



D3.2: Report of SSIBL implementation within CoP

and reflections on facilitation, support and implementation within each participating primary school - Round 2



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Glossary

Alma Löv	Museum of Unexp. Art
BBC	Beit Berl College
COSMOS	Creating Organisational Structures for Meaningful science education through Open Schooling for all
CORPOS	Core ORganisational Structure for Promoting Open Schooling
CoP	Community of Practice
HEI	Higher Education Institution
IE-UL	Instituto de Educação da Universidade de Lisboa
KdG	Karel De Grote Hogeschool katholieke hogeschool
KU	Karlstad University
MoE	Ministry of Education
SDG	Sustainable Development Goals
SSI	Socio-Scientific Issue
SSIBL	Socio-Scientific Inquiry-Based Learning
SOTON	University of Southampton
STEM	Science Technology Engineering Mathematics
TPD	Teacher Professional Development
UU	Utrecht University
WP	Work Package
WSC	Winchester Science Centre



1. Overview of SSIBL-CoP implementations during Round 2

The aim of this deliverable is to describe the SSIBL-CoP implementations undertaken as part of Work Package 3 (WP3) during the second round of implementation of the COSMOS approach (months 19-32). During Round 2 of the COSMOS project, WP3 partners have been able to successfully facilitate and support 11 SSIBL-CoP implementations in collaboration with 28 teachers and 808 children (aged 6-12 years old) across 9 primary schools. Of those schools, 4 were new schools participating in COSMOS, and 5 were continuing schools from our first round of implementation. Table 1 provides an overview of participants in each of our WP3 SSIBL-CoP implementations in primary schools during Round 2. Having both new and continuing schools working with us in Round 2 meant that we can both discuss with continuing schools the progress and development of the COSMOS approach from Round 1 to Round 2, but also try to implement the revised tools from WP2, WP5 and lessons learned from our first round of implementation (D3.1) in new school settings and to gain from new perspectives on how the approach can be further developed and made sustainable.

Table 1.1. WP3 SSIBL-CoP implementation participants from primary schools

Country	Number of new primary schools	Number of continuing primary schools	Number of teachers involved	Total number of students involved	Age of students (in years)
UK	1	1	6	180	6 to 9 years old
Belgium	1	0	4	51	23 10-11 year olds 28 11-12 year olds
Sweden	2	0	3	100	10-11 years old
Portugal	0	2	3	48	8-10 years old
Israel	0	2	12 (6 in each school)	429	9-10 year olds (4 th grade), 10-11 year olds (5 th grade) in School 1 (100 in total) 9-10 years old (4 th grade), 11-12 years old

					(6 th grade) in School 2 (329 in total)
TOTAL	4	5	28	808	6-12 years old

The 11 SSIBL-CoP implementations were co-designed in CORPOS teams consisting of a range of members, mainly the HEI and societal partners in each national context, with school teachers, but in some cases CORPOS also included school leadership and other external collaborators as shown in Table 1.2. SSIBL-CoP implementations were co-designed in CORPOS teams, involving in total, 70 CORPOS members, 28 of which were teachers, which focused on 5 main socio-scientific issues (Healthy lifestyles; biodiversity loss; environmental sustainability including ecological footprint, sustainable buildings, urban development and nature conservation, and sustainable auto motor practices; Genetically modified organisms; artificial intelligence) being addressed with the SSIBL-CoP implementations (Table 1.3). The co-designed implementations totaled more than 200 hours of contact time between CoP members and students, and varied in size and duration depending on factors such as school location, national context, school needs and interests. Overall, our implementations ranged from 6-30 hours indicating the wealth of approaches that can be taken to develop SSIBL-CoP implementations that are suitable and contextualised, which in turn shows how the COSMOS approach we have adopted is viable and sustainable.

Table 1.2. Overview of CORPOS members and their role in each of the participating country and school.

Country and school	CORPOS members & role
UK Primary school 1 (new)	9 total: 3 partners from HEI, 2 societal partners, 2 Year 3 teachers, 2 Year 4 teachers
UK Primary School 2 (continuing)	7 total: 3 partners from HEI, 2 societal partner, 2 Year 2 teachers
Belgium Primary School (new)	9 total: 3 partners from HEI, 2 societal partners, 1 Year 4 teacher, 1 Year 5 teacher, 2 Year 6 teachers
Sweden Primary School 1 (new)	5 total: 1 partner from HEI, 1 societal partner, 2 teachers one teaching year 4, one teaching year 5.

Sweden Primary School 2 (new)	5 total: 1 partner from HEI, 1 external from a makerspace, 1 teacher active during whole process, two teachers involved in activities out of school.
Portugal Primary School 1 (continuing) from school cluster 1	5 total: 1 partner from HEI, 1 societal partner, 1 primary school teacher, 2 secondary school teachers
Portugal Primary School 2 (continuing) from school cluster 2	5 total: 1 partner from HEI, 1 societal partner, 2 primary school teachers (one of them in charge of the library), 1 secondary school teacher
Israel Primary School 1	10 total: 2 partners from HEI, 2 Year 4 homeroom teachers, 2 Year 5 homeroom teachers, 2 SE teachers, 1 Art teacher, school headteacher
Israel Primary School 2	15 total: 2 societal partners, 4 teachers (2 Science Education teachers, 1- school counselor, 1- social coordinator), school principal, 1 parent representative, 2 students from Student Council, 5 community representatives (1- nurse from local health agency, 1 - from local voluntary department, 1- representative from another Arab primary school for special education, 1 – Rand institution for inclusion of population with disabilities)
Total	70 CORPOS members (HEI partners, societal partners, teachers, headteachers, parents, community members)

Similar to Round 1, a key focus for SSIs chosen during Round 2 was on socioenvironmental issues with a particular emphasis placed on issues related to environmental sustainability, demonstrating the important role that COSMOS and SSIBL-CoP implementations can play in supporting addressing global challenges of climate change and biodiversity loss at the community and local levels. Although we had less teachers in total involved compared to Round 1, the reflections and lessons learned from Round 1 implementations allowed us to work more closely with these teachers (both new and continuing) and to involve a greater number of CoP members (at least 210). The Communities of Practice (CoP) formulated to support and participate in teaching and learning about these SSIs through SSIBL-CoP implementations consisted of a wide range of stakeholders from the school's communities such as school Headteachers, parents, school governors, as well as beyond the immediate school community, including researchers/scientists, representatives of National Agencies, informal science learning centres and educators. The HEI partners and societal partners in all national contexts were key members of the CORPOS formulated for each implementation, allowing them to support and facilitate the open schooling process from within.

Table 1.3. Overview of chosen SSIBL themes in each country and school, duration of implementation and CoP members and their roles.

Country and school number	SSI	Duration of SSIBL-CoP implementation activities	CoP members & role
UK - Primary School 1 (new)	Healthy living	11 classroom-based lessons and 3 pupil-parent session with CoP members 19 hours	~22 parents, 5 members from Saints Foundation, 3 members from City Catering Southampton
UK - Primary School 1 (new)	Biodiversity loss	8 classroom-based lessons and 3 pupil-parent sessions with CoP 17 hours	11 parents, 1 member from HLOW Wildlife Trust
UK – Primary School 2 (continuing)	Biodiversity loss	6 lessons 10 hours	Headteacher, 1 school governor, 1 Year 6 teacher, school site manager
Belgium – Primary School 1 (new)	Ecological footprint (10 subtopics: sorting waste (2) – food waste – packaging – electricity – biodiversity – 'lost stuff' – transport – saving water – heating the school building)	5 half days (project: ASK-FIND OUT-ACT) + half day (post measurement action) + half day (presentation) 13 hours	Each group (subtopic) of students involved one external partner in the FIND OUT stage (10 total) e.g., local supermarket, local garden center, parent who works as an electrician, a police officer etc.
Sweden – Primary School 1 (new)	Genetically modified organisms	5 lessons during 70 minutes, plus two full days, one day at Alma Löv and one workshop day in school. 18 hours	The teachers (2), the societal partner and one HEI partner. Planning together. Teachers active alone during lessons at school.
Sweden – Primary School 2 (new)	Artificial Intelligence	6 lessons during 60 minutes, plus one full day at the university 12 hours	1 teacher, 1 HEI partner, 1 staff member from a makerspace. Planning together. Teacher having lessons at school. Makerspace staff leader of workshop day at the university.



Sweden – Primary School 2 (new)	Different problems related to sustainable development at the company Volvo CE	1 full day at Volvo CE 6 hours	1 teacher, 1 leader from Volvo CE, 1 HEI partner. Involved in planning and implementation. Engineers from Volvo (3) and engineer students from the university (4) that supported students during the Volvo CE visit day
Portugal – School 1	Sustainable buildings	Regular classes, one full day at Pavilhão do Conhecimento 24 hours	1 partner from HEI 1 societal partner (Ciência Viva) 1 primary school teacher 2 secondary school natural sciences' teachers 1 secondary school visual arts teacher Members from the project Smile, a local initiative aimed at making the neighborhood sustainable
Portugal – School 2	Sustainable school building and surrounding area	Regular classes, one full day at Pavilhão do Conhecimento 30 hours	1 partner from HEI 1 societal partner (Ciência Viva) 2 primary school teachers (one of them in charge of projects' implementation) 1 secondary school physics teacher 1 Environmental Engineer from the City Hall (Project Agenda 21) 1 member from the Nature Protection League
Israel- School 1 (continuing)	Urban Development versus Nature Preservation – developing activism	20 lessons and final field trip total approx. 30 hours extending throughout half of the school year	6 teachers (2 with intense involvement, 4 provided support and accompanied various program activities), 1 principal, 1 parent – served as a guide, 1 parent served as parents' representative, 2 mothers who were fully involved in the process and guided the field trip, +100 parents who took part in the CoP oriented process without specific roles (111 total)

<p>Israel – School 2 (continuing)</p>	<p>Healthy lifestyle of the school community</p>	<p>2 lessons at old-age home – 4 hours Full day activities – students lead sports day activities in school - ~6 hours Joint activities with Elmanar school – 3 lessons – 9 hours Dietician – 12 meetings – 12 hours Lectures by Doctors and nurses – 10 hours Rand Institute 2 meetings – 4 hours Parent lectures/workshops (1-2 each class) – 4 hours. Total: ~22 lessons, 49 hours</p>	<p>Parent committee, local municipality education department head, volunteer department (local municipality), Ibrahim Kasem high school, local old-age home, dietician, Elmanar school rep., Local community health providers (doctors and nurses), Child development center, Rand institute</p>
<p>Total</p>	<p>5 main socioscientific issues (Healthy lifestyles; biodiversity loss; environmental sustainability including ecological footprint, sustainable buildings, urban development and</p>	<p>201 hours</p>	<p>At least 210, including HEI partners, societal partners, school teachers, school headteachers, other school staff like school counselors, scientists, engineers, parents, local authorities and local community members, doctors, nurses, police officers, local shop owners (e.g. supermarket), charity groups and NGO members</p>



	nature conservation, and sustainable automotive practices; Genetically modified organisms; artificial intelligence)		
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2. United Kingdom Report (Partners 2 & 9, SOTON/WSC)

2.1. SSIBL-CoP Implementations in primary schools in the UK

SSIBL-CoP implementation in Primary School 1 (continuing school)

During Round 2, we continued working with Primary school 1, which was the only primary school we worked with in Round 1 (D3.1, Section 2.1). For Round 2, we initially intended to work with two of the three Year groups/classes we worked with in Round 1 (Year 2 and Year 3) which would allow us to work with the same teachers (the Year 5 teacher from Round 1 would be moving to be a Year 3 teacher). We had a meeting in October 2023, where the end of Round 1 focus group was conducted, and a discussion of Round 2 plans and aims took place. The teachers requested that in our TPD sessions during Round 2, we provided more in-depth feedback and input on SSIBL and on pedagogical processes that can support high-quality science teaching, such as teacher questioning. We had agreed to focus on this for our first TPD session, which was organised for December 2023, after the COSMOS Teacher Conference in Prague. However, due to changing circumstances (pregnancy and maternity leave, and moving schools), this TPD session did not take place until Spring term of the school year, and we were only able to continue our collaboration with the two Year 2 teachers, who were the same as in Round 1. Thus, the CORPOS was smaller during Round 2 implementation compared to Round 1, and consisted of the three HEI partners, two societal partners and the two teachers. The lead teacher was able to attend and contribute to the Teacher Conference in Prague and continued as the lead person facilitating communication across the CORPOS and CoP team members.

Overall, the work conducted with the two Year 2 classes at this primary school incorporated all three SSIBL dimensions with CoP members included in each dimension, as described next in Table 2.1. This was the same as in Round 1, but with different CoP members included as relevant, and without a field trip included in the SSIBL-CoP implementation during Round 2. Instead of a field trip, our societal partners, WSC, visited the school and conducted outdoor learning activities with the children and teachers that were supporting the conceptual learning of children around the topic of biodiversity. The



Headteacher and the school's site manager were the same as in Round 1, but the parents from Round 1 were not involved in Round 2.

Table 2.1 SSIBL – CoP implementation with Year 2 in a continuing primary school in the UK during Round 2

SSIBL dimension	Description	Duration
ASK	<p>Key SSI question: Should we keep the school pond?</p> <p>The teacher introduced the lesson by reading to the children a letter from the Headteacher; the letter was explaining to the children that there were concerns about the safety of children at the school and the pond would be removed. In this way they were introduced to the key SSI question.</p> <p>During Lesson 1, they co-created with the teacher a controversy map of all different perspectives on the issue, and identified who (e.g. scientists, school site manager, University) could help them answer the question (personal and social inquiry). These stakeholders then were approached and become the CoP members.</p> <p>Children formulated questions about the pond they would like to ask CoP members (Lesson 2).</p>	2 hours
FIND OUT	<p>In Lesson 1, the children were asked to think about their own opinion about whether they should keep the pond and why and listen to each others' views (personal inquiry).</p> <p>CoP members visited Lesson 3 and talked with the children (site manager, school governor, Year 6 teacher) answering their questions about the pond (social inquiry)</p> <p>Children engaged in educational activities like pond dipping, learning how to identify species found in the water, using simple classification keys, and exploring micro-habitats, which were led by two societal partners from WSC (scientific inquiry)</p> <p>Children conducted investigations to compare their school pond to better maintained ponds (Lesson 4) (scientific inquiry)</p>	6 hours

	Children went outside to identify and observe micro-habitats around the pond (Lesson 5) (scientific inquiry)	
ACT	<p>The children wrote a response letter to the Headteacher to say what they thought (keep or don't keep the pond) and why (e.g. the pond is important because it supports different species etc.) (Lesson 6)</p> <p>Children created dioramas of the pond to visualise what they would like it to look like and then presented these, and read out their letters to the Headteacher, a HEI partner and a school governor, in order to explain to them why they thought they should keep the pond (Lesson 6)</p>	2 hours

Overall, CoP members were involved in all three stages of the SSIBL-CoP implementation, even though the CORPOS team was smaller in Round 2, compared to Round 1. This smaller CORPOS, allowed for a closer working relationship with the lead teacher at Primary School 1, and the further refinement of the biodiversity loss unit we co-designed during Round 1. Having more of the CoP members coming from within the school community, rather than outside stakeholders, also supported the sustainability of the approach, as the teachers was implementing the unit for a second time, and was gradually adapting it to make it more sustainable to implement in future iterations.

SSIBL-CoP implementation in Primary School 2 (new school) in the UK

Our collaboration with Primary School 2 in the UK during Round 2, was initiated via the existing network between the HEI partners and the school's science coordinator. We (HEI partners) had previously collaborated with this school on science education projects focusing on outdoor learning and biodiversity enhancement. The school had a strong relationship with the University of Southampton taking part in their Science and Engineering Day (for which the University provided funding) and other Public and Community engagement projects. The school's ongoing relationship with the University for their science education provision was commented on positively in reports the school had received by the UK government's education regulator (OFSTED – Office for Standards in Education, Children's Services and Skills).

The collaboration was initiated with a recruitment meeting with the school's leadership team (Executive Headteacher and Headteacher), and the science coordinator where the COSMOS aims were shared



and a discussion of how we could work together to benefit the school and achieve our aims took place. Once the school leadership gave permission for the science coordinator and teachers to go ahead with our COSMOS collaboration, we organised two TPD sessions with all teachers (two Year 3 teachers, and two Year 4 teachers). Following the updated TPD handbook provided by WP5, the first TPD session took place in October 2023, and focused on exploring the concepts of learning as a community (Figure 1) and conducting the school openness assessment through a focus group discussion. Based on the outcomes of discussing school openness dimensions we focused on finding ways of increasing parental involvement and providing opportunities for parents to participate in their children’s learning. As a result, we organised three sessions for each year group spread across the unit where parents could come into school and work with the children on relevant activities with the support of CoP members.

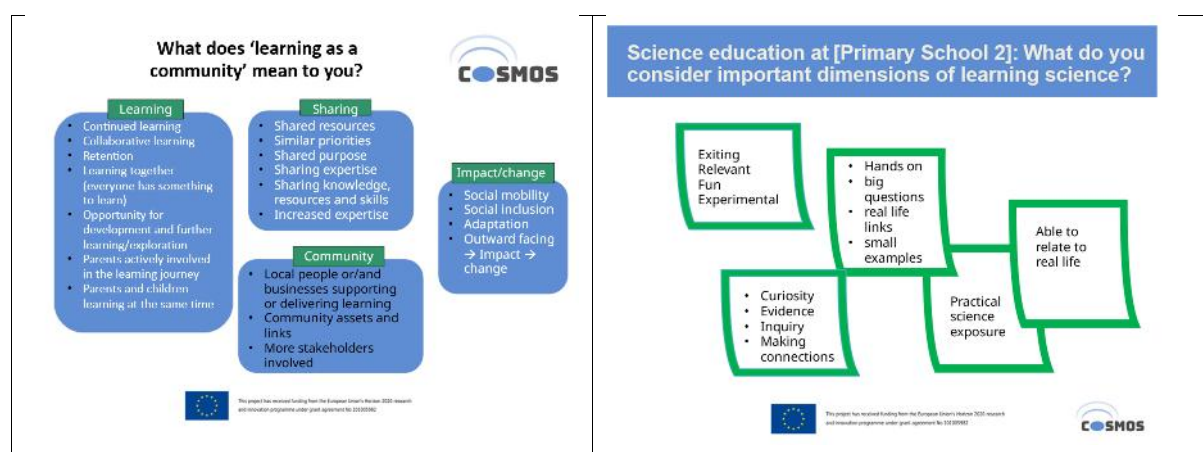


Figure 1 The key aspects considered important for learning as a community and of science education for Primary School 2

The second TPD session took place in December 2023, following the COSMOS Teacher conference in Prague, which the science coordinator of this school was able to attend and participated. TPD2 focused on SSIBL and led into the co-design sessions. We had two SSIBL-CoP implementations facilitated, supported and implemented in this school, one for Year 3 and one for Year 4 as described next. We had separate co-design sessions with each year group to co-create the lesson sequence and materials needed for each SSIBL-CoP implementation.



SSIBL-CoP implementation with Year 3: How can we make our school community healthier?

The Year 3 teachers have worked with two HEI partners on adapting their science curriculum to make it more open to their community focusing on their Healthy Bodies unit. The three sessions where parents could be involved were during Lesson 4, 7 and 11 of the SSIBL-CoP implementation, as described in Table 2.2. A fourth session with parents initially planned had to be cancelled unexpectedly the day before due to unforeseen circumstances from the external stakeholders (researchers from the Southampton General Hospital) that would be leading that session.

Table 2.2 SSIBL – CoP implementation with Year 3 in a new primary school in the UK during Round 2

SSIBL dimension	Description	Duration
ASK	Key SSI question: How can we make our school community healthier? Lesson 1: The teacher introduced the SSI question to the pupils	1 hour approx.
FIND OUT	Lesson 2: Students investigated ‘What do our bones do’ learning about the human skeleton and then thinking about how to keep their bones healthy, linking the lesson to the key SSI question. Lesson 3: Pupils continued their investigations on the human skeleton by designing tests to investigate questions such as ‘Can you jump further if your femur is longer?’ Lesson 4, with parents (1.5h): Children reviewed subject knowledge with their parents, before working with HEI partners in exploring what it means to be healthy, and coming up with questions for a school-wide questionnaire in order to start working on their SSI question (FIND OUT) Lesson 5: Muscles and Bones – building a model of a human hand Lesson 6: Learning about teeth and how to keep them healthy; make a pledge on how to keep teeth clean (ACT) Lesson 7, with parents (1.5h): the Saints Foundation collaborated with parents and the teachers and run activities for parents and children to discover together how exercise and sports supports a healthy lifestyle Lesson 8: children continued investigations into how to keep teeth healthy	16 hours approx.

	<p>Lesson 9: Children conducted investigations using egg shells to find out how different drinks affect enamel</p> <p>Lesson 10: Children focused on learning about nutrition and how different nutrients support a healthy body</p> <p>Lesson 11, <i>with parents</i> (1.5h): Southampton Catering Services, who provide the school's meals worked with parents and children to design healthy food plates, made their own pizzas, and learned about different fruit getting the chance to taste new fruit to them</p> <p>Lesson 12: Children visited Winchester Science Centre, our societal COSMOS partner, where they learned more about how the heart works and explored the Centre's exhibits (whole day)</p> <p>Lesson 13/School assembly: During a school assembly at the start of the day, a member of the company supplying food to the school, talked to all KS2 children (Years 3-6) about healthy eating habits, and the Year 3 children were credited for their work on this area for the whole school.</p>	
ACT	<p>Lesson 14: Children designed posters including facts about healthy eating and exercise to put them around school spaces to inform other pupils and staff at the school about how to be healthier.</p> <p>Four posters based on the children's designs were printed out and placed in various places around the school (e.g. the posters about washing hands were placed in the children's toilets, and posters about exercise were placed in the outdoor school grounds.</p>	2 hours approx.

Overall, during this SSIBL-CoP implementation, CoP members were involved in the FIND OUT stage but the ASK stage was co-designed with the CORPOS team based on the school's needs and children's interests, but without the involvement of CoP members. Importantly, the community level of the ACT stage in this SSIBL-CoP implementation was the school, so the children's posters (Act) were aimed at this community group.

SSIBL-CoP implementation with Year 4: How can we enhance our school's biodiversity?

The Year 4 teachers worked with the HEI and societal partners on adapting their science curriculum to make it more open to their community focusing on their Living things unit (biodiversity loss was the SSI chosen). The three sessions where parents could be involved were during Lesson 4, 6 and 8 of the SSIBL-CoP implementation, as described in Table 2.3. A fourth session planned had to be cancelled due to national elections taking place on the same day and the school would be shut to act as a voting centre).

Table 2.3 SSIBL – CoP implementation with Year 4 in a new primary school in the UK during Round 2

SSIBL dimension	Description	Duration
ASK	<p>Key SSI question: Why does biodiversity affect our local area and how can we support it?</p> <p>Lesson 1: The teacher introduced the SSI question to the pupils, introduced the concept of biodiversity and linked to the need to take action to protect our environment.</p>	1 hour approx.
FIND OUT	<p>Lesson 2: Students learned about classification of animals and living things, through observation and compare and contrast activities</p> <p>Lesson 3: Students observe their school grounds and record different types of wildlife/living things with the support of WSC partners and teachers.</p> <p>Lesson 4 (same day as L3), with parents (1.5h): Children and their parents work with WSC partners, exploring sounds of biodiversity and their school grounds, building on Lesson 3. Children and parents come up with an action plan of what they would like to have more on their school grounds.</p> <p>Lesson 5: Children learned about the pollination process through modelling and discussion activities. They also investigated the role of plants within food chains.</p> <p>Lesson 7: Students learned about classification of invertebrates and mammals using classification keys and observations</p>	12 hours approx.

	<p>Lesson 8, with parents (1.5h): Children and parents work with our COSMOS partners and an engagement officer from the Hampshire and Isle of Wight Wildlife Trust to learn about hedgehogs and make footprint tunnels to find out if they have hedgehogs on their school grounds.</p> <p>Lesson 9: Children visited Winchester Science Centre, our societal COSMOS partner, where they learned more about biodiversity and how to support it (whole day)</p>	
ACT	<p>Lesson 4 (same day as L3), with parents (1.5h): Children and their parents work with WSC partners, exploring sounds of biodiversity and their school grounds, building on Lesson 3. Children and parents come up with an action plan of what they would like to have more on their school grounds.</p> <p>Lesson 6 (same day as L5) with parents (1.5h): Children, with their parents, teachers and HEI partners planted pollinator friendly plants around their school grounds.</p> <p>Lesson 10: Children wrote and sent letters to the newly elected Southampton City Council to let them know about the work they have been doing in their school grounds and to make suggestions of action about how the Council can support them and other schools in enhancing their school grounds.</p> <p>Lesson 11: WSC partners visited the school and using their mobile dome supported children with activities learning about our planet and how to protect it.</p>	4 hours approx.

During this SSIBL-CoP implementation, CoP members were involved at various degrees in each of the SSIBL stages. The ASK stage was co-designed by CORPOS taking children’s interests into account, but did not directly involve external CoP members, including the children. In the FIND OUT stage, CoP members included the parents as active participants, who attended the sessions organised by the CORPOS for parent-children collaborative learning. Other CoP members such as the engagement officer from the regional Wildlife Trust was a more peripheral participant, with the potential of developing a closer relationship and thus become a more active CoP member in future implementations. The ACT stage of SSIBL involved CoP members in the form of the city’s Council, although these were external stakeholders, as transactional participants (WP2 framework) that were not involved in the design of activities.



2.2. Reflections on facilitation, support and implementation within each participating primary school in the UK

Reflections on CORPOS, CoP & SSIBL-CoP implementation with Primary School 1 (continuing school)

The established relationship developed with the lead teacher in Primary School 1 allowed for our continued collaboration into Round 2, despite significant challenges the teacher faced with her workload, and new role and responsibilities. During the Round 2 school year, the lead teacher, continued in her role as a science coordinator but also had a new, additional middle leadership role as the Special Educational Needs Coordinator (SENCo) for her school, which posed a challenge on her workload. This was mitigated by our decision to take a more focused approach to our COSMOS work with the school as a result of our reflections on the work done for the first round (see D3.1). This also meant that the CORPOS at this school was smaller in Round 2, consisting of the HEI partners and the two Year 2 teachers, with our societal partners involved in the planning and SSIBL-CoP implementation of some of the activities.

As with Round 1, we were able to implement all three SSIBL stages (ASK, FIND OUT, ACT), and to integrate CoP engagement in each stage, and this was a key success of our SSIBL-CoP implementation given the challenges with maintaining communication and workload mentioned above. This indicates that embedding the co-designed materials from Round 1 into the science curriculum of the school acted as a facilitator in sustaining the approach during Round 2, despite challenges imposed on the lead teacher. The teacher did not see this as additional work but as an add-in to her curriculum planning, and with some adaptations the SSIBL-CoP implementation could still go ahead, even if this mean that the CoP network developed in the previous round, had to be.

It was also interesting to see the lead teacher of Primary School 1 sharing her experiences and working closely together with the lead teacher from Primary School 2 during the TPD conference and co-develop a controversy map for the SSI that eventually became the SSI in focus for one of the two SSIBL-CoP implementations at Primary School 2.

Reflections on CORPOS, CoP & SSIBL-CoP implementation with Primary School 2 (new school)

The CORPOS within this school was facilitated and supported by the lead teacher in this school, which was the science coordinator as mentioned in the previous section. This teacher had experience of working with the University on various initiatives and had previous working experience in science communication and engagement. These teacher identity attributes facilitated engagement as there was interest from the teacher(s) and a willingness to collaborate. The CORPOS team consisted of the HEI and societal partners, and the Year 3 and Year 4 teachers, who worked collaboratively in developing and delivering the SSIBL-CoP implementation activities. A success of this CORPOS development was the fact that three of the four teachers taking part, did not have previous collaboration opportunities with the HEI and societal partners, but through the COSMOS project were able to develop working relationships and connections with our institutions and our CoP members, and as such experience for themselves how they can network and collaborate with external stakeholders in order to open up their school curriculum. As with the continuing Primary School, we were able to follow all the steps indicated in the COSMOS framework (WP2) for formulating CORPOS, although without the presence of leadership in the CORPOS team. Meetings with the leadership team took place at the recruitment stage, but from that point onwards leadership was not involved actively in the planning and implementation of SSIBL-CoP activities, although they were fully supportive of the project and work undertaken.

A key success of the SSIBL-CoP implementation with both year groups was the positive manner in which the activities designed and delivered were received by parents, who were the target dimension in our school openness discussions (parental involvement), and a CoP member group. Both SSIBL-CoP implementations were co-designed to support parental involvement. Both implementations and all sessions designed for children-parent collaborative learning were well attended by parents (approximately 20 in each session for Year 3 and 10 in each session for Year 4). Teachers noted that some of the parents attending were parents that would not normally engage with the school. One of the parents that attended all Year 3 sessions, noted in an interview that she was able to attend because the way the sessions were planned allowed her to plan ahead alternative arrangements with her employer, which was not the case for other one-off parental engagement events the school organised. Feedback collected by parents at the end of each session using sticky notes indicated how much the parents valued the opportunity to learn together with their children, and to experience learning with

them as part of school activities. Associated with this success was the fact that CoP was formulated based on existing collaborations with the lead teacher and the school, rather than fully depending on external stakeholders, and the HEI/societal partners' networking and support in identifying CoP members. This meant that the teachers were more actively involved in the creation of the CoP, since there was already some common ground and a shared repertoire that CoP members could draw on, although this was more evident with the Year 3 SSIBL-CoP implementation, compared to the Year 4 implementation. For example, one of the CoP members for the Year 3 SSIBL-CoP implementation were the school's catering service staff, who already knew the children and staff. For Year 4, external factors like weather conditions and lack of time, meant that there were less external CoP members involved, although the collaboration of those CoP members involved with the school was successful. For example, the parent-children collaborative learning session where we were planting pollinator-friendly plants (Lesson 6, Table 2.3) took place on one of the hottest days of the school year, which limited the amount of time children and their parents could be outdoors.

The key challenge in the SSIBL-CoP implementations at this new school was how to integrate the Action dimension of the SSIBL framework into the existing science curricula. This is because the science curriculum adopted at the school has a focus on scientific enquiry and thus the teachers felt they were more able and confident to address and plan for the ASK and FIND OUT stages rather than the ACT. This was mitigated through the co-design process, as with our support we were able to suggest ideas for actions and to support with networking and identifying stakeholders that could be involved in the Action dimension.

2.3. Lessons learned from Round 2 implementation in the UK

Curriculum integration of innovative pedagogical approaches such as SSIBL-CoP and adaptation with existing curricula are critical for successful implementation and likely to support the sustainability of the COSMOS approach. In all three SSIBL-CoP implementations we carried out for WP3 during Round 2 this curriculum integration was present and facilitated the process as the teachers were building on existing materials, and existing knowledge and expertise, whilst also trying out new strategies and approaches in an integrated and gradual manner. This is evidenced from one of the Year 4 teachers in



Primary School 2 who indicated he felt more 'brave' now to try out community engagement as part of his teaching and learning practice.

As in Round 1, we found that in the UK context, support by school leadership was essential but engagement of leadership beyond this level was not a requirement, and in some cases could impede the CoP development as power dynamics might influence this process in a negative manner. The teachers in both schools appreciated the 'permission' they were provided by school leadership and felt that the school leadership's buy in to the COSMOS project allowed them the space and validated their attempts to deviate from normal school and classroom practices. This means that school leadership needs to be considered carefully as part of the school openness approach, as also indicated through our ecological model of school openness (Sarid et al., 2024).

Action competence is new in science education pedagogical approaches; this means that it requires further TPD and ways of integrating with school science curricula and teaching practices, and a more explicit focus placed on action competence as an outcome of the learning process but also as part of the learning process. For example, considering how action can be integrated in the SSIBL-CoP implementation from the inception of the issue to the design of activities that raises the need to act for children in the initial stages of the SSIBL-CoP implementation. This was achieved well by all three SSIBL-CoP implementations we had as the key question addressed collective responsibility and action (what should we do about....how can we have more....?).

On-going teacher professional development and a teacher community is also another important dimension that can facilitate sustained engagement, which overcomes obstacles posed by external factors such as time and high workloads. Both lead teachers from the two primary schools (and the lead teacher of the secondary school in the UK) attended the teacher professional development conference in Prague. This allowed them to create their own community and to network and support each other where possible and relevant, further supporting the open schooling process and reinforcing the sustainability of the COSMOS approach. For example, the lead teacher from Primary School 2 has shared resources with the lead teacher in the secondary school, for a new SSIBL-CoP implementation the secondary school teacher wanted to implement in the following school year.



School openness needs to be approached in a way that is manageable for the teachers; a small change in practice that is sustained in the following year, is more likely to result into continued adoption of new ways of teaching and learning science that includes community.

3. Belgium Report (Partners 3 & 8, KdG/Djapo)

3.1. SSIBL-CoP implementations in Primary schools in Belgium

SSIBL-CoP implementation in Primary School 1 (new)

In this new primary school, we started from existing cooperations within the school team (Year 4-5-6) to initiate and make the CORPOS sustainable. Afterwards, we were building on the initiation of CORPOS by creating common language at the start of the project - throughout the focus group - about where the school is now in the openness wheel and where areas for improvement are desired. Appointing one clear point of contact (the Belgian societal partner Djapo) to guide the schools and one point of contact for research activities (the Belgian HEI KdG) also contributed to this. Throughout the school year, it also became clear that the school team also preferred a single point of contact: the Year 5 teacher.

Once the decision was made to let the students search for decent external partners regarding their subject, the teachers did not correspond with them in any way. For this school, this ended up in a lack of growth of the CORPOS. At the end of the school year the principal decided to build on the CORPOS in the upcoming years within the team: she is motivated to build on the existing CORPOS and extend it with other teachers from kindergarten and primary school.

To initiate a CoP, we started from the same existing cooperations within the school team (Year 4-5-6). In this school we worked in a certain way within the communities of practice, similar to what we did with schools during Round 1: intake - kick-off - workshop – teacher conference - consultations - reflection/evaluation. The theoretical input we provided to the school was also similar: SSIBL-CoP, methods regarding the different SSIBL stages to possibly implement in their project, research and take action on socio-scientific issues. The local partners (e.g., the local supermarket, the local garden center, a parent who works as an electrician, a police officer et c.) were identified by the students themselves.



Due to some very last minute work of this school team and the limited guidance given to the students in this regard, the actual collaboration with these partners was rather limited.

In selecting the SSIBL theme, we framed in our guidance what possible themes could be, based on the SDGs. After the intake, the school selected national learning objectives regarding sustainable entrepreneurship they would like to work on. Going through the COSMOS project and for sure attending the TPD training in Prague shifted this focus to 'ecological footprint' with 10 subthemes (as mentioned in Table 3a before).

With the method 'Pyramid' students had the opportunity to choose the subtheme that suits them the most. It was very important for them to explain why one subtheme was more interesting for them than the other.

During the whole duration of the project, the pupils were working towards their action with the following key questions:

- J What do we need to measure before our action?
- J Which action can probably downsize the ecological footprint of our school?
- J What do we need to measure after our action?

The pupils discussed several aspects of civic involvement in the selected subthemes as well as the societal impact of their actions within the school.

Table 3.1 SSIBL – CoP implementation in a new primary school in Belgium during Round 2

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	<p>Key SSI question: How can we lower the ecological footprint of our school?</p> <ol style="list-style-type: none"> <li data-bbox="416 562 986 987"> <p>1. Brainstorm “What do you know already about the ecological footprint?”</p> <p>Think-pair-share <u>Method: “Kaas met gaten”</u></p> <p>On a picture of a cheese with holes, students write in the cheese what they already know and in the holes what they do not yet know. They exchange with each other to fill in the holes already a bit more or note something down in new holes.</p> <li data-bbox="416 1039 986 1240"> <p>2. Get to know the topic ‘ecological footprint’ better</p> <p>Short roleplay from the teachers to introduce the topic ‘ecological footprint’ with its 10 subtopics Survey: ‘What is my own ecological footprint?’</p> <li data-bbox="416 1301 986 1845"> <p>3. Formulating a research question</p> <p>General question of the project – How can we lower the ecological footprint of our school? Pupils choose their subtopic <u>Method: the pyramid</u></p> <p>Each pupil has a pyramid with different levels. They locate the subtopics in the different levels: in the top – the most preferred subtopic, below – the less preferred subtopics. They need to explain why they’re (not) attracted to the different subtopics. Based on these pyramids (and group dynamics), the teachers divide the group into different subgroups.</p> 	<p>1 hour</p> <p>1 hour</p> <p>2-3 hours</p>

	<p>Specific question for their subtopic:</p> <ol style="list-style-type: none"> 1. Short brainstorm about what they already know about the subtopic and what they don't know yet (see method: Kaas met gaten) 2. Get to know the subtopic better: search on the Internet and in books (supported by guiding questions of the teachers) 3. Define their key question <p><u>Method:</u> vragenmachientje https://www.ru.nl/wetenschapsknooppunt/materiaal/leerlijn-onderzoeksvaardigheden-po-vo/hulpmiddelen-per-onderzoeksvaardigheid/#h91700375-f8b9-5161-e7be-fae7d3ad5587</p>	
FIND OUT	<p>Each group of pupils does a pre and post measurement. In between, they execute their action.</p> <p>They start with a personal inquiry: What do we feel/think about the issue? Depending on their subject, afterwards they did a social (e.g., interview with teachers and the principal) and/or a scientific inquiry (e.g., measure the different species in their school garden).</p> <p>Each group of pupils needed to involve at least one external partner to help them find an answer to their question. e.g., local supermarket, local garden center, parent who works as an electrician, a police officer etc.</p>	5-6 hours
ACT	<p>After their pre-measurement each group invented an action to execute within the school and contribute to a lowered 'ecological school footprint'.</p> <p>e.g., motivate pupils & teachers to use the small button to flush the toilet instead of the big button – plant more biodiversity-friendly flora on the playground – make the 'lost stuff' more attractive – add an extra garbage bin for reusable paper - ...</p> <p>Two weeks after the start of their action, they did a post measurement.</p> <p>At the end of the project, they presented their subtheme to the whole school: pupils, teachers, the principal, parents, the societal partner, the higher educational partner.</p>	2 hours

3.2. Reflections on facilitation, support and implementation with a new primary school in Belgium

Before we started the project, the societal partner – Djapo - initially only had contact with the principal. When talking to the teachers the first time, it became clear that it wasn't their choice to participate in COSMOS. Nevertheless from the beginning on, they were very much willing to learn from the project but there was a mismatch between what we thought they knew about the project and what they actually expected. It took us until the teacher professional development in Prague to overcome this challenge and talk and think on the same line.

To establish the CORPOS and CoP, we needed to be very flexible. The project team is used to work very last minute and expected us to be very available on an ad hoc basis. We managed to meet the needs of the team, but we believe – regarding the COSMOS project aims & learning process of the students – we could've reached more when we were able to guide them on a more regular basis and with a good preparation.

The project was built on a lot of pupil initiative and participation. We know this can be very educative, but the build-up towards this type of education was lacking. The children were very clear that they missed support in how to do (social or scientific) research and how to involve external partners within a project.

The principal was the initiator of the participation of the school in COSMOS. Afterwards she disappeared until the day where the students presented their projects. After the end of our guidance within the school, she explained that she's willing to implement the SSIBL-CoP-pedagogy into the whole school to encourage all students to grow up to critical and hopeful adults.

3.3. Lessons learned from Round 2 implementation

The key lessons learned from our Round 2 SSIBL-CoP implementation with this primary school are:

- J Identifying and contacting external stakeholders can be achieved by pupils but they need guidance and support to initiate and maintain a collaboration.

- J Focusing on improving school openness and implementing SSIBL-CoP pedagogy requires minimal experience and expertise from the participating teachers in science education and inquiry-based learning. Achieving goals in multiple of these dimensions simultaneously tends to be difficult
- J Being very flexible in working with schools seems very important and necessary. But we need to find a balance between being flexible and asking some minimal efforts and engagement when participating in a project.

Based on our experiences from Round 2 implementation open schooling is not a standard part of the school culture in Flemish primary schools. Teacher teams can focus on some of its dimensions and by doing so, take small but meaningful and satisfactory steps forward. However, to achieve school-wide sustainable results, this probably often requires the active involvement of many stakeholders within the school community.

The reflection exercise during TPD sessions with the school openness wheel does seem to really help in initiating a Community of Practice, on the one hand, to give common language to school teams, and on the other hand, to reflect on what is already going well and what the school team would nevertheless like to see changed.

4. Sweden Report (Partners 4 & 11, KU/Alma Löv)

4.1. SSIBL-CoP implementations in Primary schools in Sweden

SSIBL-CoP implementation in Primary School 1 (new)

During Round 2 we had no continuing schools from Round 1, but two new schools collaborated with us on the project. Contact with Primary School 1 in Sunne, working with genetically modified organisms (GMOs) was made via the societal partner. The societal partner had previously worked with one of the science teachers at the school. Contacts were held via phone, email and physical meetings during the project. Sometimes between the two science teachers at the school and the societal partner, sometimes between the teachers and the HEI partner and sometimes between the societal partner and the HEI partner. Now, the contacts are established, and the teachers appreciated the opportunity to take part in the COSMOS project and look forward to future collaboration. The teachers have now worked more together than before, and this is a start for a continuing CORPOS. In this school, the CORPOS and CoP were the same team.

In School 1, the teachers and the societal partner first decided that they were going to work with questions about animal ethics. This decision was made based on what the exhibitions at Alma Löv could offer, but also what the teachers thought that their students would be interested in. The questions would be about tests on animals for medical purposes, keeping animals in cages, etcetera. However, during the day at the museum this changed because of what the students were interested in. They became more interested in art that showed animals that had been genetically modified. Hence the focus changed to ethics connected to GMOs, which is something students usually do not work with at the primary school level. However, the teachers decided to follow the interest from their students and focus was changed. Activities were planned together mainly by the teachers and the societal partner.

Table 4.1 SSIBL – CoP implementation in Primary School 1 (new) in Sweden during Round 2

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	<p>What is ethical to do with animals in terms of gene modification?</p> <p>After watching an exhibition at Alma Löv museum the question was posed by the students themselves. The visit at the exhibition lasted one whole day, but included several activities, lecture, practical work for the students. After that day the rest of the work with the students had this focus.</p> <p>The day at the museum included both ASK and FIND OUT activities closely connected.</p>	<p>6 hours</p> <p>(1 day-long museum visit, 1 hour lesson)</p>
FIND OUT	<p>During five lessons the students searched for information on the Internet with the support from their teachers. In a local newspaper a story was written during this period about a sick child, 2 years old that suffered from a deathly disease. The only way to treat it is a new method with gene modification. This story caused a lot of emotional engagement among the students.</p> <p>The CoP involved during planning, the days at the museum and one workshop day at the school. The HEI partner supported with ideas of experts to contact for more information.</p>	9 hours
ACT	<p>A final debate and exhibition of students' art work was held at the school. Other classes were invited to see the exhibition.</p> <p>The HEI partner and the societal partner visited the exhibition.</p>	2 hours

SSIBL-CoP implementation in Primary School 2 (new)

Contact with School 2, in Arvika working with artificial intelligence (AI) and sustainable development issues was made from Karlstad University directly to a science teacher at the school. This teacher has a role in the Arvika municipality to stimulate teaching and learning in science. Relation with the teacher since many years of different projects related to STEM education. The teacher tried to connect with the other science teacher at school, but since they even do not work in the school the same days this was difficult. Hence, the CORPOS was small only existing between one science teacher and 1 HEI partner. Contact will continue after the end of the project, and hopefully the work from the COSMOS



project can spread to other science teachers in the municipality. Offers were made to other schools to join, but were rejected because of arguments of lack of time. Spring semesters are difficult at schools with many national exams and also many holidays. Changes are needed in the organisation to make this possible. What was unique in Arvika was the collaboration with Volvo CE who actually were the ones reaching out for contact. They first contacted the university and then also the school. They want to continue this collaboration both with the school that joined in COSMOS, but also with other primary schools in Arvika and this is planned to take place during Autumn 2024, based on the experience of stressful springs in schools. In this school, the CoP included the CORPOS team and Volvo CE, who became involved as a CoP member on their own initiative.

In Primary School 2 the first SSIBL theme was decided by the teacher having a special interest in AI. The lessons and the activities were planned in collaboration between the teacher, the HEI partner and the partner from the makerspace. The second SSIBL theme consisted of several issues developed and presented by Volvo CE in Arvika. These issues were all related to sustainable development and the students were divided in small groups working with the issues together with engineers from Volvo CE and engineer students from Karlstad University. The issues were for example: How can we create a better working place environment? How can we become better at recycling, making it more fun? How can we stimulate less food waste in our restaurant? How can we create self-driven vehicles that can “see” people?

Table 4.2 SSIBL – CoP implementation in Primary School 2 (new) in Sweden

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	Is AI something good or bad? The teacher was interested in this question and the decision was made by her. Discussion held with the staff from the university of the possibility to have a collaboration on this.	1 hr
FIND OUT	The class worked during five lessons, each during 60 minutes using a lesson package already prepared by the Mittuniversity in Sweden for this particular age group. They also used parts from a science TV program that was going on at this period in the Swedish television as a source of information. The HEI partner	11 hours (5 hours in school and 1 day at the university with a workshop)

	<p>told the teacher about this program and also about the lessons from the Mittuniversity.</p> <p>The lesson package included activities such as discussing different ethical situations that can occur using AI. The lesson package also includes information about what AI is and how it works. All the teaching materials are available on a website, however only in Swedish.</p> <p>After the lessons the full day workshop at Karlstad university took place. The workshop was held by staff from a makerspace. During this day the students tried different AI tools, and created stories with text, pictures and music. The purpose of the day was to present how AI can be used in creative processes and also to practice how to make good prompts.</p>	
ACT	<p>Debate in classroom.</p> <p>Only the teacher and students were involved in this stage. However, the teacher got some new ideas of how to stimulate argumentation among students during the TPD led by Karlstad university.</p>	1 hr

4.2. Reflections on facilitation, support and implementation within each participating primary school in Sweden

Reflections on CORPOS, CoP and implementation in Primary School 1 (new)

In this school, collaboration started between two science teachers in the same school. Both of the teachers are teaching at the primary school level, but they have education in science and can teach at both primary and secondary school levels. The school was under new administration, and in the middle of a process of developing a new organisation and the teachers did not really know what will happen in the future with a new owner and new principal. The COSMOS project served as a facilitator for this collaboration between the teachers and they planned together their project with some assistance from Karlstad University, and by the societal partner. Hence, all partners were involved in co-designing the activities. Alma Löv of course were in charge of the activities at the museum and one workshop day at the school with art creation by the students being part of the inquiry process. The teachers at this

school did also get some training in how to organise and facilitate argumentation activities with the students during the TPD, which they then used as part of the ACT stage of the SSIBL-CoP implementation. The CORPOS and CoP had the same people involved.

Overall, the SSIBL-CoP design and implementation process worked well from all aspects. The main challenge was to find partners with expertise in the GMO field. These experts are not found in small municipalities, such as in the municipality where the primary school 1 was located in, and this was also a lesson learned from Round 1. However, when it turned out that this was the theme the teachers finally wanted to have, Karlstad University provided the teacher with contacts at another university. However, the teachers did not have time to involve more people since they worked with the project the last month of the term. This was also a lesson learned from the first round, that spring terms are very busy at schools. Still, it was not possible to start the implementation in the autumn semester because evaluation of Round 1 and the TPD workshops were on-going during that period. No school leader involved as already mentioned with the school being in the middle of a new organisation to be implemented. It would have been a great opportunity to have more contacts with the school leader since they were at this stage, but lack of time from COSMOS partners did not make it possible. Still, altogether, all partners found that the experiences with the project were positive and plans are made for future collaborations, indicating the sustainability of the project approach. The students were positive and very engaged during the whole project and they were also the ones who wanted the project to have this particular focus. So, at this school student participation was developed and they were the ones driving the ASK stage.

Reflections on CORPOS, CoP and implementation in Primary School 2 (new)

To make it possible for the teachers to meet with staff from the university and staff from the makerspace we held both zoom meetings, we had email correspondence and also visits to the school. However, the organisation at the school with the two science teachers not working the same days at the school was a difficult barrier to overcome. In addition, the second science teacher did not show very much interest in the project and was less involved as a result. The collaboration with the active science teacher and the university as well with the staff from the makerspace went smoothly, mainly because of engagement from all partners.



An important facilitation factor was that the COSMOS project supported by paying for transport for the school to travel to the university and also for costs for the makerspace involvement. The school leader was only involved in agreement that the classes could spend one day at the university. The CORPOS and CoP had the same people involved. In the other project (Primary School 1) collaborating with Volvo CE was initiated by the company and there are already new projects planned between the science teacher and Volvo CE to take place during the autumn in 2024-25 school year (beyond the project timeline). The challenge at Primary School 2 is the need for a different organisational structure that can make it easier for teachers to collaborate. A hope is also that experiences from the COSMOS project will spread to other schools in the municipality since the active science teacher has a leading role in stimulating science teaching. However, there is no top-down support when it comes to science teaching; if changes are to happen it will be from a bottom-up approach starting with teachers that get inspiration from the school and the teacher who has been active during this year.

The greatest challenge experienced collaborating with Primary School 2 were the attitudes of school leadership, which did not make it easy for teachers to collaborate with the HEI and societal partners. In particular, the principal and one of the science teachers showed less interest in collaboration and the project. The SSIBL-CoP co-design process varied during the two themes they worked with at the school. First, the school worked with the AI theme and then they also worked with a theme about sustainability. The same teacher and students were involved in both themes. The not so active teacher brought her students both to the university for the workshop day about AI and also to the day at Volvo CE. However, we do not know anything about if she did anything else besides these visits. The ASK stage was already decided in both themes. However, from different partners. The FIND OUT stages worked well in both themes, with all partners involved collaboration in planning and implementing the activities. During the AI theme the ACT stage only included the active science teacher and the students in the classroom. This could have been developed even more. The ACT stage with the sustainable development issues involved all partners, since this also took place at Volvo CE and all of the activities were taking place in the same day. The ACT stage was that the small student group had presentations of their solutions at the end of the day for the rest of the groups. The presentations involved presentations of models the students had made during they with engineers and engineer students serving as coaches in each group. The engineers and the engineer students can be considered as CoP members, because they were also involved in the planning of the day and in evaluation reflections at



the end of the activities. This concept was considered as positive by all partners involved. The issues were from real life, work was done at the company and engineers and engineer students served as positive role models. This collaboration will continue both with the active science teacher at the school and is also planned to take place with the other primary schools in the municipality.

4.3. Lessons learned from Round 2 implementation in Sweden

The key lessons learned from Round 2 are in many ways the same as for Round 1. One reason for this being that there were only new schools participating and even though key lessons from Round 1 were taken into account the challenges were difficult to overcome. These challenges were that the choice of SSIBL theme can serve as a limitation on what kind of CoP can be developed. Schools in small municipalities have many limitations because of bad economy making it difficult for school to go on tours. Even though offers and ideas were shared of people to contact and have collaboration with online, this was a step that was not taken by any of the participating schools. This suggests that personal contacts are important and networking skills for teachers are needed so they feel more equipped to make contact themselves with new stakeholders. Another challenge is that Round 2 also took place during the spring semester, which is a season with national exams and many holidays in the Swedish education system. This means that teachers do not have much time to plan new activities and create new networks/CoP. It takes more time to plan with other partners not being at the same school, or even with colleagues at the same school as in the case in of school 2 that participated from Sweden. The teachers and the students are all very positive, but it still seems as teachers find this way of working as an add-on instead of as an add-in. This is something they do if they have some extra time. However, it is important not to blame teachers too much, because working in the COSMOS approach does take more time than if you work on your own. Especially the first time, establishing new contacts etc. In all of the primary schools that have participated in the COSMOS project in Sweden the teachers all wanted to develop community collaboration and in all schools the teachers argued that this also happened during the project and that they wanted this to continue and develop even more. In all of the schools the students were also so engaged and argued that they wanted to work like this even more and that they had learnt a lot during the project.



5. Portugal Report (Partners 5 & 10, IEUL/Ciencia Viva)

5.1. SSIBL-CoP Implementations in primary schools in Portugal

In Portugal, we worked with two school clusters. Schools are organised in clusters: groups of schools from different levels of education that function under the same directive board and develop a common educational project they consider adequate for their social and cultural reality. Each cluster is represented in COSMOS by 1 primary school and 1 secondary school, and the CORPOS was developed in each cluster (and not in each school). Decisions were made by consensus between all the CORPOS' members. Both clusters are participating in COSMOS for the second consecutive year. However, the addressed SSI changed in both clusters.

The schools and some of the teachers involved in this process are used to implement activism initiatives based on an inquiry-based science approach. Several of the teachers took master and/or PhD degrees at our institute (supervised by Pedro Reis) about the topic of students' activism (understood as a collective and democratic problem-solving process centred on socioscientific or socioenvironmental problems affecting their communities). So, they belong to a CoP that we have been supporting for 14 years centred on students' and teachers' activism, and the SSIBL-CoP has a lot in common with the initiatives we have been developing.

The CORPOS was developed based on the strong relations (personal and professional) existing between the IE-ULisboa team members and at least one of the school cluster teachers. In each school cluster, this teacher had a very important role in mobilising other teachers (from different levels of education) to the CORPUS. The fact that they work organised in school clusters, provided a context in which internal collaboration between different levels of education already existed. Another important fact supporting both the CORPOS and the CoL development was the fact that each school cluster had one "Science Club", supported by Ciência Viva (our societal partner), aimed at the development of collaborative projects between students, teachers, scientists, science centres' members, parents and



other community members focused on the inquiry and resolution of local problems that the school community would like to address. This “Science Club” was an important pivot for all the activities and for the combination between COSMOS activities with activities proposed by other projects developed e.g. by the City Hall (local government) and NGOs.

The CORPOS was maintained/supported by the strong collaboration and the shared culture/interest (between the IE-ULisboa team and the main teacher from each school cluster) in terms of the importance attributed to inquiry and activism initiatives implemented by students and teachers. As I already mentioned, this culture has been developed during a 14 years long process of collaboration associated with a CoP centred on that kind of initiatives.

SSIBL-CoP implementation in Schools’ Cluster 1 (continuing from last year, but with a new SSI)

This school cluster – represented in COSMOS by 1 primary school and 1 secondary school – participated in COSMOS for the second year, and the CORPOS didn’t suffer any change between the two years. The CORPOS was developed at the cluster’s level, integrating teachers from both primary and secondary schools.

One of the CORPOS members is used to implement activism initiatives based on an inquiry-based science approach. She took a masters degree at the IE-ULisboa (supervised by Pedro Reis) about the topic of students’ activism (understood as a collective and democratic problem-solving process centred on socioscientific or socioenvironmental problems affecting their communities). So, she belongs to a CoP that the IE-ULisboa has been supporting for 14 years centered on students’ and teachers’ activism, and the SSIBL-CoP has a lot in common with the initiatives we have been developing. The CORPOS was developed based on the strong relations (personal and professional) existing between the IE-ULisboa team members and this teacher. In the school cluster, this teacher had a very important role in mobilising other teachers (from different levels of education) to the CORPOS. The fact that they work organised in school clusters, provided a context in which internal collaboration between different levels of education already existed. Another important fact supporting both the CORPOS and the CoP development was the fact that the school cluster had one “Science Club”, supported by Ciência Viva (our societal partner), aimed at the development of collaborative projects between students, teachers, scientists, science centres’ members, parents and other community members focused on the inquiry



and resolution of local problems that the school community would like to address. This “Science Club” was an important pivot for all the activities and for the combination between COSMOS activities with activities developed by other projects proposed by the City Hall (local government) and several NGO organised in a group called SMILE).

The SSI for the SSIBL-CoP was chosen during a brainstorm session at the COSMOS Teacher Conference in Prague between the CORPOS members from both Portuguese School Clusters. Then, they decided to focus on sustainable buildings (e.g. sustainable school building and sustainable homes), with the aim of creating a sustainable project that could engage students across different educational levels and allow the collaboration between the two Portuguese School Clusters.

Some classes concentrated specifically on sustainable buildings, actively participating in the project by completing questionnaires and developing related projects. Other classes explored the broader theme of sustainability in varied and creative ways. For instance, they delved into the concept of giving a "second life" to materials, engaging in discussions about sustainable building materials, and exploring the United Nations' Sustainable Development Goals (SDGs). Additionally, practical activities such as constructing a school garden, landscaping, and implementing waste separation systems were incorporated into the curriculum. These adaptations were driven by the need to accommodate the differing availability of resources, time, and curriculum alignment across different classes.

The CoP was formed by identifying potential partners through a combination of stakeholder analysis and leveraging existing collaborations. For instance, the primary school's ongoing partnership with the SMILE project, a local initiative aimed at making the neighborhood sustainable, played a crucial role. Communication was maintained through regular meetings where ideas and resources could be exchanged. The CoP's activities interactive workshops for students, focusing on shared interests in sustainability and environmental education.

The theme of "sustainable buildings" was chosen as the focal point for the SSIBL project. This theme was selected based on the schools' existing initiatives, such as the use of solar panels and composting systems in the secondary school. The co-design process involved teachers working closely with students to identify relevant issues and develop practical solutions. For example, students were



encouraged to explore ways to improve their homes' energy efficiency, leading to discussions on renewable energy sources and waste management. This collaborative effort not only enhanced students' understanding of the subject but also fostered a sense of responsible citizenship. Through hands-on activities, such as constructing models of sustainable houses and exploring the use of sustainable materials and alternative energy sources, students gained practical knowledge about sustainability. This experiential learning was instrumental in boosting their confidence in their ability to make a positive impact on the environment. Students reported an increased awareness of how their actions affect the world around them and expressed a clear commitment to implementing sustainable practices in their daily lives. The project's influence extended beyond academic interests, instilling a sense of environmental stewardship. Students demonstrated a growing concern for the planet's well-being and a strong motivation to engage in actions that contribute to its preservation. This was evidenced by their willingness to reduce pollution, reuse materials, and take other steps towards sustainability.

While the overall structure of the CoP was maintained during the entire year, the participation of certain members evolved. For example, one teacher decided to step back from the project due to curriculum constraints and the demanding schedule associated with preparing ninth-grade students for exams. The topic of sustainable buildings, while valuable, did not align well with the curriculum requirements for her subject area, particularly in the context of the academic pressure faced by students in their final year of middle school.

Members of the CoP were actively involved in the learning process, particularly through the integration of interdisciplinary approaches. For example, students from the secondary school were tasked with creating educational games for their younger peers, explaining concepts such as sustainability and sustainable building materials. These activities allowed for a deeper understanding of the issues at hand and promoted peer-to-peer learning.

For the continuing schools, the focus remained on the same SSI, specifically the theme of "sustainable buildings." This decision was made based on the positive outcomes and the strong foundation established in the previous round. The co-design process, however, did undergo some changes. In the second round there was a deliberate effort to co-create new materials and adapt existing ones to



better suit the evolving needs of the students and the objectives of the project. Additionally, hands-on activities were diversified, including more complex experiments and model-building exercises.

Table 5.1 SSIBL – CoP implementation in a continuing School Cluster 1 in Portugal during Round 2

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	<p>Key SSI question: "What do buildings of a sustainable future look like?"</p> <p>The project aimed to explore sustainable architecture, focusing on energy efficiency, renewable materials, and the overall impact of buildings on the environment. The older students were tasked with researching these topics comprehensively, with the goal of sharing their findings with the younger students to foster awareness and understanding of sustainable development.</p>	<p>Primary school – 5</p> <p>Secondary school – 5</p>
FIND OUT	<p>The older students explored various elements of green architecture, including the use of solar panels, sustainable insulation, and water conservation techniques. The students prepared detailed presentations and educational materials designed to be accessible and engaging for the younger students. The focus was on understanding the principles behind sustainable construction and identifying best practices that could be applied in future projects.</p>	<p>Primary school – 8</p> <p>Secondary school – 8</p>
ACT	<p>All students applied their understanding by constructing models of sustainable buildings. These models included features like green roofs, solar panels, and efficient water management systems. The culmination of this project was an exhibition at the schools from the school cluster and the presentation at the Pavilhão do Conhecimento, where all COSMOS partner schools gathered to showcase their work. These events provided a platform for students to present their models and discuss their insights on sustainable architecture.</p>	<p>Primary school – 11</p> <p>Secondary school – 11</p>

SSIBL-CoP Implementation in Schools' Cluster 2 (continuing from last year, but with a new SSI)

This school cluster – represented in COSMOS by 1 primary school and 1 secondary school – participated in COSMOS for the second consecutive year, and the CORPUS didn't suffer any change

between the two years. The CORPOS was developed at the cluster's level, integrating teachers from both primary and secondary schools.

One of the CORPOS members is used to implement activism initiatives based on an inquiry-based science approach. He took both a master and PhD degree at the IE-ULisboa (supervised by Pedro Reis) about the topic of students' activism (understood as a collective and democratic problem-solving process centred on socioscientific or socioenvironmental problems affecting their communities). So, he belongs to a CoP that the IE-ULisboa has been supporting for 14 years centred on students' and teachers' activism, and the SSIBL-CoP has a lot in common with the initiatives we have been developing. The CORPOS was developed based on the strong relations (personal and professional) existing between the IE-ULisboa team members and this teacher. In the school cluster, this teacher had a very important role in mobilising other teachers (from different levels of education) to the CORPOS. The fact that they work organised in school clusters, provided a context in which internal collaboration between different levels of education already existed. Another important fact supporting both the CORPOS and the CoL development was the fact that the school cluster had one "Science Club", supported by Ciência Viva (our societal partner), aimed at the development of collaborative projects between students, teachers, scientists, science centres' members, parents and other community members focused on the inquiry and resolution of local problems that the school community would like to address. This "Science Club" was an important pivot for all the activities and for the combination between COSMOS activities with activities proposed by other projects developed e.g. by the City Hall (local government) and the Nature Protection League (NGO in the area of environment).

The SSI for the SSIBL-CoP was chosen during a brainstorm session in Praga COSMOS meeting between the CORPOS members from both Portuguese School Clusters. Then, they decided to focus on sustainable buildings (e.g. sustainable school building and sustainable homes), with the aim of creating a sustainable project that could engage students across different educational levels and allow the collaboration between the two Portuguese School Clusters. Later, in this school cluster, the initial proposal from Prague was reworked to align with the specific context and needs of the schools in Almada. Upon returning from Prague, the educators realised that the original theme did not fully resonate with their students or address the immediate issues within their school environment.



Therefore, they shifted focus towards practical improvements within their own school, using the theme of "the school of the future" as a catalyst for identifying and addressing current challenges.

This SSI allowed the synergetic collaboration between projects and resources proposed by different institutions: the COSMOS project proposed by th IE-ULisboa and Ciência Viva; the "Science Club" proposed by Ciência Viva; the project Agenda 21 from the City Hall.

The project engaged students in a comprehensive examination of their school's current state and its potential for improvement in terms of sustainability. The older students (11th grade) conducted interviews with younger students from the different school levels, trying to identify their desires for a future school and assessing current issues such as sustainability, temperature control, the presence of greenery, and water drainage. These interviews revealed a range of concerns and aspirations, forming the basis for subsequent project activities. Then, based on a discussion process of the collected data, both age groups (from primary and secondary schools) proposed their visions for a future school. These visions were shared and discussed between the two groups of students in common sessions. The secondary school students created digital representations using Minecraft and prepared implementation plans focused on concrete proposals – with a study about the materials and costs involved in each one of them. The primary school students constructed physical models of the school, exemplifying the proposals to be presented to external stakeholders.

The schools established robust partnerships with parents and local entities, including the City Hall, and some NGO from the area of environment. These collaborations, together with the Schools' Directive Board, were considered essential for implementing the proposed improvements. The students developed detailed action plans and cost estimates, which were presented to these partners to secure support and resources. This collaborative approach ensured that the project had a real impact, beyond the classroom, fostering a sense of community engagement and practical action.

So, the CoP was established through a combination of existing partnerships and new collaborations. Stakeholders were identified based on their ability to contribute to the project's goals, with a focus on improving the school's infrastructure and promoting sustainability. The CoP included a wide range of participants, from teachers and students to local government officials and parents.



The activities within the CoP included interactive workshops – implemented by an Environmental Engineer from the City Hall and some volunteers from the Nature Protection League – where students learned about sustainable practices and explored creative solutions for their school environment. The shared interest in creating a more sustainable and pleasant school environment served as a unifying goal for all involved.

The decision to focus on "the school of the future" as the SSIBL theme was driven by the need to address the specific issues faced by the schools. The co-design process was highly participatory, involving students and teachers in brainstorming sessions and practical activities. The project leveraged both traditional and digital tools, with older students using Minecraft to design digital models of their ideal school, while younger students created physical models. This dual approach allowed for a rich exploration of ideas and facilitated a deeper understanding of architectural and environmental considerations.

The project had a strong impact on students, fostering a sense of responsible citizenship. Students were not only encouraged to think critically about their environment but also to take practical steps towards improvement. They identified specific issues within their school, such as inadequate green spaces, poor temperature control, and water drainage problems. By proposing concrete solutions and collaborating with local authorities, they gained a strong sense of agency and responsibility.

Students' proposals included practical measures such as installing photovoltaic panels to provide shade and generate electricity, planting more trees, growing plants in the fences around schools and improving water drainage systems. These initiatives were supported by detailed cost plans and action strategies, which were presented to the School's Directive Board and to the City Hall (local government). This active involvement in real-world issues reinforced the importance of civic engagement and demonstrated the impact that young people can have on their community. Some of these proposals were already implemented in the school or in the local community, with the help from the City Hall: several trees were planted in the schools' areas; other plants were placed at the fence that separates the two schools trying to increase the green area and the available shadow; organic composters were distributed by the schools and the houses from the community; vases with plants were placed in the majority of the buildings.



CoP members, including students and teachers, played an active role in the learning process. The collaborative nature of the project allowed for a rich exchange of ideas and fostered a deeper understanding of the issues at hand. The older students' involvement with the younger students exemplified peer learning and mentorship. This iterative process ensured that the project remained relevant and engaging, providing a dynamic and impactful learning experience for all participants.

Table 5.2 SSIBL – CoP implementation in a continuing School Cluster 2 in Portugal during Round 2

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	<p>Key SSI question: "What is the vision for the school of the future, and how can the current school environment be improved in terms of sustainability?"</p> <p>This question emerged from the need to align the COSMOS project with the local realities of the participating schools. The activities leading to this question included initial discussions with students about the current state of their school environment. This activity helped raise awareness among students about the environmental aspects of their school and set the stage for proposing practical improvements.</p>	<p>Primary school – 8 Secondary school – 3</p>
FIND OUT	<p>Older students conducted interviews with younger students, asking them to describe their ideal school and identify shortcomings in the existing facilities. These discussions focused on aspects like sustainability, temperature regulation, green spaces, water drainage, and overall comfort</p> <p>The personal, social, and scientific inquiries conducted by the students involved a comprehensive analysis of the school's current state and potential areas for improvement. The students worked together to identify issues such as lack of greenery, inefficient temperature control, and inadequate water drainage. The older students played a crucial role in this process, as they were responsible for designing and conducting the interviews with younger students. These interactions provided valuable insights into the students' perspectives and highlighted areas where changes could be made. The CoP, which included teachers, parents, and local authorities such as the City Council</p>	<p>Primary school – 11 Secondary school – 8</p>

	<p>and Parish Council, supported the students in this endeavor. They provided resources, guidance, and expertise, enabling the students to deepen their understanding of sustainability and its practical applications.</p>	
<p>ACT</p>	<p>The younger students focused on creating physical models, incorporating elements such as gardens, better temperature control, and sustainable materials. The older students divided their efforts between creating digital representations using Minecraft and building physical models. These projects showcased their vision for a more sustainable and environmentally friendly school.</p> <p>In addition to creating models, the students, with the support of the CoP, developed a detailed action plan that included cost estimates and implementation strategies. They presented these plans to the City Council and other stakeholders, advocating for real changes to the school environment. Some of the proposed actions included installing vertical gardens, improving water drainage systems, and introducing composting initiatives. The involvement of parents and local authorities was crucial in these efforts, as they provided the necessary support and resources to turn the students' ideas into reality. Some of the proposed ideas were already implemented with the help of the City Hall.</p> <p>The culmination of this project was the presentation at the Pavilhão do Conhecimento, where all COSMOS partner schools gathered to showcase their work. This event provided a platform for students to present their models and discuss their insights on sustainable buildings.</p>	<p>Primary school – 11 Secondary school – 8</p>

5.2. Reflections on facilitation, support and implementation within each participating school cluster in Portugal

We present here our joint reflections from working with the two school clusters due to the integrated nature of our collaboration and work with the clusters. The CORPOS in each cluster was the same as in Round 1. We involved groups of teachers with a long experience of collaboration in the



implementation of activism initiatives based on an inquiry-based science education approach. The communication was established through our previous channels: video conference, phone calls and visits to the schools.

The CORPOS was created, maintained and supported by the strong collaboration and the shared culture/interest (between the IE-ULisboa team and the main teacher from each school cluster) in terms of the importance attributed to inquiry and activism initiatives being implemented by students and teachers. As already mentioned, this culture has been developed during a 14-year long process of collaboration associated with a CoP centered on this kind of initiatives. So, we were successful approaching school staff who: a) have been involved with us in previous projects; b) were motivated to work with us; c) already shared a common repertoire with us regarding the implementation of inquiry and activism initiatives in schools; d) have positions of leadership regarding pedagogical innovation and project implementation in schools. These facilitators for success enabled a successful SSIBL-CoP implementation in each school cluster.

We also faced some obstacles to CORPOS development: a) time constraints and a work overload experienced by many teachers; b) only a reduced number of teachers were motivated to participate in the project; c) during each school year, teachers are invited to participate in a large number of projects, causing some limitations in terms of their availability to participate in all of them (they had to choose according to the demands of each project and their personal time constraints).

The CoP was created with a small but adequate number of members. Compared with the first year of COSMOS, the teachers from the School Clusters showed a remarkable capacity to combine/articulate people and resources from different projects offered to the cluster. The activities were planned by the teachers in order to integrate in a coherent way the different proposals and requirements from several projects. This allowed a much better involvement (than last year) from external members from those projects and a much better use of resources. This second year, teachers had less difficulties planning and establishing collaborations with external groups/institutions. However, the initial idea developed during the Teacher Conference in Prague, of sharing initiatives between the two school clusters, did not happen due to time constraints and difficulties to articulate the agendas of both school clusters.



The CoP development was possible due to the previous personal and professional relations between the teachers and the IE-ULisboa team and also between the teachers themselves. Without these previous successful experiences between different elements, the CoP would become much more difficult to achieve. The CoP was facilitated by the previous experience of collaboration between different school levels and between schools from the same cluster. It is always difficult to find other teachers willing to participate. The teachers involved in the CoPs have in common a strong willingness to innovate (and to promote different activities each year) in their classes.

The SSIBL-CoP design and implementation was facilitated by last year's COSMOS experience and the previous experience/involvement of some teachers in a CoP (created by IE-ULisboa) centred on students' and teachers' activism: the SSIBL-CoP has a lot in common with the initiatives we have been developing. The CoL in each School Cluster was quite effective in promoting collaborations between school levels and with external institutions or groups from other projects. Compared to last year (affected by a teachers' strike), the ACT stage was implemented in a much better way, with some impacts at school and community level. All the SSIBL stages were accelerated by students' enthusiasm, in spite of the implementation of the majority of COSMOS' activities at the end of school year, when they have a lot of work and are already tired.

The leadership of each school cluster had the important role of supporting teachers and students' involvement and participation in COSMOS. They were not directly involved, but they didn't create any obstacles. And they were quite effective in recognising and celebrating students' and teachers' achievements within the COSMOS activities.

Overall, the COSMOS implementation was received well in both school clusters. Students enjoyed a lot the activities focused on real problems and the learning component was evident. Teachers mentioned that they always appreciate collaborating in this kind of projects because they allow them to learn more pedagogical knowledge and to continue implementing activities combining science education, citizenship education and school activism.



5.3. Lessons learned from Round 2 implementation in primary schools in Portugal

Compared with the first year of COSMOS, the teachers from the School Clusters showed a remarkable capacity to combine/articulate people and resources from different projects offered to the Cluster. The activities were planned by the teachers in order to integrate in a coherent way the different proposals and requirements from several projects. This allowed a much better involvement (than last year) from external members from those projects and a much better use of resources. This second year, teachers had less difficulties planning and establishing collaborations with external groups/institutions. However, the initial idea developed in Prague, of sharing initiatives between the two school clusters, didn't happen due to time constraints and difficulties to articulate the agendas of both school clusters.

Compared to last year (affected by a teachers' strike), the ACT stage was implemented in a much better way, with some impacts at school and community level. This year, all the COSMOS process began much sooner than last year (affected by teachers' strikes), allowing a much calmer and better planned implementation of COSMOS activities.

One of the most significant lessons was the importance of flexibility and adaptability in project planning and execution. The schools faced different challenges and had to tailor the initial project proposals from Prague to fit their unique circumstances and the specific needs of their students. This adaptability allowed the projects to remain relevant and engaging, particularly by focusing on practical and locally relevant issues like sustainable building practices.

Another lesson confirmed was the value of collaboration between different age groups and disciplines. In one group of schools, older students researched sustainable building practices and shared their knowledge with younger students, fostering a collaborative learning environment. This approach not only enhanced the learning experience but also promoted a deeper understanding of sustainability among students of different ages.

The successful execution of SSIBL-CoP projects heavily relied on the engagement and initiative of the involved teachers. Engaged teachers act as catalysts for the project, generating innovative ideas and



motivating students to actively participate. They are essential in maintaining enthusiasm and direction, ensuring that the project's objectives are met. In the context of the schools in Sintra and Almada, the dedicated teachers played a crucial role in adapting the initial proposals to the local realities, customising the content to meet the specific needs of the students and the school environment.

Moreover, the support of the school management is vital for the sustainability and continuity of these projects. School administration not only facilitates the allocation of resources but also creates an environment that values and prioritises innovative educational initiatives. This support is particularly important to ensure that the projects and their outcomes do not regress after the departure of key teachers or other significant team members.

The implications for the Open School approach include the need for increased community involvement and the integration of real-world issues into the curriculum. The projects demonstrated that when students engage with topics that directly impact their lives and communities, they are more motivated and invested in their learning. The partnerships with local entities, such as the City Hall and NGOs, were crucial in providing resources and support, showing that strong community ties can enhance educational projects. Moreover, the inclusion of external stakeholders, such as environmental groups and local experts, enriched the students' learning experiences and provided practical insights into sustainability issues.

6. Israel Report (Partners 6 & 12, BBC/MOE)

6.1. SSIBL-CoP Implementations

SSIBL-CoP implementation in Primary School 1 (continuing school)

"...No one is worried about the end of the world, if it's not the end of his world"

Last year we focused on bees, which is relevant since several of the village population are farmers that grow bees. This year we decided to embark on a new topic which is dear to all the inhabitants of the villages around our school. Between the villages of Lapid, Kfar Ruth, Upper Modi-in and Kfar Oranim lies a small and unique area which is the natural habitat for the Israeli Gazelle (*Gazella gazella*) – one of the rare and protected animals in Israel. This area, in which there are about 100 gazelles, is threatened by a project to construct a new 3-lane roadway. Many assert that there are alternatives to this roadway that will not endanger the unique populations of protected wildlife in this area. In addition, there are plans to establish a new industrial area nearby, despite that there are nearby alternatives that can be used. The major roadway and industrial area will cause noise, pollution and will upheave the quiet life that characterises the area that we live in. Building the roadway entail felling a forest and destroying a habitat which provides an ecological corridor for several plant and animal species. Despite many stakeholders with interests who support speeding the process of promoting these developments, one should ask who will protect the wildlife with no voice and will represent their interests?

We chose to explore the impact of building and urbanization of our local nature. Towards creating a deep understanding of the issue and establish a justified position on it, the students went on a field trip to the area destined for construction to and participated in diverse activities to learn about the areas and its natural assets. Different activities conducted outside in the natural area, such as playing in it, preparing art from leaves, drinks and different remedies from the natural flora served to connect the students to nature and understand the importance of protecting it. They learned about the Israeli Gazelle and the importance of protecting its habitat.



In the next stage the students investigated the aspect of building (development) and urbanization. They collected information from different sources and examined different alternatives to the planned projects to develop a reasoned position, in the aim of trying to influence the decision makers. The purpose of this project is to increase public awareness regarding the importance of conserving nature, and identifying solutions that will enable development of the area while also protecting the natural environment.

Creating the CORPOS

Identifying our mutual interest – We selected a broad topic that is relevant to all inhabitants of the area and threatens our quality of life. We conducted open meetings (knowledge events) for all the inhabitants to hear their opinions and share with them information concerning the implications of constructing the roadway.

Creating a network – We organised field trips and outdoor activities to consolidate a community around the topic. The active presence and participation of parents in the fieldtrips and activities contributed to creating the CORPOS. One of the parents guided the fieldtrip, and a former SPNI (Society for Protection of Nature in Israel) instructor volunteered to take part in guiding additional outings. Another parent- who is also connected to this issue and guides fieldtrips in the area – became an active participant in all our activities including communication in Facebook.

Community involvement – Parents filled a petition they received, illustrating how the community supports and is unified around the issue. The petition generated more public pressure on the decision makers, enhanced awareness around the issue and contributed to maintaining ongoing connection and participation around it. We conducted periodic meetings to update regarding the situation, share experiences and ideas, and maintained continuous communication via WhatsApp groups and e-mail.

Comparison to Round 1 – This round we selected an issue that is relevant to all the inhabitants in our area - a decision that increased community participation and activism. The involvement of people who live in the area, the passive and active parental involvement and choice to focus on an issue that is relevant to everyone, helped in creating a strong and unified CORPOS (and community of practice).



The CORPOS succeeded in creating awareness and influencing public opinion regarding environmental issues and preserving nature and quality of life in our region. The move from an agriculture-oriented topic to an environmental and urbanization issue influenced both the logistic requirements and types of activities.

The project contributed to educating youth for environmental-social activism and transformed them to active partners and influencers in our community.

Creating the CoP

Building on existing connections – We took advantage of existing connections with external organisations such as the SPNI, The Nature and Parks Authority, and local organisations. We also built on community members – parents and teachers with knowledge and experience in the selected topic.

Stakeholder mapping – We conducted a mapping of potential members including parents, professionals from within the community, and external organisations, evaluating the interests and abilities of each stakeholder in order to understand how to integrate them productively within the learning community.

Maintaining continuous communication - WhatsApp groups and e-mails enabled ongoing updating and coordination of activities. We conducted periodic meetings conducted F-t-F and online ongoing updating regarding the situation, sharing experiences and ideas, and planning the next steps.

Mutual learning within the CoP- Diverse learning activities included: (1) educational fieldtrips for children and grownups, guided by the parents and professionals from within the community; (2) workshops for the teachers, parents and students in topics related to environmental activism and nature protection; (3) the students conducted small inquiry activities to learn about the local flora and fauna, to collect information and develop reasoned arguments and opinions.

Comparison to previous round – Selecting a SSI relevant to everyone and one that impacts their quality of life was significant in generating mutual interest, and this led to enhanced community involvement/engagement. The new topic required CoP members with knowledge and experience



different from that around bees, leading to establishing a new CoP and new learning activities, with focus on environmental activism. In summary, professional development in the teachers' room was significant in creating a strong and engaged learning community and maintaining ongoing communication with all members. We feel that the active involvement of the community, educating for activism, and collaborative work, together contributed to our struggle for protecting both nature and quality of life in our area.

Table 6.1 SSIBL – CoP implementation in continuing Primary School 1 in Israel during Round 2

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	<p>Several questions were raised to drive the inquiry learning process. These questions, that arose consequent to knowledge events aimed to spur critical thinking, increase awareness regarding the issue, and to direct the students and community to explore the different impacts of constructing the major roadway.</p> <p>Inquiry questions:</p> <ul style="list-style-type: none"> J How will the roadway impact wildlife in the area? J What are the ecological and environmental impacts of constructing the roadway? J How will noise and air pollution impact the quality of life of people who live in the area? J Are there alternatives to paving the roadway? What are they? J How can we influence the decision-makers and prevent the construction of the roadway? <p>These inquiry questions derived from conducting several activities (knowledge events): (1) fieldtrip (for students and the community) to the forest that is to be felled, with focus on the importance of ecological corridors for wildlife; (2) meeting with environmental professionals who exposed them to the potential risks and impacts of constructing the roadway. These meetings spurred questions around the potential impacts of the project.</p>	<p>School did not specify. Difficult to disentangle the specific timeframe (hours) dedicated to each stage – since they worked in an integrated manner. This applied to the other two stages. Duration of SSIBL-CoP implementation in total was approx. 30 hours</p>
FIND OUT	<p>The students conducted several small inquiries concerning the environmental impacts of the roadway in terms of noise and air</p>	<p>As above</p>



<p>pollution and long-term impacts on the ecosystem. They conducted social inquiry around the long-term impacts of the roadway on the quality of life of people living in the area. The students and community met with environmental professionals to explore the potential risks and impacts to constructing the roadway. They met with representatives of the local municipality and conducted discussions about the construction plans and the impact; raised questions regarding the decision-making process (towards thinking how they can have impact on this).</p> <p>Scientific inquiry in situ:</p> <ol style="list-style-type: none"> 1. <u>Ecology</u>: Fieldtrips to the forest to be felled in which they learned about the ecosystem and collected data on the micro-climate, plants and wildlife. They learned how to measure temperature & humidity data, and how to document species diversity. <u>CoP engagement</u>: The science teachers, parents and parents with professional background guided the students in the fieldwork and help in analysing the data collected. 2. <u>Noise and air pollution</u>: Students measured noise levels and concentration of several air components and compared data collected from different areas. <u>CoP engagement</u>: Environmental quality professionals and engineers volunteered to support this inquiry aspect. 3. <u>Individual inquiry</u>: Each student selected a local animal species and conducted an individual inquiry about the potential impacts of the project on this organism, collecting information from the internet and scientific articles. They then prepared a presentation. <u>CoP engagement</u>: Parents supported the students in allocating information sources, preparing the presentations and, writing a "paper" <p>Social inquiry: The students conducted a survey and interviews with the local residents to explore their attitudes concerning the project and</p>	
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	<p>its potential impacts. They conducted statistical analysis of the survey data.</p> <p><u>CoP engagement:</u> Parents with suitable background helped in preparing the survey, conducting interviews and analysing the data.</p> <p>In preparation for conducting inquiry, they participated in workshops in which they learned about environmental and ecological inquiry (with focus on raising questions about potential impacts of the roadway on the ecosystem); learned how to use sensors and monitoring equipment, collect and analyse data.</p> <p>The students and parents took part in workshops about social activism to learn practical actions for influencing public opinion and decision makers.</p>	
<p>ACT</p>	<p>This project involves several act components:</p> <ul style="list-style-type: none"> J The involvement of the parents throughout the whole learning process, is, in itself, an 'act' action. J The survey conducted in the community served not only as an inquiry component but also as an activism action - creating public opinion. J Documenting the inquiries - Preparing reports and papers: the students prepared reports and papers reporting the findings of their inquiry activities and communicated these in various platforms (e.g., school newspaper, local platforms) J The students and parents prepared and distributed a signed petition against the roadway construction plan and also organised public demonstrations J The students and parents met with representatives of the local municipality in order to raise awareness and put pressure on the local decision makers regarding impacts of the roadway project. <p><u>CoP engagement</u> – The parents (general and professional in the relevant aspects) were active participants in all these actions. A representative of the environmental quality department of the local municipality participated and facilitated the connections with municipality.</p>	<p>As above</p>



In summary, the activities that were planned and conducted in the framework of this project combined scientific and social inquiry, wide and significant involvement of the learning community; students, parents and professional from within the community worked together towards a mutual goal, and through this they both increased the community's awareness concerning the issue and strengthened the community.

SSIBL-CoP Implementations in Primary School 2 (continuing school)

The way to get everyone on board is through significant change, which requires thinking and doing. Therefore, we set specific and detailed goals, designed a work plan and complementary activities. We started this year's activities with a focus group of leading students, additional professional development meetings on SSIBL-CoP, including planned meetings at the school with both students and the leading staff. We began by numerically indicating the school's position on all openness dimensions: where we were at the beginning of the project and where we arrived at the end of the first-year implementation.

We were uncertain regarding this year's research question, but after some deliberations and reconsideration, we decided to keep the same focus as in Round 1, "A Healthy Lifestyle in the Community". Primary School 2, in its policies, encourages students, parents, and anyone in the school community to adopt a healthy lifestyle and attempts to provide the means to do so. Unfortunately, this has been only partially successful. Another thing we took into account is the issue of community and culture in society in general and in Tira in particular. Unfortunately, Tira is ranked high in obesity, especially at young ages, and lacks proper support systems to address this issue. We feel that we have a great responsibility and opportunity to influence the young generation, especially through educating healthy lifestyles from an early age.

We had several reasons for choosing this SSI: The fact that in Tira and in our school there are many obese students, especially after the Coronavirus pandemic. Additionally, there is a lack of awareness to issues of health and healthy lifestyles, including, for example, the excessive use of screens by students and the school's limited connection to the community. And so, we linked the issue of health and its importance to the entire population and at all ages.

In Round 1 we designed a school-wide plan for the entire year, detailing activities and external factors (community) and allocating hours in cooperation with parents. In Round 2, we expanded the project



at both school and community levels: we added new teachers to the COSMOS team, engaged entire grade-level students (all classes from each grade level), we integrated the project into all school subjects – language lessons, science, values education, sports, all this in order to raise greater awareness and ensure deeper and long-lasting implementation.

In Round 2 we expanded the activities in the school and community, added new partner communities (schools and organisations) and involved more parents. We continued staff professional development meetings with the mentors (Beit Berl and MoE) and connected with new programs such as the joint program of the Ministry of Education and Ministry of Health "Healthy Nutrition". We introduced structured activities on health as part of life-skills lessons and for grade 6 students as part of their personal development and maturity classes. We integrated into the project disciplines in all subjects (Arabic, Hebrew, English, Science and life skills on healthy living) and connected the learning to both the inner school community and as part of our collaborations with the external community. Initially, we exposed the entire school staff to the project and the SSI, selected partners, chose the target population (grade-levels and partners), listened to ideas, and began recruiting partners from the community. We implemented the plan with flexibility and adjustments throughout the process to adapt it to the situation and needs. Sometimes, we readapted and incorporated new things to the learning process as a result of our partnerships. The process was successful primarily due to the involvement of the school staff and their full cooperation. Another factor that helped us was the close and intensive relationships and cooperation with all the partners. The sense of belonging and partnership of all the partners enhanced the process. The willingness to volunteer and contribute to the community stemmed from a need, empathy, and a desire to improve the situation for the entire community.

We advertised successful activities conducted as part of the project, which led to new requests from new stakeholders to become partners in our school community. At the end of the project, we will evaluate and gain feedback on the project in order to gain insights and design a continuation plan for next year (this has not been completed at the time of writing this deliverable).



Table 6.2 SSIBL – CoP implementation in continuing Primary School 2 in Israel during Round 2

SSIBL dimension	Description including CoP role/participation	Duration (in hours)
ASK	<p>How is it possible to promote a healthy lifestyle among members of the (school) community?</p> <p>As part of the process of articulating the issue and driving question, we studied the field and gathered information. We defined the problem, the scientific question, and refined it, which effectively advanced our work. We found that all the partners agreed on the issue and identified it as a central need.</p>	3-4 hours
FIND OUT	<ul style="list-style-type: none"> J Science lessons on the SSI in all languages for in-depth learning. J Workshops for focus groups, such as with the dietitian. J Life skills education lessons. J The students created presentations and delivered lessons to all classes. J We worked with the students on posters and advertising for implementation. J We integrated digital games on the topic. 	Approx. 25 hours
ACT	<ul style="list-style-type: none"> J The entire school worked on healthy nutrition and increased physical activity. J The school added new sports classes in new sports, such as table tennis and volleyball. J The school hired an additional physical education teacher on a part-time basis. J The school purchased health education programs through Gefen (programs offered and sponsored by the MoE by external operators) J This school submitted itself to the joint Ministry of Education and Ministry of Health "Health Promoting School" call, for accreditation. 	Approx. 20 hours

6.2. Reflections on facilitation, support and implementation within each participating school in Israel

Reflections on CORPOS, CoP & SSIBL-CoP implementation with Primary School 1 (continuing school)

Efforts throughout the project were invested to enhance communication with Primary School 1. These contributed to enhancing awareness and involvement of all community members - students, parents and residents and created a strong sense-of-community around the project. Combining both f-t-f and online meetings, conducting community events and collaborating with external organisations supported effective dissemination of information and inclusive involvement in the process. Specifically, we facilitated communication with the learning community in the following ways:

1. We utilised digital platforms (mainly WhatsApp and Facebook) for ongoing communication-sharing information, updating and coordinating actions. We created an open forum on the school website to enable discussions and share ideas about the project.
2. Meetings and discussions – Regular periodic meetings in school in which parents and community representatives participated – for sharing information and coordinating actions
3. Disseminating information and reports- monthly leaflets – for sharing and updating actions and findings; papers in the school newspaper, and posts in the school and village Facebook page.
4. Community events – meetings and workshop in which professionals gave lectures, discussion were conducted and findings were reported
5. Collaboration with external partners – SPNI, Professional from academia all contributed in providing guidance, lectures and workshops. Local organisations supported raising awareness and broad local support.
6. Creating digital and interactive materials – The project website included short videos for describing the project and its findings

Successes and challenges in establishing and maintaining the CORPOS and CoP with Primary School 1

Success – We succeeded in creating a broad community (students, teachers, parents, residents) with wide involvement. We collaborated with diverse external groups – such as SPNI, professional from academia and local organisations; these were crucial and obtaining the professional information for



this project. We also succeeded in collaborating with the local municipality. We created exciting learning resources which was successful in inspiring the students' interest and supported their learning and inquiries.

Challenges - This was a complex process which required significant time and efforts towards understanding and responding to the different requirements of the different partners. (1) Managing a large and diverse community is challenging in its requiring of accurate planning in order to maintain ongoing interest and involvement throughout the project. (2) Managing communication and collaboration with a diverse community was challenging. (3) Addressing external limitations - situations arose throughout the project which needed to be solved. (4) Financial limitations - Financing is an important factor, such as recruiting professionals to volunteer their time, and financing organised bussing.

Successes and challenges in SSIBL-CoP design & implementation in Primary School 1

Successes – We succeeded in conducting the three stages: ASK: Focused and deep questions that motivated the students to explore; FIND OUT: We inspired the students' interest in the process of consolidating and understanding of our reality; ACT: We developed processes that enabled effective and controlled data collection, discussion and responding. The whole process was based on deep inquiry and collaborating with special professionals that shared their knowledge with the students.

Challenges – Mainly coordinating the data collection, connections with people, activating the students and recruiting them for the diverse tasks, bringing this sensitive issue into the children's homes and taking a position on it.

Addressing challenges raised in Round 1 and building on these

Promoting active participation of the CORPOS and CoP – A challenge was getting the CoP active in developing the learning unit and implementing it. Our solution was to select and focus on a significant and relevant issue; invest efforts in identifying what reflects the community's interest and needs as well as the needs of the students in their daily lives.

In this round we succeeded in creating collaboration among students, teachers, school management, the CORPOS and CoP towards creating rich and meaningful learning units that focus in developing



citizenship and community capacities – the students' capacities to be responsible citizens and have positive influence on their environment by choice.

Reflections on CORPOS, CoP & SSIBL-CoP implementation with Primary School 2 (continuing school)

Based on an integration of the different reflections of the teachers – concerning the students' learning, here are our insights:

Being positive and optimistic encourages everyone and helps to succeed. At the beginning of the project, the teachers reflected that they simply 'went with the flow' and entered the project with great enthusiasm and passion. The decision to take part in the project was just right for the school because it was something new and unfamiliar and connects to global issues. The school is open to different and new things, beyond the conventional curriculum.

Challenges: In the middle of the first year, fears began due to the many pressures and demands arising in the post-Corona reality. The principals was very fearful, and it was a challenge for her to succeed despite all the difficulties she faced. In addition, fears grew following the leave of absence of a key teacher in the project and another teacher who was on maternity leave. Teachers entering the project did not possess the needed knowledge and skills. Despite everything, the school teams persevered, leading to its success; it proved to be an opportunity to develop more teachers professionally and expand the circle of educators. Also, the second round began "on the wrong foot" because of the war but driven by faith of everyone involved the school succeeded in the project despite the challenges posed by the war conditions. Another challenge was the incorporation of new teachers into the project in the second year. It takes time to adjust. Administering the survey to a large number of students proved to be an additional challenge to the school.

Successes:

- J Success of our SSIBL-CoP implementation with this continuing primary school was expressed in many things, such as the requests we received from various bodies to participate in the project, the joining of new parents, the full implementation of the programme, and even the addition of activities during the year, initiatives of additional teachers in the school in grades 1-2, positive feedback we received from the partners.

- J A central success was the students' enthusiasm and interest in the learning topics, their participation and engagement and that learning "spilled over" into their homes. Believing in the children and our team and see them as true partners is key: Success is the fruit of their efforts.
- J Another element of success was the diversity of different stakeholders taking part, each bringing to the learning spaces different knowledge and skills. The fact that healthy lifestyles integrated into school routines and language had an effect not only on the inner-school community but also on the external community.
- J The ability to connect the project to existing school processes was another success and integrating school subjects (such as Hebrew language and literature, lessons on growing up and maturity) into the common school wide theme. The connection to community stakeholders (such as school nurse) did occur previously, but it was shallower and at a surface level. In COSMOS it was enhanced and was applied more meaningfully and extensively through the project.
- J Peer professional learning was a central element – the principal and teachers from the first year assisted new teachers to develop professionally. The project developed science education in the school, producing new and innovative ways to learn and teach science – particularly with a community of stakeholders.
- J The continuity of the project was also a factor in the success of the project.

6.3. Lessons learned from Round 2 implementation in Israel

Lessons learned from Round 2 implementation in School 1

- J Focusing on significant and relevant topics – (a) *Adapting to local needs* – identifying and focusing on topics that reflect the daily reality and environmental-social challenges of the students and the community. (b) – *Individual adaptation* – developing learning units that are suited to the students' level of interest and knowledge. This was significant in enhancing the active engagement and involvement.
- J Broad cooperation – We managed to expand the cooperation among all those involved (students, teachers, school management, parents and community members). The collaborations enriched the project and led to better outcomes and results. (a) *Connections*



with external groups – we managed to create and develop collaboration with such groups, and this led to the professional support and strengthening of this project. (b) *Educating for activism* – The emphasis on educating for activism and encouraging the students to act and have impact on their environment became central in this project. The students' learned how to express their opinion, organise and act for change! (c) *Parental and community engagement* – Supported the learning process, which contributed to educating for values of active citizenship.

- J Adapting the teaching resources – Developing teaching materials individually adapted to each student, aligning the content to the individual needs and abilities of each student was significant in the success of this project.

In summary, these insights enriched the SSIBL-CoP process in the second round for School 1. Focusing on a relevant issue, cooperation with the community and external partners, cultivating citizenship and social abilities, and adapting the learning material to individual needs – all these together contributed to the success of this project.

Lessons learned from Round 2 implementation in School 2

After participating in the project for two years, the school staff expressed an interest to continue applying the COSMOS approach. Following the success that the school experienced for two years, the importance of community involvement emerged in two directions:

- J Bringing the community into the school
- J Engaging in activities in the community

Therefore, the school has become more open and active in the community, especially in the second year of the project in the following aspects:

- J Eating habits and food consumption have changed. There is a greater emphasis on this from parents and students, and everyone is cooperating because it meets a vital need for all of us.
- J School policies have changed for parties and holidays, and there is a greater emphasis on a healthy lifestyle.

- J Constant contact with the community will be maintained with consideration for further expansions to make the school more accessible to different communities.
- J The school community will maintain a healthy lifestyle.

Citizenship - The project highlighted the importance of educating for active responsible citizenship. The students learned to voice their opinion, to act for change and be involved in decision making around issues that impact their community. They understood the importance of guarding the values of democracy and the environment.

Significant Life Experiences – The events and activities that took place in the framework of this project were indeed significant life experiences for the students. They experienced the meaning of learning and acting, which had deep influence on them and changed their perception regarding their ability to influence their environment and society.

7. Reflective overview of lessons learned, successes and challenges in SSIBL-CoP implementations during Round 2

The reflections presented in this section are based on the experiences of our SSIBL-CoP implementations within and across national contexts during Round 2, bringing together the reflections and considerations of each partner and our Round 1 reflections.

CORPOS: As with Round 1, the importance of a CORPOS that was invested in the COSMOS project was critical for successful SSIBL-CoP development and implementations. In each national context, CORPOS consisted mainly of the COSMOS partners (HEI and societal partners) and teachers involved in the project. Another critical structure identified in Round 2 (UK, Belgium, Sweden, Portugal) is the importance of having a lead teacher in each school, that becomes the 'COSMOS teacher' facilitating communication between school/teachers/leadership and COSMOS partners initially and with CoP members as this is initiated and developed. As noted in the Portugal report, such engaged teachers can act as catalysts for change within the school, which thus can initiate, and importantly sustain, an open schooling transformation.

Agile COSMOS: In all national contexts, partners reflect on the importance of flexibility and adaptability as a key attribute for successful implementation of the COSMOS approach in our WP3 work. This agility was needed, and achieved at various levels including: (a) considering the local context for the open school transformation using the ecological model of school openness developed by COSMOS partners (Sarid et al., 2024) and focusing on particular school needs and interests, and adapt when circumstances required it (UK, Portugal) (b) considering the local context and how that might impact on choice of SSI, for example what are the particular socio-scientific issues that impact an area, and that students might be more likely to find personally relevant to them and their communities (Belgium), (c) adapting existing curricula to integrate the SSIBL and CoP elements to them rather than developing new materials and curricula, which allows teachers to build on their existing work and expertise (UK, Belgium, Sweden), (d) the community level upon which the SSIBL-CoP was targeted, as different levels were employed (e.g., the school level in the UK context,



Expanding Communities of Practice: The development and establishment of CoP was noted as a particular challenge at the end of Round 1 for WP3 work. Lessons learned on how to initiate CoP and how to support mutual engagement and developing a common language and ways of working, were successful in Round 2, for both working with new schools and with continuing schools. In the case of continuing schools, we were able to build on the first round of implementation with the teachers in terms of professional development work, further developing and adapting the SSIBL-CoP implementation materials when using the same SSI, and identifying and engaging with school community and external stakeholders. Challenges however do remain, for example in localities where the SSIs that are found to be personally relevant for students, are difficult to develop a CoP to address this, as in the Swedish context. This means that further work is needed to consider how community collaboration strategies can be both in-person and digital to ensure a more inclusive approach to SSI selection and CoP development.

Teacher Education for COSMOS: Teacher professional development was a key dimension of the COSMOS approach from the outset (WP5). The opportunities for teacher professional learning afforded through the COSMOS project have been invaluable in ensuring the sustainability of the COSMOS approach beyond the project lifetime. Partners report how teachers have found the process of networking and communication easier to manage during Round 2 (e.g., Portugal, UK), and this was at times mitigated by the application of an agile approach (as described above). The Teacher Professional Development Conference in Prague, allowed participating teachers to work in a community exploring more in-depth key project concepts (learning as a community, SSIBL, school openness dimensions), and provided the space for collaborative learning and co-design. This meant that teachers were ready straight after that to start considering with their CORPOS teams how their SSIBL-CoP implementations were going to be developed and implemented and how the community element would be present across all three SSIBL stages. At the same time, the COSMOS approach to science education require teachers to address and consider multiple concepts and levels of professional learning (e.g., Belgium) which reinforces the need for considering open schooling as a gradual transformation process for teachers and schools.



Action in COSMOS: Action competence is a key outcome of SSIBL-CoP implementations, and was an aspect that was carefully considered and addressed by all partners in their TPD work with primary schools and teachers. The partners' reflections of this SSIBL stage points out the need for further exploration of how students can become active responsible citizens; our work clearly shows that students can perform successful actions at various levels to solve socio-scientific issues within their communities, and that teachers have been able to plan and teach for such actions. However, challenges remain as indicated by partners (e.g. Belgium, UK, Israel)