exploiting science communication media (e.g., exhibitions, social media channels, and video clips). All OSC members will be jointly committed to teaching and learning processes in formal, non-formal, and informal settings to ensure relevant, meaningful, and sustainable engagement with science and associated ethical and societal priorities.

To define a common implementation and evaluation approach for the MULTIPLIERS activities, it was considered critical to review the existing good practices on Open Schooling approaches and identify the current needs in the partner countries. In so doing, the purpose of this report is to present a synopsis of a review of existing good practices concerning Open Schooling approaches (Task 2.2 'Review of existing good practices') and a thorough analysis of current needs and shortcomings in Open Schooling initiatives (Task 2.3 'Needs analysis'). This review was conducted in all the six MULTIPLIERS countries (i.e., Germany, Cyprus, Spain, Slovenia, Sweden and Italy) between months 1 and 4 by analysing good practices through desk research and the current needs through OSC consultations using interviews, focus groups and asynchronous online communication tools (e.g., padlet). The results of this extensive review will lead to the identification of relevant good practices and current needs for consideration in future steps of the project's common approach. Moreover, such recognition and its related outcomes will be validated through continuous consultations among project partners, the OSCs, and AB members to ensure an international and

intercultural participatory approach, in order to guarantee that project outcomes are relevant and widely applicable.

In the next sections, this report presents a detailed description of how the consortium worked to conduct the review of existing good practices and the needs analysis, corresponding to the tasks T2.2 ‘Review of existing good practices’ and T2.3 ‘Needs analysis’.

3 Review of existing good practices

This task aimed to identify, analyse, and share examples of good Open Schooling approaches, and then indicate how we intend to contribute to this framework by promoting the concept of Open Science Communities (OSCs).

To develop this task, a set of EU calls on Open Schooling launched in 2015 and a group of 12 EU-funded projects and 9 national initiatives (identified by partners of the MULTIPLIERS consortium) have been reviewed. We have also reviewed a selection of 50 articles, by performing a systematic review (main details summarised in the table below) that was carried out by following the methods outlined in the PRISMA statement (Page et al., 2021). Details on what and how all these sources of information were selected and analysed can be found in an internal report that presents the complete work carried out within Task 2.2.

Table 1. List of criteria considered to perfom the systematic review.

Databases consulted	Web of Science, Scopus and ERIC
Period considered for the search	From 2011 to 2021
Keywords used to filter the research papers	Open Schooling Schools Partnership(s) School-community partnership(s) School-industry partnership(s) Partnerships between schools and civil society organisations Partnerships between schools and museums/science centres Family involvement in schools Interaction with experts

In developing this review of existing good practices, we seek to address different questions, such as:

a. How did the concept of Open Schooling come about in European Science Education?

b. What has been done in prior projects up to now in actions to promote the concept of Open Schooling (i.e., publications, prior project reports)?

c. What are the inspiring practices and strategies in Open Schooling at the EU level?

d. What sort of conceptualisation of Open Schooling emerges from all the above, that is conducive to inspire MULTIPLIERS actions?

The aim of answering these questions is to be able to offer a vision of Open Schooling for the MULTIPLIERS project and formulate ideas for the organisation of MULTIPLIERS OSCs.

3.1 How did the concept of Open Schooling come about in European Science Education?

To analyse the appearance of the Open Schooling concept in EU, specifically in Science Education, one has to undertake a journey through the different EU reports and work programmes and their evolution from an STS (Science, Technology and Society) view within the Science in Society frameworks to the recent views of Science *with* and *for* Society. These latter frameworks are increasingly permeated with democratic and ethical concerns on citizens' participation in Science identified through the Responsible Research and Innovation approach (Richard et al., 2012), and culminating a particular version regarding science education (EU Commission, 2015). As such, Open Schooling emerges as a new term first in the report Science Education for Responsible Citizenship (EU Commission, 2015) and in the **Work Programme 2016-2017**[1] with the call **SwafS-15-2016: Open Schooling and collaboration on science education** (p. 33) and continues to be a priority in the **Work Programme 2018-2020**[2] with the topic **SwafS-01-2018-2019-2020: Open Schooling and collaboration on science education.** However, despite the term not being explicitly there, we can identify the Open Schooling idea already in the **Work Programme 2014-2015**[3].

The beginning of the Open Schooling idea in the EU WP14-15 is timid, as portrayed in sentences like "*Activities will involve role models and will bring together actors such as schools, science museums, research centres, etc. strengthening their interactions. Collaborations with regional/national authorities will be appreciated*". The idea of sustainable collaboration among these agents is mentioned, but not emphasised. Overall, collaboration with schools was not a focus nor was a particularly emphasised strategy to meet the goals of introducing Science in Society.

The EU WPs from 2016 to 2020, however, followed up on the report Science Education for Responsible Citizenship (EU Commission, 2015) to explicitly promote the concept of Open Schooling in their strategy of Science with and for Society, which revolves around the concept of Responsible Research and Innovation (RRI) and its pillar on Science Education. In these frameworks, Open Schooling is one of the strategies to accomplish a new way of doing science that takes purposefully into consideration citizens' views and capacities. Together with Open Schooling, a myriad of new concepts emerges in these documents, either introduced or emphatically promoted at the EU level by the WP frameworks. These concepts and strategies include Open Science, Participatory Research, Science Shops, Citizen Science, Co-creation and Participatory research, among others. In a very interesting move

[1] Link to the Work Programme 2016-2017: h2020-wp1617-swfs_en.pdf (europa.eu)
[2] Link to the Work Programme 2018-2020: https://ec.europa.eu/research/participants/data/ref/h2020/wp/2018-2020/main/h2020-wp1820-swfs_en.pdf
[3] Link to the Work Programme 2018-2020: h2020-wp1415-swfs_en.pdf (europa.eu)

that places values at the forefront, in these WP frameworks the themes that permeate all actions revolve around the ideas of gender equality, research integrity, and ethics.

In this RRI ecosystem, in which the concept of Open Schooling is born in an experts' report and promoted at the funding and policy level, the problem that Open Schooling tries to solve is clear. If the aim of the H2020 programme is *"to build effective cooperation between science and society, to recruit new talent for science and to pair scientific excellence with social awareness and responsibility",* the openness of schools to both society and science is an act to serve at least two of the eight specific activity lines of the programmes: (1) increase attractiveness of scientific careers, particularly for girls, and (2) improve the quality of formal and informal science education.

These ideas of the attractiveness of scientific careers and improved scientific competence of citizens are at the heart of the way Open Schooling is portrayed in both the WP15-16 and WP18-20, which starts with the sentence "*At the moment, Europe faces a shortfall in science-knowledgeable people at all levels of society"* and continues with "*Therefore, a collaboration between formal, non-formal and informal education providers, enterprises and civil society should be enhanced to ensure relevant and meaningful engagement of all societal actors with science and increase the uptake of science studies and science-based careers, employability, and competitiveness".* However, when Open Schooling initiatives are described, other powerful ideas are encompassed in this term, such as the idea of local action and transformation or the importance to engage families:

> *"Open Schooling' where schools, in cooperation with other stakeholders, become an agent of community well-being shall be promoted; families shall be encouraged to become real partners in school life and activities; professionals from enterprises and civil and wider society should actively be involved in bringing real-life projects to the classroom."* [4]

These important ideas on local impact and family involvement are more attuned to the existing literature on school networking and school partnership, which is the literature behind the Open Schooling term. In both WPs Open Schooling is related to gender and socio-economic differences, despite the fact that this is not described in great detail. In WP18-20 geographical differences are added to the equation, also just as a reference. A new introduction also in the later WP framework refers to the need to actively involve educational authorities and policymakers in the search for sustainability.

The context in which Open Schooling is born begs for a clearer connection between Open Schooling and global RRI priorities, such as in relation to schools' participation in the generation of scientific knowledge. However, this idea is conveyed through other *ad hoc* strategies such as citizen science and does not figure so prominently in Open Schooling. In these policy documents, the idea of a unidirectional relation between different agents and

[4] Link to the Work Programme 2016-2017: h2020-wp1617-swfs_en.pdf (europa.eu)

schools seems not to be problematised, which contrasts with what the literature considers as interesting and productive school partnerships.

Finally, when analysing what sort of concept of Open Schooling has been used by the projects funded under these EU funding programmes, we found mostly two important commonalities in the way they define, conceptualise and enact Open Schooling. The first one is in relation to the way Open Schooling helps schools to improve both at a curricular and pedagogical level, including the idea that external experts and professionals introduce new viewpoints and knowledge of science and about science to the schools. The second one concerns the idea of schools having an impact in their local communities, with partnerships as a way to embed in the school curriculum real-life complex challenges that need multiple agents and expertise to be fruitfully addressed. Most EU projects in Open Schooling signal one or both ideas as important in their approach. However, as mentioned earlier, there are very few proposals that give agency to students and schools in the process of co-generation and dissemination of scientific knowledge in society, which is an idea at the heart of RRI when applied to science education. As such, we believe it is important that our conceptualisation of Open Schooling would capitalise on previous knowledge and include this hidden epistemic dimension, in which schools are opened also for students to become active agents of the scientific enterprise.

In addition, and despite this not always recognized as an important priority, we consider that any EU action must be aligned with values that we share as a society. While gender equality is one explicitly stated value in both the RRI and most WPs, values such as sustainability, general equity, social justice, and inclusion cannot be taken forgranted and should be explicitly stated in any educational initiative.

3.2 What has been done in prior projects up to now in actions to promote the concept of Open Schooling?

The cross-reading of different Open Schooling and school partnership projects and relevant scientific publications shows a challenging variety of initiatives, approaches, and participating agents. However, in an attempt to organise what is being and has been done under the goal to open schools, whatever the meaning and purpose of this opening act, we have found interesting commonalities and also critical tensions that need to be negotiated in each partnership. These tensions refer to 8 dimensions, as follows:

- thematic focus
- networking approach
- ‘opening’ strategy
- scale
- hierarchical relations
- temporality
- impact measures
- involved agents

Next, we present our findings according to each dimension.

3.2.1 Thematic focus

We have found that most initiatives reported in the analysed research papers have a focus on general or transversal competencies or knowledge, as well as on the development of motivational and personal participants' aspects, such as students' autonomy or critical thinking, as in Richmond *et al.* (2018) among other examples. However, most projects on Open Schooling have a specific/disciplinary thematic focus, quite often on scientific or STEM competencies/knowledge. Clearly, the focus of projects in the STEM or scientific field is related to the EU funding calls of Open Schooling under the Science in Society programmes, which makes the more transversal or multi-thematic focus a more natural one if the funding does not prioritize specific subject domains.

3.2.2 Networking approach

We can see two very different strategies taking place. Most finished projects and quite a lot of publications opt for an one-to-one approach in the way they organise Open Schooling, as in Wang and Zhang (2014). More recent projects and some papers report a multi-stakeholder approach in which schools are generally the centre of the network, such as in the case study by Zuckerman (2019). However, it is not clear in the reported findings, when available, if these multistakeholder approaches have had the same level of exchange with all the agents involved or whether there is a varying degree of commitment and participation.

3.2.3 'Opening' strategy

The way the 'opening' strategy is organised is also diverse. Some stakeholders involved in the network come to the school to engage students in the initiative, exchange and enrich their initial views about the problem to tackle, challenging their school and professional culture reciprocally, according to Saunders et al. (2018). Often in other cases, school participants are the ones that make the effort to go out (for instance, through school trips or participating in fairs), such as in the study conducted by Richmond et al. (2018). However, most initiatives seem to combine both strategies in ways that prioritise what is realistic and feasible, considering all the constraints related to the school calendar, timetable, economic resources, and permissions (e.g., Bowen & Kisida, 2019). In addition, some initiatives use online resources and tools to "go out" virtually and facilitate exchange among professionals and students/teachers.

3.2.4 Scale

The reviewed open school initiatives have a clearly local focus: most analysed projects and research papers focus on local challenges, local changes, and local impact (e.g., Tett & Mackleod, 2020). However, some initiatives manage to combine this local focus with a more regional scale, for instance by engaging federations or associations of entities that can help to provide this wider view and impact (e.g., Olsson et al., 2019).

3.2.5 Hierarchical relations

It is interesting that despite most initiatives being reported as collaborations and networking in a supposedly flat hierarchy manner, in some of the projects and particular initiatives reported in the literature there is a non-equal relation among institutions. Strategies such as mentorship, as described in Saunders et al. (2018), or teacher professional development

events, as described in Wang and Zhang (2014) often put schools in a 'receiving mode' that contrasts with the idea of bidirectional exchange and authentic networking among institutions. The fact that schools are often addressing challenges with the help of other institutions that act as knowledge providers fuels this situation.

3.2.6 Temporality

Most reported initiatives are one-time events or events that exist only throughout the project lifetime, or the external, purposeful funding received. Very few of the initiatives have a long-term impact or are designed in a way that allows certain sustainability (e.g., Zuchkerman, 2019). This is a challenge that most projects and papers signal as an important difficulty to overcome, taking into account the significant effort undertaken in establishing, guiding, and fueling these open schooling communities.

3.2.7 Impact measure

Regarding the evaluation of Open Schooling initiatives, most of the research publications that we have studied measure impact in terms of students' engagement and attitude. Some papers focus on more precise and internationally comparable variables such as students' performance and school attendance (e.g., Alston-Abel & Berninger, 2018), or include related affective variables such as aspirations or self-efficacy (e.g., Bowen & Kisida, 2019). When the project focuses on certain transversal competencies, these are sometimes indirectly measured, for example by measuring students' or teachers' perception of communication between teachers and students or students' autonomy (e.g., Richmond et al., 2018). We have not found cases of a specific focus on the measurement of students' learning, particularly directly evaluating students' knowledge or competence.

3.2.8 Involved agents

We have found a very different picture between projects and initiatives reported in research papers in terms of participating agents. Most research papers conceptualize Open Schooling in terms of opening to families, both acknowledging the important role of this agent in successful schooling and how this area is a fruitful research topic. However, Open Schooling projects use a different approach and generally focus their efforts on an adequate selection and establishment of a partnership with an array/myriad of institutions from the community which, in those that are funded under Science in Society calls, always include scientific institutions. Interestingly, families play a very minor role in Open Schooling projects, and, despite some exceptions, the projects also lack the focus on equity and inclusion which is more frequently highlighted in relevant research papers.

3.3 What are the inspiring practices and strategies in Open Schooling at the EU level?

It is very difficult to highlight concrete approaches or find inspiring examples in Open Schooling both in the analysed projects or papers, as these initiatives are very diverse and have different participating agents, purposes, and foci. However, certain aspects of some initiatives seem particularly interesting to us since they either challenge some of the previous findings or offer strategies and tools that could illuminate how to work in our OSCs at

MULTIPLIERS. In the following, we will comment on some of the analysed initiatives highlighting those aspects that seem to us more relevant to be considered.

The Art initiative (Bowen & Kisida, 2019) is quite a big program that combines both, the one-to-one approach with a more extensive network. The initiative offers a pool of diverse artistic institutions that partner with schools in a very intensive, one-to-one manner that is focused on radical transformation in the sense that the art institution and the school challenge and change their agenda and culture to adapt to each other. In addition to the one-to-one intensive strategy, the initiative focuses on concrete transversal competencies, such as critical thinking and writing, and works to improve them through the arts. As such, the combination of an institutional transformative focus with a focus on concrete students' learning seems to be a good recipe for specific good results.

Chapman *et al.* (2016) report a network of schools that share strategies, skills, data, and ways to solve problems within the framework of collaborative educational inquiry, that is, inquiring collectively their norms and practices in a reflective way. As such, the involved schools share among them their different school cultures and enrich their views and practices by purposefully inquiring and exchanging them. Despite the focus being on school management and school climate rather than on students' learning, it is an interesting example of bringing reflection to the process of networking and exchange, in the sense that it is only by explicitly reflecting on your strengths and weaknesses that the networking and exchange effort can help you overcome your problems.

The work of Yull *et al.* (2014) describes an initiative of how to incorporate parents as partners in the educational process in the context of a family-school-community-university partnership from a culturally responsive paradigm. The partnership focuses on parents of colour in an attempt to address the achievement gap of students of colour. The initiative is designed from a critical race theory, deconstructing traditional ways of involving families in schools, typically based on Eurocentric behavioural practices of White middle-class parents. The way in which all stakeholders (families, community members, school representatives, and researchers) are involved in all steps of the design and implementation of the initiative and research, ensuring cultural and racial equal representativeness and agency, constitutes an exemplary work, as it facilitates the identification and deconstruction of power structures that need particular attention when promoting active family engagement practices with diverse groups of parents. Hence, the main results focus on the lack of cultural enrichment for families of colour, their isolation in the community, experiences of colourblind racism and cultural ignorance, lack of cultural competency in the schools, stereotyping, and racial disproportionality in school discipline measures.

Both the PULCHRA[5] and the SEAS[6] projects are very complete initiatives in terms of producing interesting documentation and particularly useful tools. Concretely, both projects made an effort in developing specific online platforms to either facilitate the exchange of ideas and information between schools, stakeholders, and project partners or to facilitate

[5] Link to the PULCHRA Project website: https://pulchra-schools.eu/
[6] Link to the SEAS Project website: https://www.seas.uio.no/

collaboration among participants in local school partnerships. It is not clear to us if these platforms can be used by other projects or if they can be adapted to other purposes, but more exploration in this area is certainly required to capitalise in previous efforts and facilitate international exchange, which in fact is one of the aspects teachers in MULTIPLIERS were interested in as discussed in the next section.

Despite most projects having a local focus, there is not always the case that the actual topics addressed have a clear relation and impact on students' lives and their communities. An example that does work on the local dimension is the MOST[7] project, which is addressed to overcome local challenges at a regional level. As such, it is very close to students and their communities, including topics that have been conveniently adapted to participants' needs, such as waste management and energy efficiency. The OSHub.Network[8] project is another example of an initiative that aims at supporting schools and communities to tackle relevant challenges (linked to the Sustainable Development Goals) to create local impact.

Finally, due to the fact that equity and inclusion seem to us a very important value to guide Open Schooling initiatives, we want to highlight again the OSHub.Network project, which puts the focus on underrepresented communities in the innovation scenario. By establishing a network of community hubs (OSHubs) in communities that traditionally do not engage with research and innovation due to various barriers linked to geographical location, socio-economic status, or ethnic minority group background, this project has a clear equity and inclusion perspective that is not as visible in other projects.

4 Needs Analysis

The aim of this task was to investigate every local environment and participating country according to its particular needs for Open Schooling and to plan the project's subsequent activities building on the results of the analysis of good practices of Open Schooling approaches. More specifically, the consortium aimed to identify the needs with respect to two aspects: (a) conducting successful learning projects, and (b) building sustainable networks/OSCs.

In addressing this task, focus group interviews or individual interviews with the OSCs (including participating school representatives) were conducted online, during the third and fourth month of the project, to identify anticipated motives, intents, barriers, and difficulties in the effort to implement Open Schooling in that context and to explore ideas on how to pre-empt these obstacles to safeguard success. It was recommended to conduct focus groups interviews since it is considered as the appropriate method to collect a very 'rich' source of data. The group situation provided security for respondents, encouraged participation, promoted interaction and helped participants to reflect deeply on their opinions and explore similarities and differences within the opinions heard. However, in the cases of time restrictions, we used a combination of online asynchronous communication tools (e.g., padlet)

[7] Link to the MOST Project website: https://icse.eu/international-projects/most/
[8] Link to the OSHub. Network Project website: https://oshub.network/

and individual semi-structured interviews, which helped to obtain a deeper understanding of the stakeholders' viewpoints about conducting successful learning projects and building sustainable OSCs based on their experiences and expertise.

Before the focus group discussions/individual interviews a short overview of project MULTIPLIERS was presented providing information about the scope and the objectives of the project; the implementation process; the role of the OSCs emphasising the process of collaboration and the planned activities in each OSC with respect to the project's timeline. In efforts to provide the OSCs with a clear understanding of the concept of 'Open Schooling', some partners chose to provide descriptions of selected Open-school science learning (OSS) projects, from previous funding cycles, as good practices.

The focus group discussion/individual interviews (of approx. 90 minutes) were then conducted based on an interview protocol which was drafted according to the findings from Task 2.2 'Review of existing good practices' and specifically the review of European funded projects under the concept of 'Open Schooling'. The interview protocol is divided into two categories based on the two aspects of the needs analysis: (a) conducting successful open-school science learning projects, and, (b) building sustainable OSCs. The interview protocol was finalised after two rounds of revision and consists of sixteen main questions and thirteen sub-questions related to the incentives for participation; resources; practicalities; collaboration; evaluation process; equity/access/inclusion issues; and sharing information/networking. The generic interview protocol can be found in the Appendix. Each partner country adjusted the questionnaire according to the local context and the stakeholder group.

In total, 45 people participated in the focus group meetings in the five countries, representing schools (primary and secondary school teachers), policy-makers, science-related research institutions, formal and informal learning providers (e.g., NGOs, civil society organisations, museums), the industry, and the media. Table 2 provides information on the number of participants in each category.

Table 2. Stakeholders who participated in the focus groups/individual interviews per category

Stakeholders	Number of participants
School teachers	20
Science research institutions	7
Informal learning providers	11
Policy-makers	3
Industry	2
Media	2

Each interview was recorded and then the viewpoints of each OSC were summarised in an excel document based on the structure of the interview protocol. The findings of this analysis concerning the two aspects of the needs analysis can be found below:

4.1 Conducting successful learning projects

This section summarises participants' anticipated motives, intents, barriers and difficulties in the effort to implement Open Schooling in the local context and ideas on how to pre-empt these obstacles to safeguard success.

4.1.1 Incentives

School teachers expressed interest in participating in the MULTIPLIERS project as a means to contributing towards making science more authentic and thus interesting to students. They showed a strong motivation to adopt and test the integration of new practices and learning materials in already established science curricula while at the same time raising students' awareness about socio-scientific issues. More specifically, the adoption of the Open Schooling approach was considered by the teachers as a medium to promote students' self-directed learning as opposed to traditional/conventional teaching methods. The Open Schooling approach was perceived as an opportunity for the students to take ownership of their learning through researching issues relevant to the local and global context in interaction with 'real' scientists and then acting as 'multipliers' to disseminate the knowledge out of the school borders. Moreover, the teachers indicated that this project is an opportunity for schools to establish a network of collaborators for future projects, interact with other stakeholders (e.g., research institutions specialized in the topics to be addressed in the Open-school science learning projects) and provide access to research; share ideas on educational materials and public programs; expand learning beyond the school borders (e.g., school visits to research institutions); and ultimately make some recommendations to policy-makers.

The representatives from the science research institutions perceived this project as an opportunity to tackle negative stereotypes about science (e.g., 'science is boring, male-dominated and only for smart people') and promote scientific literacy while providing access to research. Scientists recognized their 'duty' to communicate science and expressed that the MULTIPLIERS activities would be useful for them to learn how to disseminate their work through establishing connections between theory and practice. Furthermore, they indicated their interest in providing tools to facilitate data analysis during the project activities and contribute to educational research and practice.

The informal learning providers claimed that the MULTIPLIERS project will provide them with a set of evidence-based teaching and learning materials to implement the Open Schooling approach as well as the opportunity to connect and collaborate with other organisations and institutions thus promoting interest in science. In addition to this, participating in the project would be useful to obtain the required knowledge and expertise in developing such learning materials and contribute towards addressing important societal issues.

For policymakers participating in the project was perceived as an information source to identify future trends and possible adjustments to current educational policies. For industry representatives it was appreciated as a route to bridge the gap between school education, academia and the industry world in terms of promoting a real-life context in learning.

4.1.2 Resources

In planning and implementing the project activities, a variety of resources were considered as valuable if they could be provided to the participants in the OSCs, as summarized below:

- Provide teacher training and workshops on the philosophy of Open Schooling as this is an innovation in some local contexts (e.g., Cyprus), sharing detailed guidelines on the implementation of the Open Schooling Science (OSS) project activities and ready-to-use resources to limit the workload.
- Design and develop clear-targeted project ideas, easy to be implemented with explicit connections to the curriculum and indications on how the activities contribute to achieving the learning goals.
- Provide the students with supporting materials to conduct their research, especially in out-of-school contexts, promoting hands-on activities.
- Provide financial resources to cover travel expenses for school visits.
- Establish a network of school participants for teachers and students to share their experiences.
- Establish a web platform to share ideas and on the project activities within the OSCs and ensure good communication among the participants.
- Develop materials for the representatives of the research institutions/scientists/industry to facilitate science communication (i.e., communication of the scientific content) according to pedagogical principles (e.g., triggering interest).
- Provide participants with clear guidelines about the development of the OSS projects during planning and emphasize the benefits of the projects to the wider society.

4.1.3 Practicalities

A number of barriers have been identified by the focus groups participants that may hinder the implementation of the OSS projects. These barriers concern institution logistics, education system regulations and policies, and financial support.

One significant barrier that can influence the implementation of the OSS projects in various ways relates to time restrictions. Initially, time restrictions influence the duration of the implementation of the OSS projects in schools which cannot occur the entire school year. Given the already established school curricula, especially in the cases where the education system is centralized and controlled by the state (e.g., Cyprus), the possibility to make changes is restricted particularly in secondary schools. Hence a recommended solution for this was to integrate the OSS projects in existing curricula, indicating clear connections with the school curricula and an alignment to the learning objectives. However, making adjustments to existing curricula depends also on the teachers' culture, will and flexibility. An idea to facilitate this and encourage teachers' participation was to engage policymakers in the process of designing and developing the project materials and also use resources currently used effectively in other projects. Another suggestion was to offer the teachers a decrease in the teaching hours upon approval from the authorities (e.g., 1-2 teaching hours

reduction per week) thus controlling the workload and increasing their motivation to participate in the project.

Considering the school visits, it was expressed that planning the visit well in advance was essential to deal with the institution's logistics and safety protocols. For example, school visits to certain scientific premises (e.g., laboratories) may be restricted in terms of the number of students they can host and therefore alternative solutions need to be considered (e.g., arranging working groups on different days). Another example concerns the primary schools in Slovenia where it is required for the lower classes to have an accompanying person in addition to the teacher for safety purposes. In this case, this role can be appointed to undergraduate or postgraduate students attending our academic institutions (e.g., Slovenia, Cyprus) or ask parents to join (e.g., Germany). Additionally, in order to avoid traveling and save time, students can organise their multipliers events in the surrounding school area (e.g., nearby parks, forests, squares, etc.). It was also suggested that some of these events could be integrated within already planned school trips/excursions, and outdoor activities, thus saving time and avoiding extra expenses.

Engaging external stakeholders in the project activities was reported as a critical issue to take into consideration. Based on the OSCs' experiences, it is important to engage the stakeholders in a meaningful way and this can be achieved by giving them ownership, engaging them in the development of teaching and learning activities (e.g., not just giving a lecture using a PowerPoint presentation). For example, the science experts can develop and run workshops, the NGOs and civil society organisations can collaborate with the schools to organise the multipliers events. In the case of the countries with a centralized education system, the MULTIPLIERS partners should obtain the consent of educational authorities (e.g., Ministry of Education and Pedagogical Institution) before the implementation of the OSS projects, to motivate the participation of schools.

4.1.4 Collaboration

It was clearly stated that setting a strict/formal hierarchy in terms of the OSS projects' activities between the students, their teachers and external stakeholders could work counter-productively having a negative impact on the schooling approach and the expected outcomes. However, it was expressed that an operational description of how the collaboration will take place would be useful. Among the participants, there was a consensus on adopting a student-centred approach thus fostering students' ownership of their learning, while retaining adequate flexibility to make alterations when required (e.g., demonstrations on how to use scientific equipment). This method requires respectful communication and collaboration among the OSC members and teachers' support to serve as facilitators scaffolding the learning for the students.

Furthermore, reflecting on partners' previous experiences, it was suggested that promoting collaboration with people from the Arts (e.g., singers, actors) could make the multipliers' events more interesting and attractive not only to the students but to the public in general.

4.1.5 Project setting

School visits (e.g., visits to science centres, forest institutes, industry companies) were suggested by the teachers as useful for the development of the OSS projects. Considering the multipliers' events when students will be sharing knowledge, it was recommended to participate in the media (e.g., radio programmes, digital TV) and in events in crowded places (e.g., squares, parks). Representatives from museums and science research institutions recommended school visits to their premises to promote students' learning in an authentic context. Virtual tours were also mentioned in the cases where in-person attendance is not possible. Stakeholders also suggested introducing the schools to their network to widen access to the public.

4.1.6 Evaluation

All the stakeholders agreed to participate in the evaluation process of the MULTIPLIERS project with the aim to monitor the implementation process in the short term and evaluate the effectiveness of the project in the country context.

4.1.7 Equity – Access - Inclusion

It was commonly reported that the MULTIPLIERS project should raise awareness that all people 'can do' science regardless of race, ethnicity, socio-economic status, and gender.

Below we summarise the suggestions that were formulated by the OSCs:

- Provide adequate resources to all the students and personalised teaching and learning activities to address diversity with respect to gender and ethnic backgrounds (e.g., promoting Muslim female role models; organising school events for girls or newly arrived citizens; forming small groups of students with diverse racial, religious or gender identities) or different cultural experiences (e.g., students with other than a northern Scandinavian ethnic background may not be aware of the forest use and protection).
- Provide free of charge visits to museums or tours to natural parks through organising open days.
- Ensure the participation of marginalized people (e.g., minorities, migrants, asylum seekers) in the multipliers' events. Stakeholders representing civil society organisations stressed the need to ensure that marginalised people are informed about the multipliers' events. This could be feasible through the school communication channels (e.g., school platform, wall of announcements, headteacher's newsletter, etc.) but outside schools, location and time are important parameters to take into consideration in order to promote equity at all levels. In so doing, the OSCs have to first identify these people and then invite them to the project activities securing their personal data. For example, to secure the presence of migrant people we need to go to places where there is a concentration of these people (e.g., big squares); with people from rural areas an information day has to be organised in those areas. Moreover, time is equally important for the organisation of the multipliers' events considering the dates of important religious holidays of different religions in the local

context. For instance, events will not be organised on Easter Sunday nor the day of the Islamic New Year.

4.2 Building sustainable networks

This section summarizes participants' ideas on the challenge of scale-up and explores possible ways to expand the OSCs in subsequent months and/or establish new OSCs in the same country.

4.2.1 Resources

The participants of the focus group meetings stated that obtaining parents' consent to participate in the OSS projects and particularly in the after-school activities would be a significant barrier that could hinder the development of the OSCs. This can be more difficult in schools located in disadvantaged areas and also in upper secondary schools which have more time constraints as participating in the OSS projects may not be deemed a priority. In efforts to encourage parents' and therefore students' participation, it was considered important to provide detailed information about the implementation of the OSS projects, the students' role in these projects and the anticipated outcomes respecting the General Data Protection Regulation (GDPR). Moreover, it must be made clear that OSS project-related activities will be integrated into the school curriculum will not increase students' workload and may enhance students' interest in science and motivation to participate in school-related activities in the afternoon. For example, the participants claimed that informing the students about the possibility to share their work with other people about controversial issues and interact with 'famous' experts may make them more interested in taking part in the project since they will be looking forward to something.

Furthermore, the participants suggested developing materials that have a 'longevity' and can be used also after the end of the MULTIPLIERS project. The focus of these materials should be on contemporary socio-scientific issues promoting the motto 'think globally, act locally' emphasizing that students' actions can contribute 'to change the world'. Such resources can support the work of the OSCs even after the completion of the project.

4.2.2 Collaboration

To ensure a meaningful, relevant, and authentic engagement of the stakeholders in the OSCs and succeed in building sustainable networks in the context of the MULTIPLIERS project, it was considered essential to ensure good interaction among the different stakeholders. Regarding the collaboration between schools and families, it was recommended to promote an authentic engagement of the families getting parents 'on board' from the beginning of the OSS project. An idea is to organise school open days on a frequent basis to share information about the project progress, invite the parents to participate in public events and allow the students to present their work. This can create a 'win-win' situation. On the one hand, parents can have a clear understanding of what their children have accomplished acknowledging the fact that their children's work is recognized by the public through the multipliers' events. On the other hand, this recognition may also improve students' self-confidence and interest in science. The open days can be also organised in the stakeholders' premises (e.g., science

centres, museums, parks, etc.) giving the option to families to participate in events offered by the experts in collaboration with the academic institutions such as workshops or guided tours.

4.2.3 Sharing information and facilitating networking

The participants shared various ideas on the media that can be used to inform stakeholders about the progress of the project, raise awareness and facilitate the networking process of companies and institutions with schools. Developing an official project website with relevant information and multimedia content (videos, photos, podcasts, vodcasts) was considered as the ideal medium for sharing information. The project website can have all the resources available online and in open access, contact information per country, and links to the different project accounts in social media to target different groups (e.g., Facebook for families, Twitter for teachers/research institutions/companies, Instagram, TikTok, and Snapchat for youngsters). A newsletter can be also shared through the project website for quick updates.

It was also suggested that interactively using social media can meaningfully engage both the students and the parents. A much more immersive experience can be promoted through posting images or videos on social media platforms such as Instagram or TikTok which can be maximized when setting some challenges, for example adding the option of give-away gifts. Nevertheless, it was stated that the use of social media mostly applies to out-of-school activities (upon receiving informed consent), and it should not be encouraged during school hours since some schools have certain safeguard rules (e.g., it is not allowed to use other social platforms than the school platform for school learning purposes and for schoolteachers to 'be friends' with the students in those platforms).

Communication within the OSC members can occur via monthly emails, face-to-face or virtual meetings (e.g., zoom) upon an agreed timeframe to reflect on the progress of the project activities. There was an agreement that developing a forum for asynchronous discussion on the project website may not be useful because it demands a moderator to review comments and provide answers. Instead, a Facebook page can provide such affordances where stakeholders can share their experiences and discuss teaching and learning activities. Schools can also disseminate information through the school's platform, the schools' Facebook page, and principal's weekly newsletter. Additionally, the OSCs can organise informal public events (e.g., picnics) to present the project outcomes but also for bonding purposes within the OSC.

5 Conclusions and next steps

This deliverable presented the findings of the analysis performed on good practices on Open Schooling approaches, as well as on the outcomes of the needs' analysis performed in the MULTIPLIERS countries. Below there is a summary of these findings emphasizing the 'take-home' messages that will be used for the development of a common approach for the MULTIPLIERS activities based on the operational definition we propose.

5.1 Review of existing good practices

The Open Schooling concept in Science Education has appeared in the report Science Education for Responsible Citizenship (EU Commission, 2015) and, subsequently, in different EU work programmes (2014-2020) and their evolution from an STS view within the Science in Society frameworks to the recent views of Science *with* and *for* Society and Responsible Research and Innovation approach. Initially, the concept of Open Schooling embraced the idea of promoting a sustainable collaboration between schools and other regional/national agents which was however not particularly emphasised to meet the goals of introducing Science in Society. In the following years, this concept refers to one of the strategies to accomplish a new way of doing science that takes purposefully into account citizens' views and capacities and revolves around the ideas of gender equality, research integrity, and ethics. In so doing, the concept of Open Schooling serves to build effective collaboration between science and society in efforts to increase the attractiveness of scientific careers, particularly for girls, enhance the scientific competence of citizens and in general improve formal and informal science education.

Projects under the corresponding funding schemes adopted the concept of Open Schooling in two ways: (a) Open Schooling as a means to improve schools at a curricular and pedagogical level, based on new viewpoints and knowledge of science and about science introduced by external experts and professionals to the schools; and (b) Open Schooling as a way to embed real-life complex challenges in the school curriculum that need multiple agents and expertise to be fruitfully addressed thus developing partnerships with an impact in the local communities. What is interesting to note is that there are very few proposals that give agency to students and schools in the process of co-generation and dissemination of scientific knowledge in society, which is an idea at the heart of RRI when applied to science education. In addition to this, reflecting on previous work, we advocate those educational actions must explicitly promote values such as gender equality, sustainability, equity, social justice, and inclusion.

In reviewing prior work, we found some common themes in projects/initiatives and publications promoting the Open Schooling concept which we referred to as dimensions, namely: thematic focus; network approach; 'opening' strategy; scale; hierarchical relations; temporality; impact measure; and involved agents. More specifically, we found that the thematic focus was on general or transversal competencies or knowledge, as well as on the development of participants' personal traits and abilities (e.g., autonomy, critical thinking). Considering the networking approach, we identified two different strategies: (a) a one-to-one approach between the stakeholders, and (b) a multi-stakeholder approach with the schools being at the centre of the network. Moreover, the 'opening' strategy is organised in diverse ways: (a) stakeholders visit the school and engage the students in the initiative, exchange and enrich their initial views about the problem to be tackled; (b) schools reach out to stakeholders by arranging out-of-school activities (e.g., school trips, fairs); and (c) a combination of both strategies (a and b) while also using online resources and tools. Furthermore, our analysis indicated that the majority of the projects and publications focus on

local challenges, local changes, and local impact while some initiatives engage agents that can help to promote an impact on the wider society. Regarding the hierarchical relations, we found that schools were often 'receivers' (e.g., mentorship, teacher professional development events) which contracts with the idea of bidirectional exchange and authentic networking among the institutions. Most of the initiatives were one-time events or had a restricted duration (i.e., depending on the duration of the project or the funding source) and focused mainly on measuring students' engagement and attitudes, performance and affective variables (e.g., aspirations, self-efficacy), and indirectly students' transversal competencies (e.g., autonomy, communication). Considering, the involved agents in most research papers deal with Open Schooling in terms of opening to families, while Open Schooling projects focus on establishing partnerships with an array of institutions in the community and particularly scientific institutions.

Reflecting on previous practices and strategies in Open Schooling at the EU level, next we highlight certain aspects that we can incorporate into our approach strengthening the work within the OSCs: a combination of an institutional transformative focus (i.e., making changes on institutions' culture and agenda as a means to adapt to each other) emphasising students' learning; a network of schools that share their norms and practices using collaborative inquiry to reflect on their strengths and weaknesses; a family-school-community-university partnership in efforts to promote active family engagement practices with diverse groups of parents thus ensuring cultural and racial equal representativeness and agency; a platform to facilitate the exchange of ideas and information within and among the OSCs; a network of 'community hubs' that focus on underrepresented communities to promote equity and inclusion.

5.2 Needs Analysis

School teachers, science research institutions, informal learning providers, industry representatives, and policymakers agreed that MULTIPLIERS activities contribute towards making science more authentic and interesting to students. More specifically, the incentives for participating in this project included experiencing new teaching and learning practices; promoting students' self-directed learning and autonomy; establishing a collaboration network to share ideas and resources; tackling negative perceptions about science; promoting scientific literacy and science communication; acquiring knowledge and expertise in developing Open Schooling educational materials; identifying future trends and possible adjustments to current educational policies; and promoting a real-life context in learning thus bridging the gap between school education, academia, and the industry world.

However, in planning and implementing the MULTIPLIERS activities, the OSC members considered it important to provide a variety of resources namely: teacher training and workshops on the Open Schooling approach and its benefits; ready-to-use resources with clear guidelines and explicit connections to the curriculum; supporting materials for learning in out-of-school contexts; financial resources to cover travel expenses; a web platform for communication, collaboration and sharing experiences and resources; and materials for science communication for research institutions/scientists/industry representatives.

Despite providing these resources, certain barriers were identified that may influence the implementation of the OSS projects. These barriers pertain to time restrictions; schools' and teachers' willingness to make changes in already established curricula; planning school visits based on safety protocols and institutions' logistics (e.g., number of visitors); and meaningfully engaging external stakeholders in the project activities. To counteract such barriers, the OSC members suggested as follows: encouraging teachers' participation by engaging policymakers in the process of designing and developing the projects' teaching and learning materials upon receiving authorities' consent; offering teachers a decrease in the teaching hours to control the workload; planning school visits well in advance taking into consideration forming small groups of students and appointing university students as accompanying people; planning school visits in the surrounding school area or integrate such events within already planned school trips/excursions; and encouraging the stakeholders to engage in the development and implementation of teaching and learning activities, organising workshops and other public events.

Moreover, it was expressed that an operational description of how the collaboration will take place would be useful. Nevertheless, there was a consensus that adopting a student-centred approach and making alterations when required would promote students' ownership of their learning and have a positive impact on the project. Hence, schoolteachers and other stakeholders would serve as facilitators in the project activities providing scaffolds for students' learning and also participate in the process to evaluate the effectiveness of the project. Considering the MULTIPLIERS' events, it was recommended promoting collaboration with people from the artistic field (e.g., singers, actors), students' participation in the media, and organising events in crowded places (e.g., squares, parks).

In addition, the OSC members explicitly refer to the issue of providing equity, access and inclusion in the project activities regardless of race, ethnicity, socio-economic status, and gender. The OSCs suggested providing adequate resources to all the students and personalised teaching and learning activities to address diversity or different cultural experiences; free visits / open days to museums or tours to natural parks; ensuring the participation of marginalized people by maximizing the access to information outside the school borders considering location and time constraints (i.e., reach out to these people respecting their culture).

To build sustainable OSCs, the participants referred to the availability of resources; ensuring a meaningful, relevant, and authentic engagement; and facilitating the networking process. First, it was considered important to encourage participation by receiving informed consent providing detailed information about the OSS projects and their integration in the school curriculum, the out-of-school visits, the role of each stakeholder, and the anticipated outcomes respecting the GDPR and school safeguard rules. Also, the participants suggested developing materials with a 'longevity', promoting the concept 'think globally, act locally' that could be used to sustain the work of the OSCs after the completion of MULTIPLIERS project. Second, to promote a fruitful collaboration and authentic engagement, it was suggested to get everyone 'on board' from the beginning of an OSS project and organising open days at

schools and in the stakeholders' premises (e.g., science centres, museums, NGOs) to raise awareness through various activities (e.g., workshops, guided tours). Third, to facilitate the networking process within the OSCs, developing an official project website with open access to the project materials, multimedia content, newsletters, and links to the accounts in the social media was considered as the ideal medium for sharing information. It was also noted that an interactive use of social media by setting some challenges (e.g., competitions and give-away gifts) (where applicable) can meaningfully engage the OSCs and promote a much more immersive experience. Last, in terms of the communication between the OSC members and bonding purposes, the participants preferred receiving monthly emails; organising face-to-face/virtual meetings and informal public events; participating in discussions on the project's Facebook page and sharing information through their institutions' social media platforms.

5.3 Conceptualization of Open Schooling

Considering all the above as well as the review of calls, projects and papers, we propose an approach to Open Schooling that combines three main objectives (community impact, pedagogical impact, and scientific impact) and explicitly emphasizes important values. According to this view, a possible definition of Open Schooling that is compatible with the proposals in the WP frameworks and gathers important notions of different projects and papers on the field would be:

Open Schooling is an educational perspective in which schools become open to society by bidirectionally collaborating with different institutions with the aim to:

a) ***Improve community well-being*** *by raising awareness and co-creating solutions to both personal and socially relevant problems that have a direct impact at a local level.*

b) ***Enrich the curricula and pedagogical repertoire of schools****, by sharing different views and expertise from both educational and non-educational agents and institutions with the aim to promote students' meaningful learning and competence development.*

c) ***Give epistemic authority*** *to all agents from within and outside of the school, specifically to the students and their families, by engaging them in sustained inquiry, knowledge creation, creative action, and dissemination on issues of relevance to the local community and beyond.*

To do so, the projects and initiatives on Open Schooling take advantage of the knowledge, practices, visions, attitudes, resources, and values of all involved agents, empowering them to collectively transform society from a ***reflective and critical standpoint that focuses on sustainability, equity, social justice, and inclusion.***

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7 APPENDIX

Interview Protocol *(questions in italic are sub-questions)*

Part A: Conducting successful learning projects

Incentives

1. What did motivate you based on your expertise as [expertise, i.e., teacher, policy-maker, local authority, informal learning provider, researcher] to participate in this OSS project? How would you encourage other people to participate in an OSS project?
    a. *What are the benefits for you as a [expertise] from participating in an OSS project?*

Resources

2. What kind of support would you like to receive:
    a. before the implementation of the projects?
    b. during the implementation of the projects?
3. What kind of materials would support your participation in the projects?
    c. *How can we support science teachers in implementing the OSS projects?*
4. Under which conditions would the organization of school-based workshops be useful for the implementation of the projects? For example, how much time can you spend for this?

Practicalities:

5. What kind of barriers can you identify in implementing OSS projects in established science curricula? How can we overcome these barriers?
6. What kind of barriers related to the institutions' logistics (e.g., teachers change schools; researchers' mobility) could hinder the implementation of the open schooling projects? How can we overcome these barriers?
7. What would be the ideal duration of an OSS project and what could limit the duration?
8. What would be the difficulties in visiting science experts and acting as multipliers outside school based on your experience?

Collaboration

9. How do you envision the distribution of roles in the open schooling project?
    a. *Do you think it is important to have hierarchy within the project team (e.g., between students, teachers, experts etc.)? Why / Why not?*

Project setting/location

10. How do you feel about organizing field trips/visits outside the school? Can you share your experiences?
11. Can you suggest some specific places for the students to a) develop their projects and b) act as knowledge multipliers?

Evaluation

12. Would you participate in interviews, questionnaire surveys and observations with the aim to monitor the implementation process and evaluate the success of the project? Do you have any suggestions on how we could facilitate your participation in the evaluation process?

Equity / Access / Inclusion

13. How can we guarantee that students and families can have an equal access to open science schooling projects regardless of gender, socio-economic status, ethnic backgrounds?
    a. *How can we promote social inclusion in these projects?*
    b. *How can covid protective measures hinder the implementation of OSS projects? How can we encounter such difficulties?*

Part B: Building sustainable networks/OSCs

Resources

1. What could hinder students and their parents to give their consent to participate in the OSS projects?

Collaboration

2. How can we best help community stakeholders to engage with the proposed school projects?
    a. *How can we ensure a meaningful/relevant/authentic engagement of the stakeholders in the OSS projects?*
    b. *How can we actively involve societal actors and work with them in OSS projects and safeguard their commitment?*
    c. *How can we have parents and the wider community's support in implementing open schooling projects?*
    d. *What could stand as a barrier to support the teachers in implementing OSS projects?*

Sharing information and networking

3. What would be the ideal medium to inform the stakeholders about the progress of the project?
    a. *How can we raise awareness about what is going on in the OSS project?*
    b. *How can we facilitate the networking process of companies/institutions and the school?*