



Communities for Sciences

Towards Promoting an Inclusive Approach in Science Education

D3.4 – Final Report on HUB activities

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INDEX

INDEX	2
Introduction.....	8
What.....	8
Set up.....	8
Report	9
The story of us. How a group became a team	9
Testimonials.....	11
Brief overview of meetings, assemblies and trainings.....	13
Brief overview of the Hubs and HUB members	14
Description of the Hubs.....	15
Websites	15
1 Vienna C4S Hub.....	16
1.1 General presentation (and origin of the hub).....	16
1.2. Structure.....	18
1.2.1. Partners	18
1.2.2. Living lab(s)	19
1.2.3. Team.....	19
1.2.4. Student participation (if applicable)	19
1.2.5. Schematic presentation	20
1.2.6. Consultative bodies and structures	21
1.3. Theoretical framework and methods	23
1.3.1. Vision	23
1.4. Day to day approach of the Hub.....	26
1.5. Reflection.....	40
1.6. Inclusion	43
2 Budapest C4S HUB	44
2.1. General presentation (and origin of the Hub)	44
2.2. Structure.....	45
2.2.1. Partners	45
2.2.2. Living lab(s)	46
2.2.3. Team.....	47
2.2.4 Student participation (if applicable)	47



2.2.5.	Schematic presentation	47
2.2.6.	Consultative bodies and structures	48
2.3.	Theoretical framework and methods	48
2.3.1.	Vision	48
2.3.2.	Theoretical and conceptual framework.....	48
2.3.3.	Aims	49
2.3.4.	Paradigm and methods of the Hub.....	49
2.3.5.	Analyses of needs	50
2.4.	Day to day approach of the Hub.....	50
2.4.1	Partners	50
2.4.2.	Participants.....	50
2.4.3.	Collaborators and co-creators	50
2.4.4.	Day to day activities and outreach.....	51
2.4.5.	Best practices.....	51
2.4.6.	Photos, Links.....	52
2.5.	Reflection.....	52
2.5.1	Challenges and risks.....	52
2.5.2	Main findings or discussion points.....	52
2.5.3	Implications on practice or policy	53
3	Sofia C4S HUB.....	54
3.1	General presentation (and origin of the Hub)	54
3.2.	Structure.....	55
3.2.1.	Partners	55
3.2.2.	Living lab(s)	55
3.2.3.	Team.....	55
3.2.4.	Student participation (if applicable)	56
3.2.5.	Schematic presentation	56
3.2.6.	Consultative bodies and structures	57
3.3.	Theoretical framework and methods	58
3.3.1.	Vision:	58
3.3.2.	Theoretical and conceptual framework.....	58
3.3.3.	Aims	59
3.3.4.	Paradigm and methods of Hub	59



3.3.5.	Analyses of needs	60
3.4.	Day to day approach of the Hub	60
3.4.1.	Partners	60
3.4.2.	Participants	61
3.4.3.	Collaborators and co-creators	62
3.4.4.	Day to day activities and outreach.....	62
3.4.5.	Best practices.....	65
3.4.6.	Photos, Links	66
3.5	Reflection.....	79
3.5.1.	Challenges and risks.....	79
3.5.2.	Main findings or discussion points.....	80
3.5.3.	Implications on practice or policy	81
3.6.	Recent evolutions and adaptations	82
3.6.1	Evolution or major changes (if applicable).....	82
3.6.2	Inclusive aspect (what? How? Recommendations?).....	82
3.6.3	Stakeholder map.....	82
3.6.4	Impact of activities.....	83
4	Brussels Wonderlab C4S Hub	84
4.1	General presentation (and origin of the Hub)	84
4.2	Structure.....	84
4.2.1	Partners	84
4.2.2.	Living lab(s)	85
4.2.3.	Team.....	86
4.2.4.	Student participation	86
4.2.5.	Schematic presentation	87
4.2.5.	Consultative bodies and structures	87
4.3	Theoretical framework and methods	88
4.3.1.	Vision	88
4.3.2.	Theoretical and conceptual framework.....	88
4.3.3.	Aims	89
4.3.4.	Paradigm and methods of Hub	90
4.3.5.	Analyses of needs	90
4.4	Day to day approach of the Hub	90



4.4.1.	Partners	90
4.4.2.	Participants	90
4.4.3.	Collaborators and co-creators	91
4.4.4.	Day to day activities and outreach.....	91
4.4.5.	Photos, Links	92
4.5	. Reflection.....	95
4.5.1.	Challenges and risks.....	95
4.5.2.	Main findings or discussion points.....	96
4.5.3.	Implications on practice or policy	96
4.6	. Recent evolutions and adaptations	96
4.6.1.	Evolution – major changes.....	96
4.6.2.	Inclusive aspect.....	97
5	Manresa-Vic C4S HUB.....	98
5.1.	General presentation (and origin of the Hub).....	98
5.2.	Structure.....	99
5.2.1.	Partners	99
5.2.2.	Living lab(s)	101
5.2.3.	Team.....	101
5.2.4.	Student participation (if applicable)	101
5.2.5.	Schematic presentation.....	102
5.2.6.	Consultative bodies and structures	102
5.3	. Theoretical framework and methods	103
5.3.1.	Vision:	103
5.3.2.	Theoretical and conceptual framework.....	103
5.3.3.	Aims	104
5.3.4.	Paradigm and methods of Hub	104
5.3.5.	Analyses of needs	105
5.3	Day to day approach of the Hub	105
5.4.1.	Partners	105
5.3.2	Participants.....	106
5.3.3	collaborators and co-creators.....	107
5.3.4	Day to day activities and outreach.....	107
5.3.5	Best practices.....	108



5.3.6	Photos, Links.....	111
5.4	Reflection.....	111
5.5.1.	Challenges and risks.....	111
5.5.3.	Main findings or discussion points.....	111
5.5.4.	Implications on practice or policy	112
5.6	Recent evolutions and adaptations	112
5.6.1.....		112
5.6.2.	Inclusive aspect.....	113
6	Milano C4S HUB	115
6.1	General presentation (and origin of the Hub)	115
6.2	Structure.....	116
6.2.1.	Partners	116
6.2.2.	Living lab(s)	116
6.2.3.	Team.....	117
6.2.4.	Student participation	118
6.2.5.	Schematic presentation	119
6.2.6.	Consultative bodies and structures	119
6.3.	Theoretical framework and methods	119
6.3.1.	Vision	119
6.3.2.	Theoretical and conceptual framework.....	120
6.3.3.	Aims.....	120
6.3.4.	Paradigm and methods of Hub	120
6.3.5.	Analyses of needs	121
6.4.	Day to day approach of the Hub	122
6.4.1.	Partners	122
6.4.2.	Participants	122
6.4.3.	collaborators and co-creators.....	122
6.4.4.	Day to day activities and outreach.....	123
6.4.5.	Best practices.....	127
6.4.6.	Photos, Links.....	128
6.5	Reflection.....	128
6.5.1.	Challenges and risks.....	128
6.5.2.	Main findings or discussion points.....	129



6.5.3. Implications on practice or policy	129
6.5.4. Inclusive Aspects.....	129
Annex 1: List of Hub members with brief description	131
Vienna C4S Hub	131
Galileo C4S Hub	131
Sofia C4S Hub	133
Wonderlab C4S Hub (Brussels)	134
Hub Manresa-Vic	136
Hub Milano	139



Introduction

What

This document is Deliverable 3.4 from Work Package 3 of the C4S project.

The aim of this document is to describe the activities of the 6 different Hubs of the C4S project as living, evolving entities. Hence, this document was created as a living, evolving document. A first version and draft were presented to the European authorities at the end of March 2021, a mid-term report was submitted in March 2022. On a regular basis the document was revised, updated and adapted to new situations and realities in the different cities, living labs and pilots.

Set up

This document starts off with the '*Story of us*'. In a short narrative it recounts the creation of the HUBs and the Liaison Network. The Liaison Network was critical in keeping the HUBs in contact and provided space and platform for exchange of good practices, reflection on action and brainstorming in order to overcome issues of one _or all_ HUBs.

Members of the Liaison Assembly talk about their C4S-experiences in a couple of *testimonials*.

Subsequently every HUB *describes* its mode of operation in a number of agreed topics. It is Important to realize that contexts vary, and the different HUBs operate in different circumstances and realities. Nevertheless, a common philosophy and joint goals and ambitions propel them all on.

This document was not compiled overnight but has been a living and evolving account of HUB operations during the entire project. So, some parts may correspond with previous submissions, others may have been altered or stricken because of changes in course or attainability. All descriptions were drafted with the utmost care and drive.

In conclusion some *annexes* were added to clarify or to summarize information provided in other sections.



Report

The story of us. How a group became a team ...

Kick Off

It was September 2019 when a number of ambitious and idealistic researchers and lecturers from all over Europe came together in a Brussels attic meeting room to deliberate on the project proposal that would keep us driven for the next years. From that first in-presence meeting in Brussels, the project plan not yet submitted, it was clear to all that the aims and objectives were so close to heart, that we would give it our all to make this endeavour a resounding success. Well aware of the different realities and contexts of each member, the joint intention and commitment of the group was immediately a leading factor for future activities. The enthusiasm was even more unstoppable once approval was granted and the project could be launched.

During a digital kick off meeting (in raging COVID-19 era!), every work package leader disclosed plans and resolutions for the deployment of their work package activities. Also work package 3: 'Coordination of HUBs', was announced and introduced to the group. Plans were made to meet bimonthly, digital if needed, in-presence if possible. Little did we know how long COVID-19 would keep Europe in its grip.

Liaison Assemblies

Design

From the start the Liaison Assemblies, where every Hub has its representative(s), were designed as a platform for cooperation and exchange. As a safe space to declare intentions, successes, hick ups or evolution and progress. Also, a place to pose questions and name problems they were facing, to deepen and align concepts, to assure themselves of the direction the HUB was taken, etc. In fact: the assemblies were subject of co-creation from the beginning. The assemblies were piloted by the coordinator, who saw her role as 'the operator on the switchboard' and who organized the meetings accordingly. Subjects and course of proceedings were decided on together, forum was given to input of the liaisons or to experts with clarification of concepts or procedures necessary or of interest.



Frequency

The plan was to meet bimonthly and was thus carried out. The HUB liaisons and the WP3 coordination was also involved in other meetings, workshops and trainings. A schedule is added in annex 2. Some of the liaisons also engaged in bilateral visits and worked on further cooperations within and beyond the scope of the project.

Content and topics of the meetings

The topics of the assemblies were set in close consultation with the liaisons and the work package coordination. Also, project management and other work package coordinators were involved in determining necessary, desirable or urgent topics for discussion.

At the start of the project, it became swiftly evident that the Hubs started from various baselines. Some networks were already established while others needed to be structured and formed, before work could get started. Some of the newly formed organs suffered from organizational delays, mistrust from their target communities or other hurdles or hick ups. In this respect the liaison assemblies offered Hub coordinators and members a great deal of support, council and inspiration. Once up and running liaisons started sharing and inspiring others. The Liaison Assembly started out as an easily accessible platform and meeting space and kept this vibe going throughout the project.



Testimonials

"It was a very enriching experience for me to get insights into the European educational landscape in relation to Science Education and to meet wonderful people with sustainable visions for a bright future."

Nene



Inspiring hub-meetings with interesting views on playful science education in the different countries. Exchanging practices challenged us to think critically with our team, our students and participating families.

Inge

Science is more than the laboratory, test tubes and colored liquids. Science could be outdoor exploration, interaction on the playground, or even dance. The partners showed me this, and taught me the different ways of doing science and research.

Louisa



Valeria



Petar



Roberta



It was an honour and a privilege to be working with such driven experts in the field. But above all ... it was a pleasure working with such wonderful people! Who said switch board operators would become obsolete?

Leen



Working with this group of people was more than just sending email, doing deliverables and organizing meetings, it was creating relationships, learning and growing. It was the best experience to end my career and go happily in retirement.

Simona from Giocheria Laboratori



I am proud and grateful to be a part of this professional and friendly team. It has greatly eased the execution of a large, diverse, and complex project, sharing common aspects with our European partners.

Mvriam



Brief overview of meetings, assemblies and trainings

In this section a list of meeting and assembly dates is added. This list only contains official and consortium wide deliberations under coordination of WP3. More unofficial or bilateral meetings are not mentioned. This list thus provides only a portion of the discussions and dialogues that took place between partners.

Date	Meetings
26/11/2020	Liaison Assembly 1
14/01/2021	Liaison Assembly 2
11/03/2021	Liaison Assembly 3
6/05/2021	Liaison Assembly 4
9/09/2021	Liaison Assembly 5
20/01/2022	Liaison Assembly 6
24/03/2022	Liaison Assembly 7
2/06/2022	Liaison Assembly 8
8/09/2022	Liaison Assembly 9
8/12/2022	Liaison Assembly 10
26/01/2023	Liaison Assembly 11
4/05/2023	Liaison Assembly 12
15/06/2023	Liaison Assembly 13
	Other Meetings involving Liaisons and WP3
29/06/2020	Warm Up
29 and 30/10/2020	Kick Off
24/02/2021	Training Science
29/06/2021	General Assembly Online
2/09/2021	Workshop Day Pictures and Stories
17 and 18/11/2021	General Assembly Brussels
4 and 5 /07/2022	General Assembly Manresa
8/11/2022	Workshop Critical Image Analysis
24, 25 and	
26/05/2023	General Assembly Milan
27/10/2023	Dissemination Event in Flemish Parliament and Final Exhibition Kanal Brussels



Brief overview of the Hubs and HUB members

In this section a brief schematic description of each Hub is presented, derived from the information provided in Annex1. In Annex 1 there is more information of each Hub providing a more detailed overview of Hub members and partners.

Hub Name	Vienna C4S Hub “Gardens4science”
City and location	Vienna, Austria
Lead	RCE Vienna Europa Büro, der Bildungsdirektion Wien
Living Labs	Community / school garden project Allotment Garden Community Kleingarten Verein Schongauergasse Primary School Robert-Blum-Gasse 2, 1200 Wien

Hub Name	Galileo C4S Hub
City and location	Budapest, Hungary
Lead	Galileo Progetti JEB Mini-Manó Bölcsőde
Living Labs	1 EduLAB O_6 Baross út 103/a 1083 Budapest

Hub Name	Sofia C4S Hub
City and location	Sofia, Bulgaria
Lead	New Bulgarian University Sofia
Living Labs	3 (HESED Kindergarten Groups)

Hub Name	Kanal C4S Hub
City and location	Brussels, Belgium
Lead	Erasmus Brussels University of Applied Sciences and Arts (EhB) Bachelor of Education Pre-primary Education (teacher training)
Living Labs	Wonderlab@Kanal on Campus of EhB and Box to the Streets (Wonderlab in a Box, various locations in Brussels) Slotstraat 28 1000 Brussels



Hub Name	Hub Manresa-Vic
City and location	Manresa & Vic, Spain
Lead	UManresa University of Vic
Living Labs	2 Manresa (The river and its surroundings -Valldaura-, Science space - Nana family space) 2 Vic (Santa Caterina Primary School, ATB Lab)

Hub Name	Hub Milano
City and location	Milan and Sesto San Giovanni (MI), Italy
Lead	University of Milano-Bicocca (UNIMIB) - Scientific Responsibility Municipality of Sesto San Giovanni (Sesto SG)
Living Labs	5 CLLs: GiocheriaLaboratori; Bambini Bicocca (Pilot), Antonia Vita of Monza - Popular School; Infant School of Sesto SG - Monte San Michele (Pilot), Infant School of Concorezzo (MB) - Falcone e Borsellino (Pilot).

Description of the Hubs

This section contains the heart of this document. HUBs describe their origin and set up. They talk about vision, aims and day to day practice. They provide their own account of the project they have been developing and nurturing during these intense project years.

Websites

<http://www.communities-for-sciences.eu/>

<https://cordis.europa.eu/project/id/872104>



1 Vienna C4S Hub

1.1 General presentation (and origin of the hub)

The aim of the Vienna C4S Hub was to encourage our Viennese partner school as active Living Hub Member to discover and explore science independently through a low-threshold and interactive workshop concept. The hub was organized as a community living lab and located in a school garden in the 20th district of Vienna. At first the creation of the garden itself was a central part of the project. Due to difficulties to secure the property permanently, we adapted the CLL to also function independently for the dedicated location. Our vision was that the garden would be permanently established as CLL, even after the C4S project. Ongoing efforts and talks with city officials and property owners persist. To assure extensive outcome, unfortunately no final decision could be made by now. Besides the garden, the workshops, instructions and teaching material were designed with the aim to allow adaptation to different and changing circumstances. This benefits other schools to implement the concept and broadens the general outreach. The idea was to design the CLL in such a way that it would be sustainably applicable regardless of a specific location. This makes it more practical for schools to use.

For a schematic presentation of the development process see figure 2.

The workshops are based on STEAM (Science, Technology, Engineering, Arts and Maths) methodology and focus on the larger topic of sustainable development. More specifically on sustainability topics connected to ecosystems, food production, nature in cities and cooperation between different stakeholders and generations.

The workshops adhere to the following criteria:

- Enable and foster engagement of Communities in vulnerability risk situation in pedagogical processes
- Promote and support critical and creative thinking
- Create an open, appreciative atmosphere and a safe space for own discoveries
- allow learners to immerse into topics and experiments of their choice according to their personal interest and at their own rhythm
- take into account the Sustainable Development Goals of the United Nations
- Support Intergenerational learning

Our CLL was located in the 20th Vienna's district Brigittenau in close premise of our partner school Robert-Blum-Gasse (see figure 2).

The school is a primary school with full day care, our partner class was the fourth grade with kids in the age range from 9 to 11 years. In this Class were 9 boys and 9 girls from 9 different Nationalities.

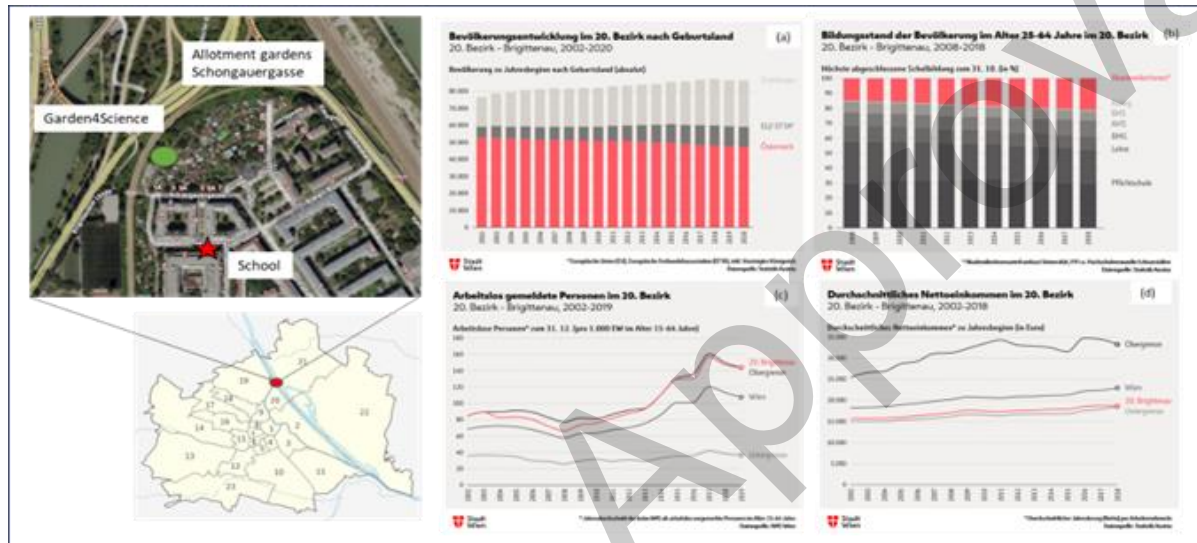
The 20th district is one of the most ethnically diverse municipal districts of Vienna. At the same time, it is characterized by a low proportion of academics, although the share has been growing slightly over the last years. The district also shows a high percentage of unemployment and a lower-than-average income as compared to the rest of the city (see figure 1).

The Hub activities were developed by the project partners EUB and RCE Vienna together with inputs from the teachers and their pupils and other community stakeholders. Implementation was supported organizationally by the EUB (European Office, Board of Education for Vienna) and



scientifically researched by the RCE Vienna (Regional Centre of Expertise; Vienna University of Economics and Business). The workshops were conducted by Irene Glockengießer (Science educator). In the process of the workshops, the concept was adjusted and continuously adapted and tested to the realities and needs.

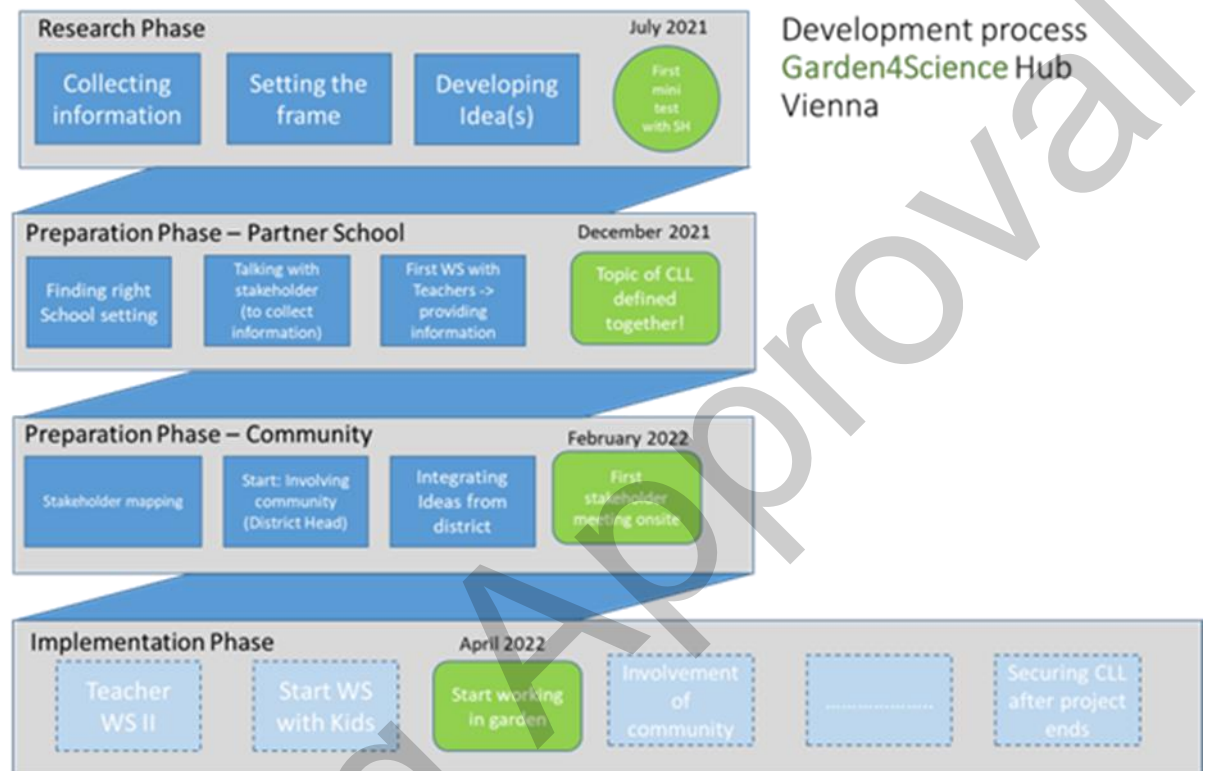
Figure 1: location of the Garden4Science hub and socio-demographic characterization of the district. Panel a: Population development and share of migrants. Panel b: educational level of the district's population – the red bar shows the share of academics. Panel c: number of unemployed in the district (red line) compared to the upper- lower bound and average in Vienna. Panel d: average income in the district (red line) compared to the upper- lower bound and average in Vienna. (source: <https://www.wien.gv.at/statistik/bezirke/brigittenau.html>).





1.2. Structure

Figure 2: the development process of the Garden4Science Hub in Vienna. The green boxes mark important milestones in the process. The Implementation phase has just started.



1.2.1. Partners

- Primary School Robert-Blum-Gasse 2, 1200 Wien
- Allotment Garden Community Kleingarten Verein Schongauergasse
- Association of Allotment Gardens Vienna
- District Administration of Brigittenau
- Austrian Railway ÖBB (owners of the property).



1.2.2. Living lab(s)

Our pilot school, which was participating in the C4S program is located in the 20th district of Vienna at Robert Blum Gasse (see map in figure 1). Our Living Lab Garden4Science was taking place on a property in the direct neighbourhood, including an allotment association and in the nearby nature, like the Danube meadows. The garden functioned as the temporary physical manifestation of our living lab that allowed pupils to experience a playful first step on „how science works “.

1.2.3. Team

- Dr. Martin Wildenberg
- Mag. Anna Maria Krulis
- Mag. Marlis Henner
- Irene Glockengiesser
- ➔ and the Teachers of our class Klaus and Christine

1.2.4. Student participation (if applicable)

The students of the **fourth grade at GTVS Robert Blum Gasse were** at the centre of our activities and the living lab. They have taken an active role in the establishment of the garden. For example, they suggested at the beginning what kind of plants they would like to plant in their garden. Beside the “usual suspects” like tomatoes, potatoes, sunflowers, berries and so on, they also wanted to plant extra salad for the snails to eat, so they might not eat “their” fruits. This is given as an example of a kids' view on interaction with the garden and nature. And also, a perfect opportunity to learn and experience on their own if their ideas are feasible or not. It also poses an opportunity to develop further solutions if problems with snails, eating their plants persist. The students also wrote protocols about their work and experiments by themselves. We supported them by handing out their own personal diaries. This way we stay informed between the different WS. The pupils were eager to take on responsibility and very excited to work as scientists, even outside the school context. Their first experiment was conducted at home: how to grow plants out of seeds or taking care of their “Bottle gardens”.

The most important competence, and also our goal of the project, is for students to share their knowledge with others and thus becoming multipliers themselves. Many students come from an anti-educational background, and it is sometimes difficult to reach their parents. In this context children are ideal ambassadors. Parents get to experience subjects, topics and knowledge given in school and this allows for an image of school, that is true to life and practice oriented.

Step by step the students learned with their own ideas, thoughts and hands. We supported and guided them with the focus on NOT to disturb their process of experiencing the basics of scientific work hand in hand with nature.



1.2.5. Schematic presentation

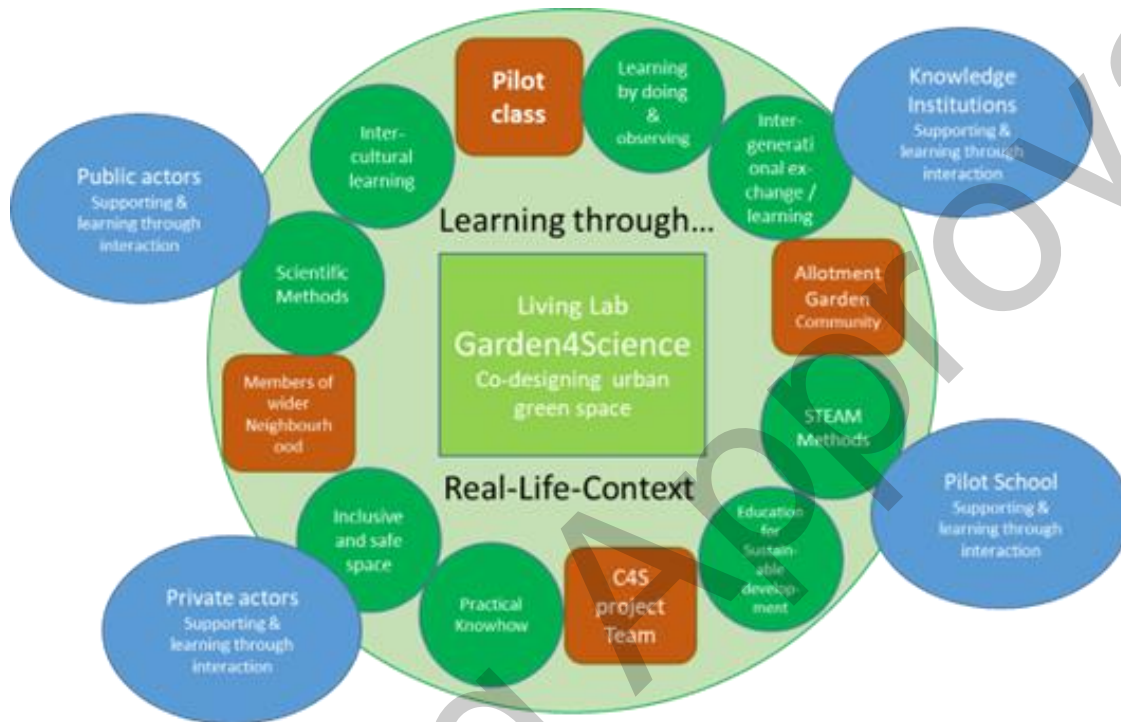


Figure 3 Schematic representation of the Garden4Science Hub. The Lab will provide a space to learn about nature human interactions in the context of cities through real world interaction. The primary users of the Lab (brown boxes in the green circle) will participate actively in the lab activities. The blue outer circles represent involved actors who do not participate in the activities of the hub, but support and interact with the members of the hub.

The schematic presentation shows the concept of the Vienna C4S Hub. The key element is the Community Living Lab. Here, workshops for the pupils but also community networking take place. The EUB and RCE (C4S project Team in figure 3) are responsible for organization and support of the workshops and network building to the involved actors who do not directly participate in the Hub activities (blue circles in figure 3).



1.2.6. Consultative bodies and structures

The stakeholder structure of the Vienna C4S Hub consists of four areas: Beneficiaries, Neighbourhood, Partners and Public. The Beneficiaries include the partner school (students, teachers, school management and extended staff) and their community (parents, guardians, peers, family circle and friends); communication at this level has the predicate "Manage Closely". The neighbourhood area covers the local anchorage of the school and the local surroundings, such as public educational institutions and recreational facilities. This area carries the communication level "Keep informed".

The School Quality Managers (SQM) have the task of regional school management and sustainable implementation of school development. The Partners area has the communication predicate "Keep Satisfied".

The area "Public" concerns the District Representative, the City Councilors and the media in general, and has the communication reference "Monitor".

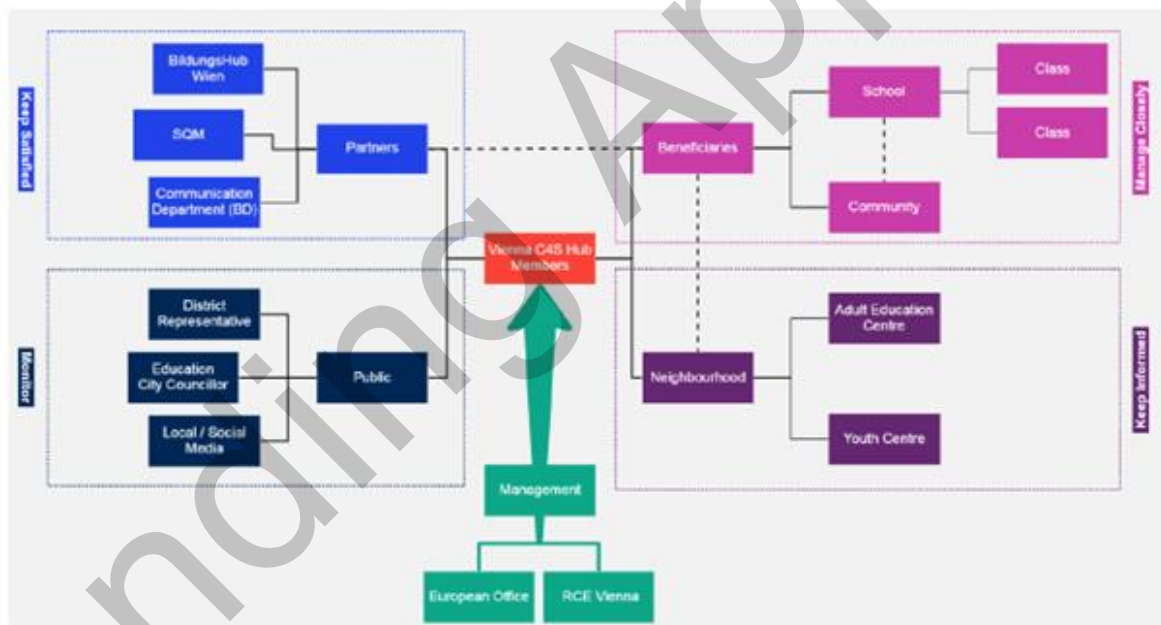


Figure 4: Vienna C4S Hub bodies and stakeholder structure and communication.



Management:

- European Office of the Board of Education Vienna:
Responsibility for Hub organization & management
- RCE Vienna:
Responsibility for the scientific & pedagogical requirements of the Vienna C4S Part
- Members
 - Beneficiaries
 - One pilot classes of a selected cooperation school participating in the C4S program
 - Community as community of enquiry

Partners

- BildungsHub Wien: virtual presentation platform, dissemination
- Communication Department of the Board of Education Vienna:
strategic implementation of the SDG
- SQM: School Quality Manager of the corresponding educational region

Neighbourhood ("Grätzl")

- Adult Education Centre ("Volkshochschule")
- Youth Centre ("Jugendzentrum")
- Area Management ("Gebietsbetreuung 2. & 20.")

Public

- Executive City Councilor for Education (City of Vienna)
- District Representative ("Bezirksvorsteher")
- Local Media (Local Press, School Homepage + social media)



1.3. Theoretical framework and methods

1.3.1. Vision

Inclusive science education should have been established in Vienna's educational landscape and among the relevant stakeholders long ago. The reality is often different: linguistic, cultural and especially structural barriers make it difficult to establish sustainable and inclusive learning settings.

Our goal was and still is to encourage and motivate all students and their environment to participate in the sustainability discourse in order to work successfully for the present and the future. It is desirable that this discourse, which is already taking place in theory, also becomes the norm in practice across the board.

Through targeted information about inclusive science education and corresponding events, a network among stakeholders from politics, science and research will grow continuously. This contributes to raising awareness about possible disadvantages of vulnerable groups and to concepts for dealing with these disadvantages.

1.3.2. Theoretical and conceptual framework

Community Living Lab

The European Network of Living Labs (ENoLL) defines Living Labs as “user-centred, open innovation ecosystems based on systematic user co-creation approach, integrating research and innovation processes in real life communities and settings. They operate as intermediaries among citizens, research organizations, companies, cities and regions for joint value co-creation, rapid prototyping or validation to scale up innovation and businesses”.

In our case we adapt and transform the concept to fit our need as a pedagogical and sustainability focused community lab. We focus less on the aspect of innovation – most of our approaches are not *per se* new or unknown – at least not in general. Nevertheless, their application in this place, within this community and setting are new and many of the participants found them to be truly innovative.

In the context of science education, the innovation lies in the focus of science practice for society – which one could also frame as Responsible Research & Innovation (RRI). For this type of science cooperation between disciplines and different stakeholders as well as the acknowledgement that complex problems are perceived and framed differently by different actors.

The core of our community living Lab concept is to understand the lab as a community of practice that works together to create an urban school garden and the exploration of the nearby nature. Constructing the garden gives the members of different communities a reason to interact with each other and with the teachers and the children. Our expectation was that through this interaction, learning and appreciation would take place, contributing to a more inclusive view.

We build on following educational approaches & concepts:



Inclusive Science Education

Our understanding of Inclusive Science Education (ISE):

- Inclusive = Inclusion as an educational approach has as an essential principle as recognition of and respect for diversity
- Science = interdisciplinary (i.e., not primarily natural science)
- Education = “Bildung” (in the holistic sense)

Experience - and problem-based learning

Education means co-creation: Therefore, we incorporate a PBL-approach, where the pupils are seen as subjects with their own valuable ideas, experiences, living environments and opinions. We mainly focus on the exchange with the pupils about worldly challenges that relate to their everyday experience and empower them in a playful and fun way to observe, deconstruct, reconstruct and analyze and eventually create further options for action. Consequently, the educational process should be connected to their experience, the reflection about their experience and finally promote creation and action.

1.3.3. Aims

Overall aim:

The aim of the Vienna C4S Hub was to encourage our Viennese partner school as active Living Hub Member to discover and explore science independently through a low-threshold and interactive workshop concept. We wanted to encourage all school students and their communities to participate in the sustainability discourse through experiential and problem-oriented research projects. By fostering critical thinking and holistic understanding of scientific work, young people can successfully contribute their knowledge to the present and the future. In general, we want to involve people, regardless of their social, financial or cultural background in the science and sustainability discourse with the help of participatory research approaches. Therefore, we use methods that include non-verbal interaction to give everyone the chance to express their ideas, experiences and thoughts - regardless their linguistic proficiency.

Aims at level of the Hub participants:

Pupils:

Young people, regardless of their social, financial and cultural background, were involved in the science and sustainability discourse with the help of participatory research approaches, and their opportunities for participation were increased through a low threshold offer.

We reached this aim through the involvement of pupils in the establishment of the Garden4Science Hub, through the workshop series (six thematic workshops), through integrating the topics through STEAM approaches in the regular work of the teachers with the kids.

Teachers:

The teachers became aware of the STEAM methodologies and inclusion as an important element of science education. They got the possibility to co-create and use the Garden4Science in their work with the children. They were motivated to become pro-active and carry on the work after the project ends.

Wider Community



When it comes to the families and neighbourhood of the pupils, we wanted to share the needs, interests and ideas of the young people with them by providing a low-threshold information transfer and by including them in project activities around the Garden4Science. We wanted to open appreciative and supportive spaces, where members of the communities have the possibility to bring in their perspectives and experiences regarding gardening and connect that with the topics of science, sustainability and creativity.

Science Community:

Students and scientists from diverse backgrounds participate as role models and inspirers in various activities within the C4S workshops. They learn about the concepts developed in the project for dealing with children and vulnerable groups and can integrate them into their professional practice where appropriate.

Policy:

Relevant stakeholders and policymakers know about the project and its objectives and get involved in networking activities. This helps to raise awareness, sensitize and develop a child-friendly view of the sustainability discourse and possible disadvantages of vulnerable groups in the field of science. They also know the concepts of dealing with these issues that have been developed within the project.

1.3.4. Paradigm and methods of the Hub

STEAM, Green Care - „Green pedagogy“ places development and thus processes at the centre of learning. Specific references are made between scientific concepts, practical application and the motives of individual and collective action.

Learning through participation
Learning from contradictions
Learning to differentiate between facts
Learning to empower people and clarify intentions
Learning to turn creative ideas into innovative solutions

1.3.5. Analyses of needs

The engagement began with an analysis of the needs and interests of the target group (in the context of sustainability). Once a partner school and class were identified, we involved the teachers directly in the further design of the Hub so that we could address their needs with our approach. Since the school's own playground and outdoor spaces are essentially a paved courtyard with no greenery - and no way to reasonably grow plants in pots, for example, due to heating in the summer - the need for a school garden was identified. This would not only help to address issues around the interaction between humans and nature in a low-threshold way, but also provide a green and cool place to simply spend time outside on hot summer days. In this way, the benefits of nature in terms of urban adaptation to climate change, as well as the joys and challenges of creating your own urban space, can be experienced in a multi-stakeholder environment.



But a school garden is much more. It is a learning space and offers numerous opportunities to work transdisciplinary in schools. The possibility of interdisciplinary learning ensures sustainable and, above all, life-oriented educational opportunities. In addition, complex scientific or global processes are illustrated and made tangible in a small and above all understandable setting.

Each workshop is concluded with feedback to integrate interests and needs of the students and to adapt the content.

1.4. Day to day approach of the Hub

We took a co-production approach to the construction of the Hub and the focus of the workshops. Therefore, the content and the “day to day” approach of the Hub was evolving along the activities and underlies constant adaptation.

1.4.1. Partners

Allotment Garden Association & District:

The partners from the allotment gardens are involved when they decide to join. For example: In the first workshop with the children a senior citizen from the direct neighbourhood offered their experience and information about the property and plants, how to deal with water problems.

Our partners from the district supported us in any case of need with the property and communication / networking.

1.4.2. Participants

Pupils

The children were in their fourth year of primary school, aged between 9 and 11. There are 9 different nationalities represented in this class.

Teachers

The teaching team consisted of three teachers, two of whom worked actively on our pilot. The main teacher was motivated and eager, the second teacher was able to support the children well in the field of science through her existing knowledge in biology.

Senior Citizen

The retirees on the allotment garden helped the students with their knowledge of local conditions and with practical things like the provision of rain barrels.

1.4.3. Collaborators and co-creators

We are closely linked with the University College for Agricultural and Environmental Pedagogy (HAUP). A permanent exchange on ideas and practical solutions for all sorts of problems is given. See also Hub structure 2.5.

1.4.4. Day to day activities and outreach

Because of the COVID-19 pandemic, we needed to adapt our original plan and e.g., postpone a lot of our Workshops. Due to difficulties on structural level, especially in regard to the possibility to permanently using the area designated for the Garden4Change, a more flexible workshop-concept including six thematic workshops and a comprehensive instruction, on how to set up a learning environment fostering inclusive science, was established.

The concepts as well as instruction are widely distributed among Viennese schools and encourage teachers to establish inclusive learning environments. These workshop concepts and useful information are provided:

WS 1: The early bird catches the worm: Gardening starts in winter.

Der frühe VoGeL fängt den Wurm!

Garteln fängt im Winter an

1 WUNSCHTADEL: In unserem Garten soll es Platz geben für...

Zeichnen, Malen, Kleben wir Papierschneisel oder Blätter, Bilder aus einer Zeitschrift, viele bunte Sachen von denen wir glauben, dass sie super sind, HIERHER! Was brauchen wir und was können wir Gutes für Tiere tun? Lassen wir unserer Fantasie freien Lauf! Vielleicht ist diese Tafel zu klein, dann machen wir einfach ein eigenes Plakat mit unserer Wunschtafel!

2 Informieren wir uns über wichtige Sachen, die es in einem Garten unbedingt braucht. Was ist gut um Artenvielfalt zu fördern und was braucht die Natur zu welcher Jahreszeit? Welche Dinge können wir leicht umsetzen? Wir können Ideen in unser Forschungstagebuch schreiben und zeichnen. Vielleicht wissen auch Freund:innen und Familie Nützliches!

Der Garten beginnt im Kopf zu blühen!

SCHAU ÜBER DEN TELLERRAND

Inklusiv - Interdisziplinär - Partizipativ

Methode

STEAM und Inklusion: ABOUT & WHY

Science Technology Engineering Arts Mathematics
im Sinne der Inklusion.

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Wissenschaft und Kreativität

Das Coole an der ganzen Sache ist, dass es so viele Möglichkeiten gibt. Hier liest du ein paar Ideen, wie ihr den Garten, und das, was ihr draußen macht, mit in die Schule bringen könnt.

BE/WE: Gestaltet Umschläge für euer Forscher:innen - tagebuch! Fragt eure:n Lehrer:in, welche Möglichkeiten es gibt! Welche Ideen habt ihr? Anzuschauen und Mit-Gewischlüssen könnt ihr ganz leicht selber machen. Macht Spaß und ist gut für die Umwelt!

MATHE: Habt ihr schon mal einen Plan gezeichnet? Das ist gar nicht so kompliziert und macht die Gartenarbeit leichter! Manche Pflanzen brauchen mehr Platz, andere weniger! Findet eine Lösung!

BIO: Redet über die Pflanzen und Tiere die ihr entdeckt habt! Habt ihr schon einmal ein Referat gehalten? Das geht auch gemeinsam in einer kleinen Gruppe!

Fällt euch noch mehr ein?

Questions: What is growing now? What is there to see? What do plants need to grow? What happens to plants outside in the winter? What do the animals do? What is the difference between



hibernation / hibernation / hibernation? Why does everything sprout again in the spring? How do we make environmentally friendly growing pots and mini greenhouses?

The kids were asked to explore the property with magnifying glasses and to take notes what animals they found, what plants. Then we talked about their discoveries. In the second part we started to plant some seeds and the kids take the pots home to take care of them until the next WS.

They found a lot of animals and plants, thereby we were able to build an easy and logical bridge to explain what biodiversity means and what everybody can do, in small steps to support insects, for example.

WS 2: It's so green! Spring is here...

Questions: The plants and animals have awakened. We need to take care of our little plants: What does plant protection mean? What are beneficial weeds / weeds / weeds? How can we help beneficials and make plant protection / nesting aids / insect hotels / rose balls ourselves? We put out beneficial insects (wild bees) and observe them.



We take time to observe the garden and talked about our experiences. We crafted some breeding and nesting supplies for insects. In this WS we move about 40 wild bees to the property and learn about the importance of Insects and their role in human survival on this planet.

WS 3 What is crawling, flitting and growing there?

Der Mensch kann sowohl Störfaktor sein, aber das ökologische Gleichgewicht auch schützen und fördern. Was sind denn gute und was schlechte Dinge die wir Menschen in Ökosystemen machen?

WICHTIG!
Es gibt kein absolutes ökologisches Gleichgewicht. In der Natur kommt es ständig zu Veränderungen im Ökosystem und damit auch zu Veränderungen im ökologischen Gleichgewicht.

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Jede:r Einzelne ist wichtige:r TEILGEBER:IN.

Was kauft und flucht denn da?
Ökosysteme und Lebensräume

Ein Ökosystem ist eine Gruppe von Lebewesen, die mit ihrer Umwelt in Wechselbeziehungen stehen. Zählen wir Dinge auf, die wichtige Bestandteile eines Ökosystems sein können:

Jedes Lebewesen im Ökosystem hat eine bestimmte Rolle und beeinflusst die anderen Lebewesen und die Umwelt, in der es lebt. Das ökologische Gleichgewicht ist die Beziehung zwischen den Lebewesen und ihrer Umwelt. Das Leben funktioniert im Ökosystem in einem ewigen Kreislauf. Das haben wir alle schon einmal gehört, oder? Da gibt es alle möglichen Arten von Kreislauf. Ein bekanntes Beispiel für ein großes Ökosystem ist der Wald. Fallen euch Beispiele ein? Zeichnet oder schreibt sie hier auf! Schneidet vielleicht Bilder aus und klebt sie hierher!

Aber bevor wir das machen, gibt es 3 komplizierte Worte, die stehen da unten. Wir sollten herausfinden was die denn bedeuten. Lüften wir das Geheimnis der:

- **PRODUZENTEN:**
- **KONSUMENTEN:**
- **DESTRUMENTEN:**

Wissen und Kreativität
Das Coole an der ganzen Sache ist, dass es so viele Möglichkeiten gibt. Hier liest du ein paar Ideen, wie ihr den Garten, und das, was ihr draußen macht, mit in die Schule bringen könnt.

BE/WE: Legt Flaschengärten an, gestaltet verschiedene Plakate zu Klimazonen/Ökosystemen, ihr könntet ein Quartett oder ein Memory gestalten, plant eine Kräuterspirale.

GEOGRAPHIE: Welche Klimazonen gibt es überhaupt und was sind globale Klimaphänomene? Wächst alles überall? Was für Probleme gibt es denn gerade mit dem Klima? Was könnten wir Menschen tun?

BIOLOGIE: Welche Fähigkeiten müssen Lebewesen haben damit sie überhaupt in verschiedenen Ökosystemen überleben können? Kennt ihr verschiedene Merkmale, je nachdem wo Pflanzen oder Tiere leben und wie sie sich anpassen?

Wenn da schwierige Sachen stehen, frag einfach deine:n Lehrer:in

Fällt euch noch mehr ein?

Ecosystems/habitats using the example of an herb spiral/bottle garden.

Questions: What do plants and animals need to grow? Biodiversity and sustainability, what does it mean? What can we do to promote biodiversity? There are many different habitats, we talk about them. Climate protection: what is this climate and why do we have to protect it? How to garden in an environmentally friendly way?

In practice, we had to put WS 3 and 4 together. Due to numerous illnesses and for organizational reasons, we decided to make a full-day excursion. This allowed us and the children to explore and work in a completely different way. This was not only ideal from a pedagogical point of view, but also on a psychological level, after months of isolation and homeschooling, a wonderful experience for all. We spent the morning collecting materials on the Danube Island and talking



about landscapes. We observed animals in their natural habitat, discovered beaver castles, shared a meal and played games. We spent the afternoon in class creating our bottle gardens.

This was a wonderful example on how the workshop concepts can be adapted to individual needs and circumstances.

WS 4 Back to the Roots: soil, water and more...

BACK to the ROOTS!
Erde, Feuer, Luft, Wasser - Farben?

DASS PFLANZEN ZUM WACHSEN ERDE, WASSER, LUFT UND LICHT BRAUCHEN, WISSEN WIE MITTELWEGE. TIERE BEHÖREN DAS FREIZEICH UND DAS WASSER. AUCH WIR MENSCHEN KÖNNEN OHNE WASSER NICHT LEBEN UND VERWENDEN ERDE FÜR VIELE DINGE. HABT IHR ABER SCHON MAL VON ERDFARBEN GEHÖRT?

Erdfarben werden durch Mahlen aus farbigen Erden, Mineralen oder Mineralgemischen hergestellt. Wenn man die dann noch brennt, verändern manche die Farbe. Häufig verwendete Erdfarben sind Ocker, Grünerde, Röt, Terra di Siena, Umbra, Kreide und Zinnober.

SAMMELT HIER MAL EIN PAAR INFOS:
Welche Stoffe gibt es? Woher kommen sie her? Woher kommen sie her? Woher kommen sie her?

BUNTE FARBEN AUS STEINEN?
Die alten Ägypter haben, soweit wir wissen, als Erste grüne und blaue Farbe hergestellt. Dazu wird Lapislazuli, ein blauer Stein in einer Mühle fein gemahlen und dann gesiebt. Nachdem dieses Pulver gereinigt wurde konnte man es mit Fett oder Öl vermischen und verwenden. Je feiner dieses Pigmentpulver ist, desto schöner ist die Farbe. Lass uns noch mehr Beispiele aufschreiben:

GEH' BITTE?
Geht das ned a bissel einfacher?

Aber natürlich! Nämlich ganz natürlich und super einfach! Wir brauchen weder Stifte noch Pinsel, sondern nur einen Hammer... Richtig gelesen! Mit der Hammertechnik können wir wirklich von jeder Pflanze oder Pflanzenteilen total realistische Abdrücke machen. Wir nehmen ein dickeres Zeichenpapier, legen Pflanzen darauf, so wie wir es gerne haben wollen und dann deckt man das Bild mit einer Klarsichfolie ab und drückt mit der Hand leicht an. Jetzt können wir mit dem Hammer vorsicht anfangen auf die Folie zu hauen. Nicht zu fest! Wir wollen ja keinen Brei - Gatsch, sondern die Pflanzenzellen nur ganz aufbrechen damit die Farbstoffe aufs Papier können.

Am besten probiert man verschiedene Sachen aus und erweitert dieses Plakat um ein paar coole Pflanzenbilder!

Das klappt übrigens auch auf Stoffen!

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PHYSIK: Vielleicht schafft ihr es zusammen eine Art Wasserkreislauf nachzubauen? Welche Fähigkeiten hat Wasser? Und wie nutzen wir diese?

CHEMIE: Man kann sooo viele coole Sachen mit Wasser und Erde machen, messen und experimentieren! EC & PH- Wert feststellen, verschiedene Tests über Eigenschaften und Zustände machen... Yeah!

BIO: Wie kommen Nährstoffe und Wasser überhaupt in die Pflanze? Nehmen Pflanzen ihr Nahrung gleich auf wie Menschen? Wozu brauchen Lebewesen Wasser und Nährstoffe?

GEOGRAPHIE: Gibt es verschiedene Arten von Erde? Schaut die Erde überall gleich aus?

Fällt euch noch mehr ein?

We take a closer look at the soil, the earth.

We review: What do plants need to grow, what plants are here? Do they all need the same thing? What are native plants, what is now "native"? Where do the vegetables from the supermarket come from? Is farming the same as cultivating a garden, only big?

In practice, we did not implement this workshop as standalone, to make WS 3 a one-day project. However, the content was largely incorporated with the other workshops.

The material and concept are, like the other workshops ready for standalone use.

WS 5 You are what you eat, right?

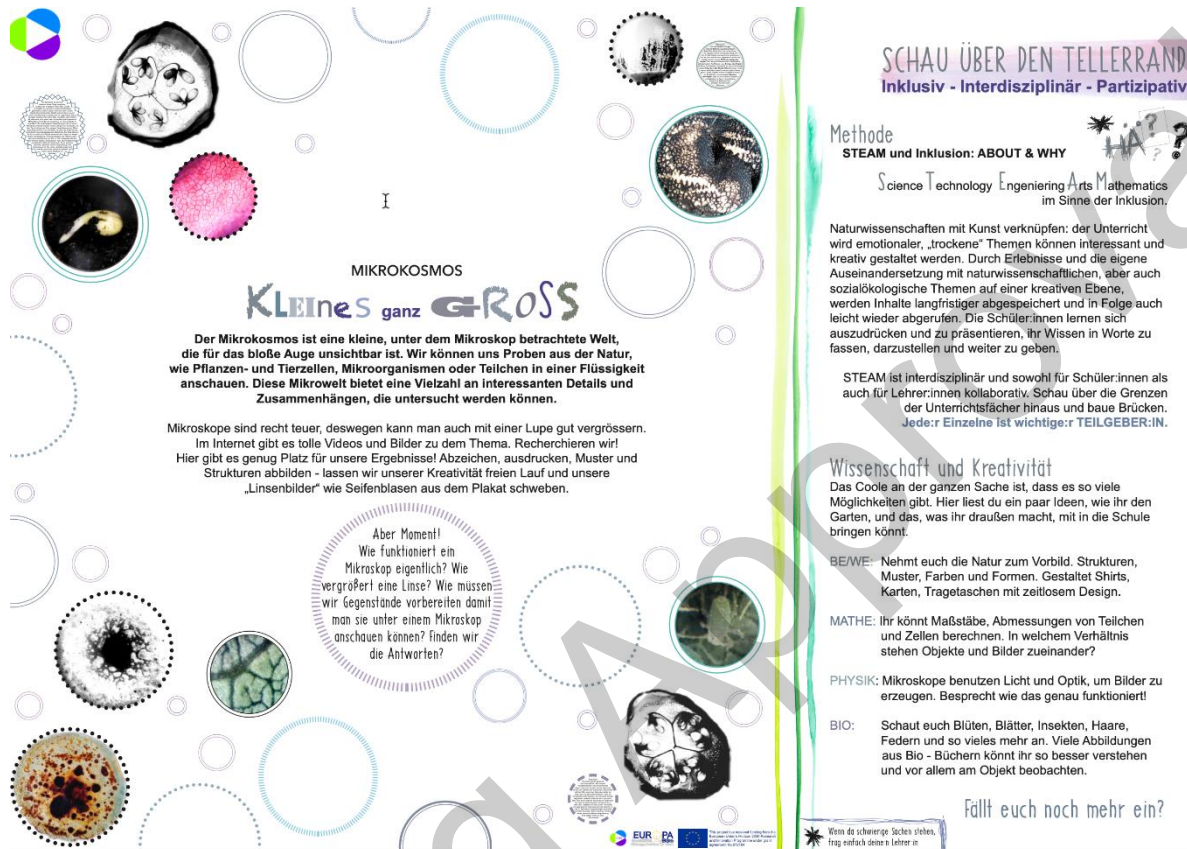


Questions: Vegetables can be eaten: which wild plants are edible? Many products we buy can be made by us: Spreads / jams / syrups and more. Harvesting and cooking together is fun. Where does our food come from: vegetables / animal products? What is food waste, what can we do about it?

Since harvesting, cooking and eating together not only promotes cohesion, but is always a nice experience during which many topics can also be discussed, this unit was the one that the children liked best of all.



WS 6 Small world big time: science practice.



Questions: What is science? What have we learned? We look at our logs / learning journals. What is a microscope and what can you do with it? We collect material, prepare, research. We draw what we see. Looking closely is important: learning to see!

It is very important for us to creatively introduce complex and challenging topics and practices to children, to trust them to treat living things with care and, above all, to show appreciation for even the smallest animals and plants.

Microscope utensils must be handled with care, which was also an important process to avoid injuries and to be able to work scientifically in the first place.

1.4.5. Best practices

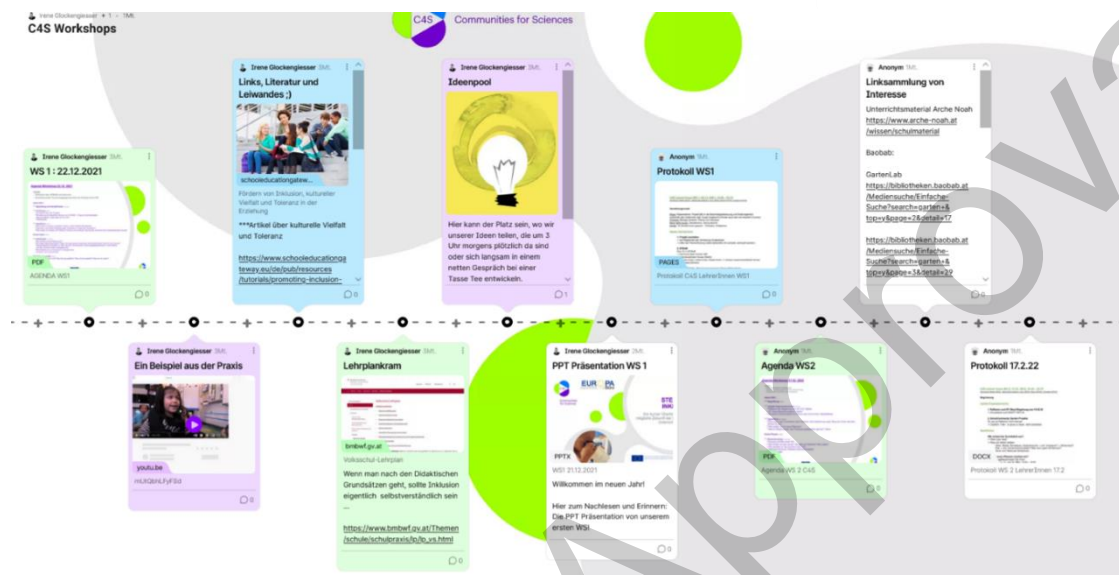
1. Involve teachers in the planning of the Hub and activities as early as possible to best meet their needs. It is important to understand their possibilities and limitations due to institutional settings, regulations and resources.
2. To successfully work together in online settings, it is advisable to use virtual blackboards that allow collaboration. We had good experiences using Padlet, an online platform for collaborative working resembling a flipchart / black board. See



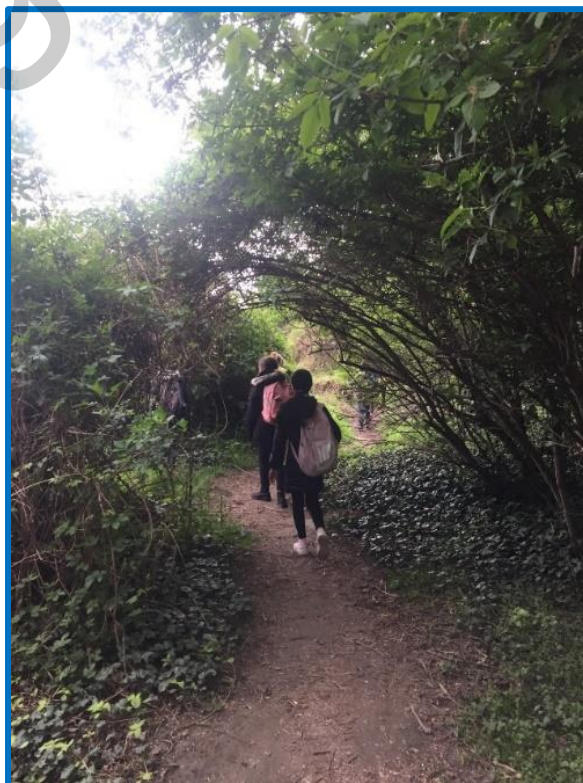
https://padlet.com/NeNe_Vienne/759l6tcwmh853oqy for our co-created hub design (see also figure 3)

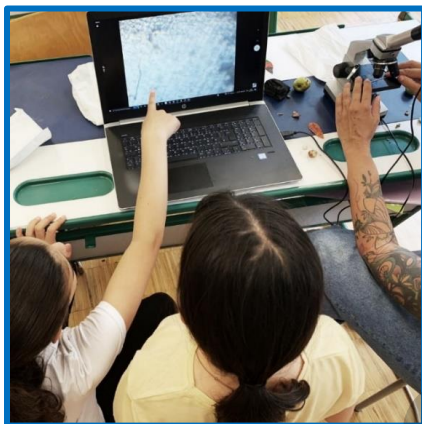
3. Involve the community representatives as early as possible

Figure 5: Screen shot of our Padlet used to co-create the hub and workshop content with the teachers.

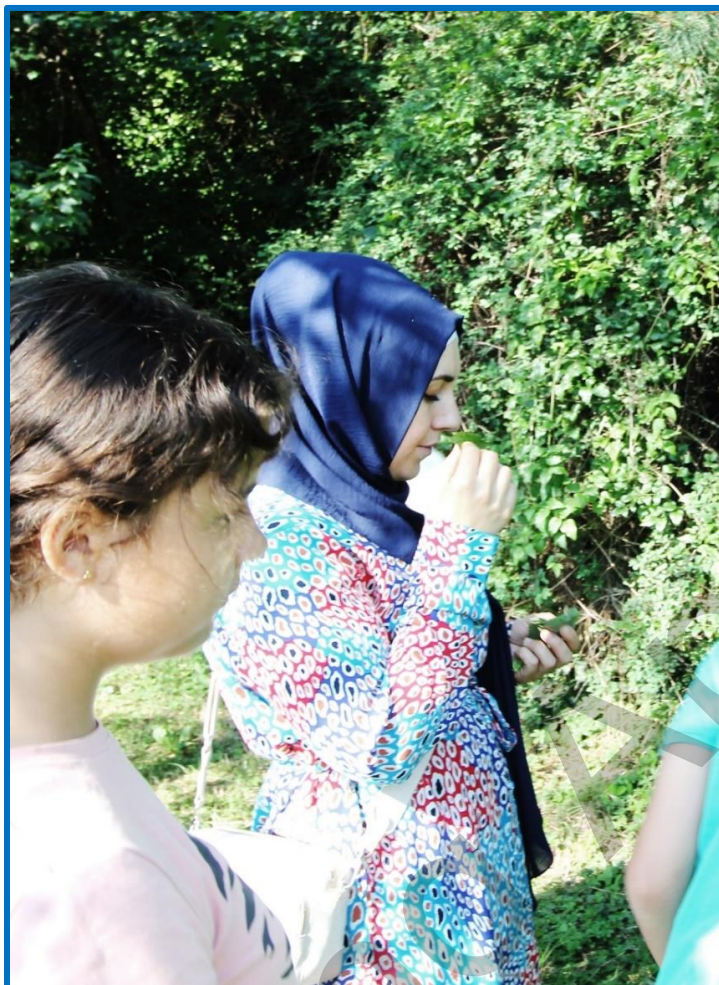


1.4.6. Photos and link(s)















Some impressions are also captured on instagram @Transformation.design
https://www.instagram.com/transformation.design/?fbclid=IwAR1uK2F8_lilBphR5uZ5NV2A8TseedTQJjZ5-P5-koaF1s1la8BC88XQQw



1.5. Reflection

1.5.1. Challenges and risks

General challenges identified beforehand

The first major challenge we faced was the COVID situation, with its uncertainties and unpredictable developments, which made planning in general and interaction with stakeholders in particular difficult. Another difficulty was connecting with student communities in a school setting. Some parents may feel intimidated or lack the free time to get involved. Besides that, we have to look carefully at the scientists we pick as role-models and further communicate our intersectional & educational approach, expectations and aims clearly and well to them. Because not “privileged white male” scientists might have their own stereotypes and bias too, that should not reproduce during their interactions with the pupils.

After all, we must remember that we would be operating within an educational system with its own internal logic, processes, rules and conditions. It is therefore important to think carefully about the possible consequences and finally to communicate with the teachers about their expectations and our role.

Challenges and Risks:

Due to the pandemic not all activities were implemented as planned, had to be delayed or adapted to circumstances.

- The property used as Garden4Change, where most of the CLL activities took place, has not yet been permanently dedicated and secured as school garden. Talks with the district officials and owners continue.
- Cooperation between kids and senior citizens in the garden - On the whole, the cooperation between students and allotment residents has worked well. After initial scepticism on the part of the residents, all fears, such as too loud behaviour, not dealing properly with the conditions and the fear of destruction of plants, were overcome. The residents helped with tips and tricks for gardening and found the lively interest of the students great.
- Keeping the teachers and the class motivated, we tried to involve everyone from the beginning and discussed the workshops in advance. We tried to listen carefully to ideas and address problems and difficulties quickly.
- Inform the other allotment garden owners about the benefits of biodiversity in their gardens.



1.5.2. Main findings or discussion points

Role of teachers – proactive vs. passive

The role of teachers in our pilot was very exemplary for the role of teachers within in the Viennese educational landscape. Many teachers are extremely motivated and committed, but schools often lack time and money to implement projects. Often small things are very difficult: e.g., taking the bus to visit educational projects, like the City Farm, where you also must pay an entrance fee. At our partner school, we have been lucky enough to have teachers who always take the children outside in the afternoon. Because of the location of the school near the Danube Island, it is possible to be in nature relatively quickly on foot. Mr. Klaus is very practice-oriented, Mrs. Christine is a biologist and therefore holds professional know-how. Therefore she is also a good role model. Both would like to spend more time outside or organize projects in class. The principle gives them a lot of freedom in this regard, which they use as much as time and money allows. But unfortunately, resources are very limited. Material and ideas are mostly contributed by the teachers. When Irene got involved with C4S in December 2021 and started preparing for the pilot, the idea was to introduce the teachers to the STEAM method extensively, giving them the chance to implement the last four of the 6 workshops themselves. We also planned for them to keep a teacher's diary, partly for their own reflection and partly to record important insights and experiences. Unfortunately, there were communication problems beforehand, and the teachers were told that there was a possibility to participate in a series of workshops as part of the project. It was not clearly communicated what the teachers' role would be in the CLL. The teachers thought that we were coming to the school to do these workshops FOR them. The situation at the school was very demanding, as a lot of capacity and energy had to be invested in these activities due to the lockdowns and the preparation and follow-up required for homeschooling. Due to this fact, we had to redesign and adapt the planned concept after the first teacher workshop, as it was immediately clear that the teachers could not be as involved in the organization and implementation, as originally intended.

How to organize research in a meaningful way

Our plan was, to ensure an objective observation and analysis, to cooperate with HAUP and to offer students the possibility of an internship. This would have allowed the students to gain experience and would have supported us with valuable data for extensive analysis. WU is not a university of education and in this respect is not an ideal place for such resources. The HAUP was therefore an ideal partner institution, and it was planned that at least 3 students per workshop would be present as observers, both in the pre- and in the post-workshop.

The realization was unfortunately not possible, because we had to hold our workshops very spontaneously or often postpone them. Additionally, the coordination of the students was impossible, because the university is very time-consuming and most courses are linked with compulsory attendance, and so no dates that were suitable for all could be organized. In the end, our research results are based on interviews, questionnaires, and memory protocols of four persons.



1.5.3. Implications for practice or policy

The biggest challenges we had to face during the pilot and the CLL were the pandemic and troubles on a structural level. Frequent staff changes within the project-team and misinformation, lack of skills in the education sector in some cases were challenging regarding the progress and implementation. Due to disagreements on the political/organizational level concerning the site of our CLL, we were forced to constantly adapt our concepts to various adversities, but this also led us to realize how flexible we can be not only as a solution-oriented team, but also how quickly and effectively we can implement plans and changes.

We have worked with students, teachers, and senior citizens to create practical, real-life and, above all, sustainable educational units that go far beyond the school setting and have had an impact on families.

As far as the political level is concerned, a lot is currently happening in the 20th district to implement the ideas of sustainable urban planning and partial "renaturation". The motivation to create environments for encounter and learning exists, also on the political level. What often fails is that this requires agreements on different levels, between parties or companies and institutions or magistrates. Unfortunately, this is very difficult and sluggish.

What would be desirable and worth striving for is better cooperation and networking among all those involved. There are now many projects and initiatives that deal with inclusion, diversity, environmental protection, and sustainability, as well as platforms that try to create an overview. A lot can be achieved with funding and free offers for schools and community centres, or even street workers, if awareness and above all recognition of the need for education for sustainable development is ensured at the political level.

The implementation of new approaches and ideas is often difficult in today's school environment. It is often not because of the teachers that it fails, but much more because of the time, money and administration involved. Another problem is the lack of teachers in the school, which often results in larger classes, non-specialist teachers and overworked educators. Even though the curriculum is constantly being updated to keep up with the latest developments, it can only be softened by having enough to teach.



1.6. Inclusion

In our CLL, we have tried to ensure that our science activities, materials, and resources were accessible to all students, regardless of their individual abilities, background, or limitations. Different learning styles were accommodated, and alternative formats or resources were offered to allow all students to participate.

-Interactive and participatory approaches provided opportunities for all students to actively engage in science activities rather than just being presented with information. Dialogue was encouraged, questions were asked, and students were encouraged to contribute their own ideas and opinions. Sharing knowledge and experiences allowed students to become more engaged in the learning process and generate lasting knowledge.

-Consideration of diversity and inclusion allowed for the diversity of the student population and their different backgrounds, experiences, and perspectives. Examples, case studies, and materials representing different cultures, genders, ethnicities, and social backgrounds were used. As a result, all students felt better represented and could relate to the content.

-The local community was included as a partner and resource in our project. Attempts were made to bridge the gap between the school and the community by inviting people from academia, local experts, or representatives from organizations, however, rules regarding external people in the school setting limited implementation or did not allow it to the extent desired. Workshops were conducted that offered students the opportunity to conduct research in collaboration with the community. In this way, students could make the connection between scientific research and their environment and see the value of science in everyday life.

-Students were encouraged to think critically, ask questions, hypothesize, and conduct their own investigations. In this way, students learned to analyse and evaluate information and draw their own conclusions. They were helped to present their findings and share them with others.

Emphasizing these aspects helped make science more inclusive for students and involved the community in the learning process. By considering different perspectives, experiences, and knowledge, a more inclusive and diverse environment for teaching science was created.



2 Budapest C4S HUB

2.1. General presentation (and origin of the Hub)

The aim of the Galileo C4S Hub was to encourage the work of the Community Living Lab, EduLAB 0-6, to assist in the implementation of the inclusive science education (ISE) in early childhood education and care (IECEC).

The target group of children was predominantly socio-economically disadvantaged Roma children and their families.

Organizer of the Hub was Galileo Progetti Nonprofit Ltd. – Budapest, Hungary.

The main objective of Galileo Progetti was the development of the social sector, the social economy, and the social inclusion, also through the exchange of good practices and experiences among European Union countries and by developing networking, European mobility and exchanges of experiences. Through its activities, Galileo Progetti aimed to contribute to sustainable development within the European Union and in Hungary, also through the dissemination of models, methodologies, tools, with attention to the European experiences and policies. The overall objectives include social inclusion, inclusive and high-quality early childhood education, employment, equal opportunities for disadvantaged people, fighting poverty, discrimination, and exclusion.

Józsefvárosi Egyesített Bölcsődék (JEB) was founded in 1994 by the municipality of the VIII. district of Budapest, a district in which the minority population is particularly relevant. The early childhood educators from the nursery have experience in various international projects. Some of these are as follows: FINE! Food and Nutrition in ECEC (2018-1-HU01-KA201-047760); I.ECEC (Intercultural Early Childhood Education and Care Curriculum Design for Professionals project (2018-1-HU01-KA201-047763), MECEC+ Multicultural Early Childhood Education project (2016-1-HU01-KA201-022945).

Community Living Lab:

Starting from the Lab 0-6 founded in 2020 in the Mini-Manó Nursery, member of the Józsefvárosi Egyesített Bölcsődék (JEB, association of municipal nurseries of the VIII district, Józsefváros of Budapest) to implement of the inclusive science education (ISE) in early childhood education and care (ECEC), in the framework of the C4S was created the **EduLAB 0_6** community living lab developing activities in the Mini-Manó Nursery in Budapest – 8th district. This district is in the heart of Budapest, and it's especially populated by Roma families.



2.2. Structure

2.2.1. Partners

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
Galileo Progetti Nonprofit Ltd.	Non-profit organization	the organization works in the fields of education and teaching, training, citizenship education, youth empowerment and equal opportunity	Local partners research/coordinator, communication	organiser
Józsefvárosi Egyesített Bölcsődék (JEB)	Organization of the nurseries of the VIII district of Budapest - Municipality	early childhood Education and care	implementer, stakeholder	JEB is the public organization owning the nursery schools / centres where the lab / pilot is realized
JEB Mini-Manó Bölcsőde	nursery school	early childhood education and care	Implementers	hosts the lab / hosts of the activities
JEB Biztos Kezdet Gyerekház (Sure Start Children's House)	child welfare service	Sure Start Children's Homes in Hungary are effective initiatives which have provided	experts, advisers, implementers	organization, advice, cooperation



		significant early childhood development (ECD) opportunities to segregated and disadvantaged micro-regions, composed of Roma and non-Roma populations		
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2.2.2. Living lab(s)

The pilot project started in Budapest, in the nurseries of the VIII district of Budapest Municipality. Galileo Progetti, in cooperation with JEB (Municipal association of the 7 nurseries of the VIII district), created the leaving lab EduLAB 0-6.

The EduLAB activities were held in more places and with different timing:

- In the nursery named Mini-Manó, a specific dedicated place was prepared for the lab activities. The space is open for children and families of the neighbourhood on certain Saturdays, in the afternoon. Trained educators manage the running of the EduLAB and the activities. On certain Saturday afternoons, can access children accompanied by an adult.
- The space of the EduLAB in the Mini-Manó are used by children together with their educators, during the school-time.
- The pilot project was mainly implemented in the Mini-Manó in the nurseries during the week-days.
- The living lab was also used by the JEB Biztos Kezdet Gyerekház (Sure Start Children's House): this is a special space for children and families, mostly dedicated to Roma people and vulnerable families. Parents and children find here help about parenting, or in case of special needs children, support for learn about feeding, caring etc. It is a service in the framework of the project SURE START, developed in more than 100 places in Hungary.

The educators involved and directly trained are 15, all of them participated in the training sessions and already works in the nurseries.

The educators have been trained to execute the pilot projects.



2.2.3. Team

EduLAB Team:

- 15 educators, trained - early childhood educators
- 2 researchers involved in the pilot – expert of Science (J. Selye University, Faculty of Education, Department of Biology), expert of Pedagogy of ECEC (Apor Vilmos Catholic College Department of Pedagogy)
- The staff and management of JEB - director of Nursery Mini-Manó, and director of JEB
- The staff of GALILEO, communication / organization / management

2.2.4 Student participation (if applicable)

Not applicable

2.2.5. Schematic presentation



Figure of the model Galileo C4S Hub



2.2.6. Consultative bodies and structures

The stakeholder structure of the Galileo C4S Hub consisted of four areas:

The Beneficiaries included the partner nurseries (children, educators, nursery management) and their community (parents)

The Neighbourhood area covers the local other nurseries and kindergarten in the district and the local surrounding and Roma communities.

The Area Partners included Sure Start Child House, NGOs, Roma communities, students, municipality, preschool and schoolteachers, special needs teachers, scientists.

2.3. Theoretical framework and methods

2.3.1. Vision

The vision of the Galileo Hub was:

1. to work with vulnerable communities by fostering inclusive science education in children aged from 0-6 years old, and their families, through formal and non-formal social/pedagogical institutions.
2. to raise awareness at an institutional level of some value-laden practices in science education activities and provide tools to redress such practices.
3. to promote engagement in inclusive science education through the creation of working groups with scientists or science-related members of those vulnerable communities co-participating in different programs to foster inclusive science education.

2.3.2. Theoretical and conceptual framework

The principles of the ECEC are based on this recognition: easing social and cultural disadvantages; strengthening parenting competences; prevention aimed at narrowing the social gap; voluntary access for all stakeholders; operation as an open service based on local needs. Our theoretical and conceptual framework are characterised by the idea of partnership (with professionals and parents); our service is universal and targeted, the target group being children aged 0-6 and their parents, we will focus on a specific vulnerable community (Roma community) who start life with serious disadvantages. We are convinced that the C4S project is a badly needed programme because offsetting social disadvantages, breaking the cycle of propagation must be started in the first years of life. One of the main goals of the programme is to cooperate with parents having or expecting children to achieve this goal.



2.3.3. Aims

In this Hub, how do you meet the RRI - Responsible Research and Innovation- dimensions or on which is focused? Ethics dimension, gender equality dimension, governance dimension, open access dimension, public engagement dimension, science education

Galileo C4S Hub is focused on The RRI Dimensions

Governance dimension: we shared responsibility and accountability among all actors during the project, from agenda setting, to design, implementation and evaluation. We also considered and applied bottom-up and top-down approaches during the project.

Gender and intersectionality dimension: To ensure gender-sensitive approach we promoted equal opportunities between men and women in the implementation to aim for a gender balance. We identified topics which required a specific gender analysis and identified needs for knowledge on gender issues explore them.

Public engagement dimension: we worked together all societal actors throughout the entire process in order to align its outcomes with the values, needs and expectations of society. We organized coordination meetings in order to promote opportunities to foster communication with different actors and the public throughout your regional project implementation. We included diverse actors and the public to ensure diversity of voices in our regional implementation and communication.

Science education dimension: in order to tackle the interests of your participants in our pedagogical and science educational work we listened to and assessed their needs. We provided them access to pedagogical and science education work, we took into account the peculiarities of age, we promote the scientific profession. The aim was to build bridges to society.

2.3.4. Paradigm and methods of the Hub

Inclusion and vulnerable communities' dimension: we wanted to make the pedagogical and science education work available not only to the target group, but to everyone in the 0-6 years age children group and for their parents. We also involved local professionals, external expertise in the preparation and implementation of the program.

We ensured to engage our target group as subjects and social agents by involving them in the project, not as a research object, but to use their knowledge and skills for developing solutions.

The project's objectives were targeted to needs, problems and opportunities of the target group.

We created a structure of co-creation and co-design with our target group and their communities.

We identified the interests and needs of our target group and their communities and involved them with their resources and strengths as agents of social change.

We sought to minimise any adverse impact on the wellbeing and privacy of individuals.

We tried to mitigate the potential challenges by risk identification, risk mitigation planning strategies and issue management.



2.3.5. Analyses of needs

We were planning to analyse needs in the first part of the project. The aim of this needs analyses were:

- to know which the real needs of the professional ECEC teams in relation to science education and intercultural diversity are,
- to gather data with the aim of progressing in this research project.

Questionnaire as a research tool. This questionnaire was anonymous and aimed at detecting the competences of educators, their self-awareness concerning their roles when dealing with a context of science education among cultural diversity and the needs they have to promote science education in ECEC settings.

2.4. Day to day approach of the Hub

2.4.1 Partners

Which external partners are involved, how and when do you consult them?

Meetings have been held together with the member of the municipality and stakeholder and other Hub members with the aim of presenting the project and exploring the interest in getting involved.

2.4.2. Participants

Directly: Mini-Manó Nursery: children (0-3 years) and their parents, early childhood educators, special needs educator, Roma children and their communities, educators of the Sure Start Children's House.

Indirectly, the ECEC early childhood educators of the JEB nurseries.

2.4.3. Collaborators and co-creators

Galileo and JEB have been collaborating for many years, combining Galileo's experience in innovation and building networks and new initiatives with the experience on the territory and analysis of the needs of JEB and its educators.

Educators themselves were the primary source of inspiration, because they knew the children, their families, the context.

Another source of inspiration were the local partners of the universities, such as ELTE, which collaborated with GALILEO and JEB for example in the Erasmus + KA2 I.ECEC project.



Furthermore, the international partners of the different projects in which Galileo and / or JEB participated, in particular, of the exchanges of good practices that helped to innovate, take inspiration, import ideas and adapt them to the local context.

2.4.4. Day to day activities and outreach

Professional activities

- meetings with the stakeholder,
- design of the laboratory rooms,
- creation of the physical environment,
- analyses of needs of the professional ECEC educators in relation to science education and intercultural diversity are,
- professional training of the educators,
- selection of the educators involved in the pilot,
- training for the educators involved in the pilot,
- compilation, testing, selection, analysis and review of the play set,
- testing the equipped laboratory,
- redesign of the laboratory rooms,
- planning the operation of the laboratory,
- elaborating and discussing aspects of dates, policies and documentation,
- organization of the events on weekdays in the Lab,
- organization of the events on certain Saturday afternoons for families,
- organization of the outdoor Lab activities with the families,
- discussing the science learning activities with the educators,
- building of the research team,
- organization and implementation of the pilot,
- organization workshops for the educators of the JEB
- participation in conference and other professional events,

Administrative activities

- agreements with the local municipality,
- organization of the regular Hub meetings,
- organization of the dissemination events,

2.4.5. Best practices

The good practice we would like to share is the territorial dimension of the pilot. The project reached the all district, thanks to:

- The involvement of all the local municipal nurseries: the pilot involves mostly one nursery, but all the. 7 nurseries of the district have been involved.



- The cooperation of the local municipality in the pilot. The municipality offered the space for the lab, and the cooperation of the local nurseries' association. The municipality was even cooperating in the promotion of the initiative to the local families.
- The cooperation between GALILEO and JEB / Municipality was a strength of the project implementation, because allow to work in an easy way – being a private company – and to have the benefit of a local support.

2.4.6. Photos, Links

Links to photos and website:

<https://jozsefvaros.hu/otthon/hirdetotabla/hirek/2022/03/megnyilt-az-edulab/>

Mini Manó Nursery

<http://www.bolcsode-bp08.hu/mini-mano.html>

2.5. Reflection

2.5.1 Challenges and risks

What challenges or risks do you take into account when rolling out your Hub?

It is important to connect with several representatives of the local community. The Roma community involvement is challenging, it was important to have members of the community in the work team.

2.5.2 Main findings or discussion points

Outdoor activities were the most visited and most successful events in the Spring and Summer period, these were the most ideal initiative for inclusive science education for the local community.

The concept of the Community Living Lab and the STEAM pedagogical approach should be part of teacher training for early childhood education and care.

The laboratory EduLAB 0-6 was the practical venue for teacher training.



2.5.3 Implications on practice or policy

The supportive attitude and behaviour of the local government, made us be really positive in the implementation of the pilot, in the development of the Hub and in the sustainability after the project. The positive effect is outlined.

Pending Approval



3 Sofia C4S HUB

3.1 General presentation (and origin of the Hub)

Sofia Hub was formed for the purpose of the C4S project and aims to promote inclusive science education among preschool Roma children. For this purpose, we were in close cooperation with HESED Foundation (Health and Social Development Foundation) - an organization that has many years of experience with the Roma minority in Bulgaria and has been running an alternative kindergarten for Roma preschoolers for years. The main goal was to stimulate active engagement of children 3-6 years old in the regular science activities planned in the state-approved curriculum with the help of the Child participation approach. Instead of planning special activities aiming to provoke interest in science-related topics, we wanted to see whether the mere change of the social context may promoted the interest and eagerness to learn science in very young children. In doing so we heavily relied on previous findings with the Child participation approach in Roma minority hinting at that possibility by showing that Roma teenagers became more curious in general and more responsible for what and why they accomplish in short and long-term perspective. We hope to see a similar transformation in much younger children, which may in turn be enough to change their attitudes toward science, and to make it more positive and inclusive, since the science activities allow us to be autonomous and to ask our own questions. In addition, we expected to improve science learning skills, such as relational thinking, as it is suggested that curiosity and interest can foster it much earlier than expected¹. If this happens, it could be argued that early inclusive science education not only leads to the formation of positive attitudes towards STEM, but also that:

- it can support subsequent STEM learning as important cognitive skills for science learning such as relational thinking are also developed.
- the so-called relational shift (i.e., moving from object/attribute-based similarities to structure/relational-based similarities) can be fostered through inclusive science education.
- relational shift can be supported and stimulated in children from the Roma community where it is not observed at the age of 3-6 years, which is the age of children involved in Sofia Hub activities.

Another goal of the project relates to the skills of teachers to create and promote inclusive education in which everyone can participate and develop according to their own knowledge, experience, needs and skills. In Bulgaria, teachers are often constrained by a pre-set curriculum to which they must adhere strictly in their work, including in science classes. Children thus lose the opportunity to experiment, explore and learn the science material at their own pace and according to their level of development and experience and must catch up with the curriculum. This applies with full force to children of Roma origin, who often do not know the language they are taught in kindergartens (i.e., Bulgarian) and have no previous experience with science activities, as these are simply lacking in the community and there is no focused and structured experience to develop them informally. Therefore, it is very important that teachers who meet Roma children engage them in learning, generate interest and know how to actively involve everyone in their activities. Our aim is to support these attempts by training and supervising teachers in their attempts to support and encourage child science participation.

¹ before age 2, although the relational shift is usually observed around age 4



3.2. Structure

3.2.1. Partners

- *HESED* - Our main partner in C4S Sofia Hub.
- *Know-How Centre*, NBU – it is a support organization as well.
- *Muzeiko* - children's museum in Sofia, it is a support organization²

3.2.2. Living lab(s)

The main activities of C4S Sofia Hub took place in 3 of the HESED kindergartens groups. The HESED Foundation has developed a specific program called 'Preschool Education and Care for 3–4-Year-Old Children' that engages with young children living in compact Roma communities who are not covered by the education system, as well as with their parents. These children differ significantly from their peers in terms of cognitive abilities and fine motor development, which are essential for school readiness but are often not stimulated and developed in their home environment. Additionally, children in the neighbourhood frequently do not speak or have a limited understanding of Bulgarian, which poses an additional obstacle to their school adaptation and formal science learning in particular.

The HESED teachers and assistant-teachers were trained in the Child participation approach and have regular supervision sessions while trying to change their interaction with children in their regular pedagogical activities and specifically their science classes with the children. The training provided general knowledge about a) the philosophy, values, and different levels of children's inclusion in the educational process when teaching science, and b) the method of participatory action research and the role of the teachers as co-researchers to reflect on their personal experience of inclusion in their work with the groups of children. After the training, the teachers were expected to apply pre-planned experiential learning methods to the three groups of children. To facilitate the experiential learning part of science teaching and stimulate children's learning, different materials, toys, and play activities were provided by the project to the three groups of children.

3.2.3. Team

The main C4S Sofia Hub activities were carried on by NBU and HESED. This is a list of participants from the two main organizations involved in the project:

- *Nadia Koltcheva* - University teacher and researcher at Department of Cognitive Science and Psychology, NBU, C4S researcher and Coordinator for NBU
- *Penka Hristova* - University teacher and researcher at Department of Cognitive Science and Psychology, NBU, C4S researcher

² After the first year Muzeiko withdrew from the project due to a change in ownership and status of the organisation.



- *Antoaneta Mateeva* - Researcher and university teacher, Know-How Centre for Alternative Care for Children, *NBU*, C4S researcher
- *Galina Markova* (used to be in the project but quit in January 2022) - Researcher and university teacher, Know-How Centre for Alternative Care for Children, *NBU*, C4S researcher
- *Boian Vasilev*- Psychologist, *HESED* Coordinator
- *Emilia Mikova* - Director of *HESED* centre, clinical psychologist
- *Tsvetina Shindarska* - Psychologist, *HESED*
- *Eleonora Petrova* - Preschool teacher, *HESED*
- *Albena Dragieva* - Preschool teacher, *HESED*
- *Radoslava Dushkova* - Preschool teacher, *HESED*
- *Mitka Mihailova* - Assistant teacher, *HESED*
- *Ani Manova* - Assistant teacher, *HESED*
- *Sofche Atanasova* - Assistant teacher, *HESED*
- *Radostina Mihailova* - Assistant teacher, *HESED*
- *Galia Asenova* - Assistant teacher, *HESED*

3.2.4. Student participation (if applicable)

Students from the Department of Cognitive Science and Psychology at New Bulgarian University also joined the C4S NBU team. They took part in the training for researchers and partially participated in the observations planned for the C4S consortium in order to assess the impact of the project and to identify the barriers faced by underrepresented children in science education and learning. One of the students joined the child participation team and participated strictly in all these activities.

3.2.5. Schematic presentation

The other organization were mostly other museums that were physically close to the Faculteta neighbourhood where HESED kindergartens and hence the CLLs were located. A good lasting relationship was established with the Agricultural Museum in Sofia (<https://nzmsofia.com/>).

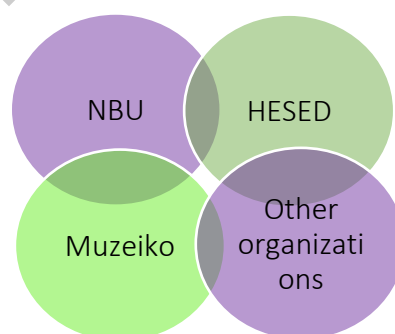


Figure 1. The main actors of C4S Sofia Hub

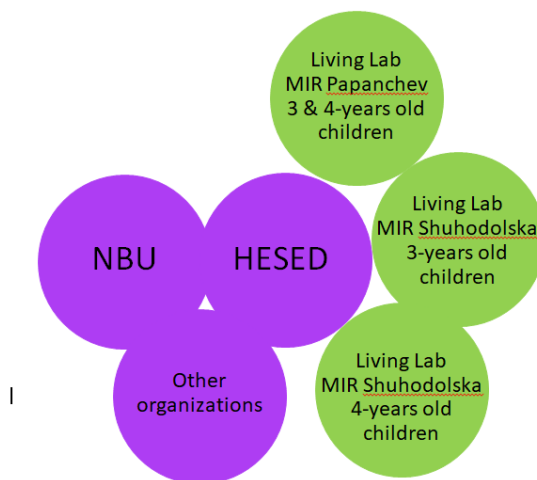


Figure 2. C4S Sofia Hub Structure

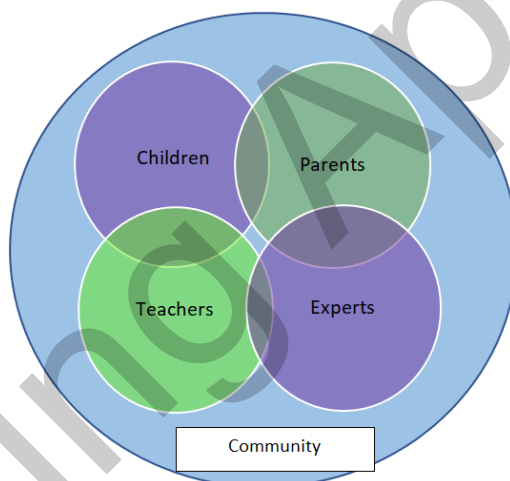


Figure 3. The participants in C4S Sofia Hub activities

3.2.6. Consultative bodies and structures

Which consultative bodies (e.g., resonance group, think tank, steering group, ...) will you put in place? How will they interconnect?

The main consultative bodies were the organizations that are closely involved in Hub activities:

- *HESED*- expertise in inclusive education of Roma children
- *Muzeiko* - expertise in promoting science for preschool children³
- *Know-How Centre, NBU* - experts in Child participation approach

³ They participated in the first year of the project and in the informal science activities that were planned to be undertaken to make STEM more attractive to the Roma community (children, parents and kindergarten teachers of HESED).



3.3. Theoretical framework and methods

3.3.1. Vision:

The team's vision was to stimulate Roma children's development by bridging the gap between science and Roma children's education. This gap is caused by several factors. First, stigma against Roma has increased during the years of transmission from socialism to the market economy due to the increased poverty in the country. Second, because of that the above Roma population has been excluded from quality education. Many Roma children still study in segregated schools where they cannot receive even basic knowledge and skills. Third, there is a chronic marginalization of Roma, which affected mostly the most impoverished families. This problem for many Roma has become intergenerational transmitting poverty from one generation to the next.

In general, academic education in Bulgaria is still guided by values related to passing knowledge in a hierarchical manner to the children, depriving them of being authors of their own education. By preventing the participation of children and young people in the educational process, the system blocks their curiosity and initiative.

That is why our vision that leads us through the project is that by sensitizing the teachers to recognize and acknowledge the authentic curiosity of the children to explore and create, a new culture will be set where science will find its natural setting. We see the trusting relationship between the teachers and the children as the major tool for keeping the children safe and secure – the prerequisite to exploring the environment and the world with pleasure and joy.

As a result of this, we believe that the fear related to academia and science will be reduced, which will help the students and their parents to see the school as a friendly and stimulating environment where everyone can develop.

3.3.2. Theoretical and conceptual framework

Our previous experience has taught us that the approach called Child participation can be implemented to realize our mission. Preliminary results have evidenced that this approach can change the hierarchical academic culture that blocks the children's curiosity to explore. Our project will collect further evidence of the applicability of the Child participation approach in the current project setting and will link Child participation in science learning in particular to analogical reasoning.

The link between adult scientific thinking and analogical reasoning is well documented. Many brilliant scientific discoveries were based on thinking in terms of relations and systems of relations. This cognitive skill is argued to be of key importance for education worldwide, since it underpins higher-order thinking, generalization, and knowledge transfer, including in science (for a review Richland and Simms, 2015). Findings, however, show that before the age of four, children rarely recognize and use relations, unless the task did not provoke their authentic curiosity (Gentner, Shao, Simms & Hespos, 2021). Even two-year-olds were able to go beyond



object similarity and to take into consideration how they are related in pairs if the task itself is amusing enough. Hence, curiosity may be the shortcut for relational reasoning at an early age and maybe enough to motivate children to represent what they observe and learn in terms of relations. Indeed, according to Jirout (2020) curiosity is the main factor for developing scientific thinking and motivation to learn science in general.

3.3.3. Aims

The Sofia-Hub's main goal is to stimulate the science learning of Roma children through the Child participation approach. We hope to help children, teachers, and parents to work in partnership to achieve the project goals. Instead of implementing a specific pedagogical intervention aiming to encourage scientific thinking, understanding, and trust, we plan to encourage them through the means of the participatory learning environment.

Roma children, their teachers, and parents started to be co-creators of their own journey through science, rather than enactors. Teachers started to structure the activities in a way that stimulates children's initiative and the focus of those is to help the adults delegate more power to them rather than to control the educational process. In this manner, we meet the requirements of Responsible Research and Innovation for inclusion. In addition, by engaging parents and Muzeiko as one of the main stakeholders of informal science education in Bulgaria, we hope for public engagement and sustainable project outcomes.

The ethical aspects of the data collection are strictly followed closely by the standard procedure of informed consent, ethical approval from the Departmental Ethical committee (beside the approval by the Ethical Committee in Manresa University, we applied and got an approval by the Ethical Committee at the Department of Cognitive Science and Psychology, New Bulgarian University), and the confidentiality of the stored data.

3.3.4. Paradigm and methods of Hub

We are engaging the children by using the methodology of child participation the essence of which is that the adults become more attuned to the children's messages, more responsive to their initiatives and curiosity, more supportive to their motivation and steps towards achieving goals. The effectiveness of the approach we have taken is estimated through quantitative and qualitative methods. We want to know whether and by what mechanisms, Child participation may support science learning. Since the raised curiosity was among the main outcomes of the previous Child participation projects with Roma children in Bulgaria, we plan to trace its effect further to understand whether it may also support deeper learning and representation of new knowledge in terms of relations. Relational thinking was measured with a Relational Matching-to-Sample task (RMTS), which was designed to estimate the child's preference ward deep relational processing of information, compared to the piecemeal, object-based one. The RMTS stimuli and procedure were discussed with the HESED partner and piloted. We managed to gather base-line data for the relational reasoning preference style, typical for the Roma children from 3 to 6 years of age at the HESED kindergarten at the end of the previous school year (i.e., before the start of the CLLs). The same task (and stimuli) was used to estimate the relational thinking of the children after several months of active engagement with science through the Child participation approach. The goal was to trace both longitudinally and cross-sectionally the expected change in relational thinking of the Roma children involved in the project due to the



heightened interest, curiosity and positive attitude toward learning of science as a key aspect of the participatory learning environment promoted by the Child science participation. In addition, we prepared a curiosity measure based on the Mastery Motivation Puzzle Task (MMPT; Smiley & Dweck, 1994) in coordination with the Muzeiko partner. We planned to use it to estimate whether the approach of this Children's museum relying on active exploration and play within an appropriately structured and inspiring learning environment raises children's curiosity toward any aspect of it. This particular measurement was not conducted as Muzeiko has gone through a major restructuring of the core activities and vision of the organization due to a change of ownership. We manage however to test the role of curiosity with the MMPT for the expected relational shift for a subsample of children involved in the C4S activities (i.e., children from one of the CLLs) so that to test its mediatory role between Child participation and relational thinking.

3.3.5. Analyses of needs

Our aim is for all participants in C4S Sofia Hub to be aware of the aims and activities of the project, the vision aims and activities of the Hub and to be involved in the whole process of task execution.

That is why we are involving our main partner HESED in meetings for discussing the specificities and needs of the target group, the teachers' needs, tasks, activities with children, and workload, so as to be able to align their needs with the project activities. Similarly, the curiosity measure was developed as a cross point of the project goals and the Muzeiko's needs to check how effectively they can provoke science related curiosity of pre-schoolers.

Last but not least, the training of Child participation that the HESED teachers and assistant teachers underwent during the C4S project relied on regular supervision during which teachers were able to reflect, evaluate, and share their experiences of applying Child participation and to discuss their personal views on how this approach affects children's behaviour and learning. After each session, the knowledge collected was summarized by the researcher and validated by the teachers' group. In this manner, teachers were encouraged to explore their own definitions of participatory learning environment and to compare and evaluate different strategies to promote it in the specific science activities they promote with children. During the supervisions the teachers identified also some challenges in front of child science participation and ways that these challenges may be addressed in their own work.

3.4. Day to day approach of the Hub

3.4.1. Partners

Which external partners are involved, how and when do you consult them?

EXTERNAL PARTNERS INVOLVED IN THE C4S SOFIA HUB:

- **Health and Social Development Foundation (HESED)**

Website: <https://hesed.bg/en/>

HESED Foundation is an organization that works with Roma children and their families living in a closed community in the Faculteta neighbourhood of Sofia. The organization has



developed a specific program called 'Preschool Education and Care for 3–4-Year-Old Children' that engages with young children living in compact Roma communities who are not covered by the education system, as well as with their parents. These children differ significantly from their peers in terms of cognitive abilities and fine motor development, which are essential for school readiness but are often not stimulated and developed in their home environment. Additionally, children in the neighbourhood frequently do not speak or have limited understanding of Bulgarian, which poses an additional obstacle to their school adaptation. HESED Foundation was involved in all stages of the project. I.e., from the design of the project activities, through their application, to the evaluation of the change in children's attitudes toward STEM, relational thinking and curiosity. The two kindergartens that we worked with are not state-governed institutions but are part of nongovernmental initiatives developed and operated by HESED.

Muzeiko

Website: [Muzeiko](#)

Muzeiko is the biggest science centre for children in Eastern Europe. Muzeiko is a 2,000 m² space with over 130 interactive games created for children and curious adults. The entire content of the museum is designed to inspire children to learn, discover and explore the sciences, while helping children, their families and educators spend time together actively and effectively. They were involved in the preliminary stages of the project when various activities were discussed to engage the children in informal science learning activities. However, when the plan was to be implemented in 2022, they went through a long transition period of reorganization due to a change of owners⁴ and withdrew from the project.

Know-How Centre

Website: [Know-How Centre](#)

The Know-How Centre for Alternative Child Care is part of the structure of New Bulgarian University and is a research and consulting organization that works in support of the government policy on the deinstitutionalization of children in Bulgaria. It is involved in all stages of the C4S from the design of the activities, through their implementation to the project dissemination. The Know-How Centre was in charge of training teachers on child participation and further supervision of teachers' attempts to promote inclusive and participatory science learning in HESED kindergartens.

3.4.2. Participants

DIRECT:

- Children (3 groups of 3-6 years old Roma children 2 kindergartens situated in the Faculteta neighbourhood in Sofia)
- Teachers and assistant-teachers (3 teachers and 4 assistant-teachers who work in the kindergartens run by HESED)
- HESED as organization (3 of the HESED psychologists)
- Experts (from the HESED Foundation and Know-How Centre on Roma in Integration and Inclusive Roma Education)

⁴ America for Bulgaria Foundation officially handed over the management of Muzeiko to Sofia Municipality on 27/01/2023, when all planned activities from the active stage of the project were completed.

**INDIRECT:**

- Parents
- Community (Roma community in the Faculteta neighbourhood of Sofia)

3.4.3. Collaborators and co-creators

We acknowledge the HESED Foundation as a co-creator of the project. They were actively involved in shaping the activities of the Hub together with the children and teachers. Thanks to the participatory approach adopted at the Sofia Hub, teachers were encouraged to empower children during their science activities and create a supportive, positive and inclusive environment as children explored different science materials (magnifying glasses, scales, puzzles, globes, etc.) and learned how to use them to better understand the different science facts embedded in their science curriculum. Therefore, HESED kindergarten children should also be assessed as co-creators, along with their teachers and assistant teachers, as they were actively involved in the science learning activities and had the opportunity to shape and modify them according to their interests, knowledge, and differences (both as individual differences, such as developmental level and as group differences, such as a mixed age group for 3-6 year-olds versus groups of 3-4 and 5-6 year-olds).

Everything and everyone who has helped teachers to inspire children to become actively involved and to understand what inclusive science education can be for such young children, should therefore be seen as an important stimulus for the work of the Sofia Hub. These were (1) the meeting with some of the C4S partners, such as Hub Manresa and Hub Milano, (2) the new science materials that were made available to the teachers by HESED for their science activities, allowing the active involvement of each child in their groups, and (3) last but not least, the regular supervisions that were held by the Know-How Centre, allowing them to share, discuss, doubt, criticize, etc. the approach of Child Science Participation.

3.4.4. Day to day activities and outreach

YEAR 1 OF C4S PROJECT (PREPARATION, GOALS AND ACTIVITY COORDINATION AND PLANNING PHASE)

Preparation and coordination:

- initial meetings with HESED
- initial meetings with Muzeiko
- planning of the activities
- planning of the assessment of the outcomes of the activities
- discussion and scheduling of planned activities with each partner
- Coordinating the science learning activities outside the kindergarten with both partners (i.e., Muzeiko⁵ and HESED)
- Distribution of leaflets presenting the C4s Vision for inclusive science education on different scientific forums related to inclusive education

Research pilot phase:

- Design of the research aiming to estimate the change of the Child participation

⁵ After their withdrawal all collaborative activities were frozen.



- Development of the research instruments for general, science related curiosity and relational thinking
- Ethical approval from the Departmental Ethical committee for the Relational Matching-to-Sample Task (RMTS)
- Training of the HESED psychologists with the RMTS
- Piloting of the RMTS and gathering the base-line data for the spontaneous preference of children in the target group toward processing of relational information
- Reflecting on the obtained results with the HESED partner
- Discussing the science learning activities, which Muzeiko may include the Roma children and the possible tasks that may measure their effectiveness
- Discussing Muzeiko's proposal with HESED and choosing a science activity appropriate for the age and state curricular of children in the HESED kindergartens
- Planning and scheduling the visit of HESED in Muzeiko
- Planning and scheduling the assessment of the effectiveness of the Muzeiko's science activities for HESED children
- Developing the curiosity measures (general and science related) discussed as assessment tools for effectiveness of science learning activities of proposed by the Muzeiko's partner
- Ethical approval from the Departmental Ethical committee for the general and the science related curiosity task
- Conducting the first (pre-project) measurement with RMTS – April-May 2021

YEAR 2 (IMPLEMENTATION OF CHILD SCIENCE PARTICIPATION IN THE HSED KINDERGARTENS AND FORMATION OF THE 3 COMMUNITY LIVING LABS (CLLS) PER EACH OF THE 3 HESED KINDERGARTEN GROUPS)

Project activity phase regarding Child participation:

- Planning of the 4 trainings in action research and children participation methods
- Provision of 4 trainings and their analysis
- Planning of the supervisions of 3 teams of educators working with children
- Provision of 1 reflection session of supervision with the 3 teams of educators
- Collection of good inclusive practices and their initial analysis

Project activity phase regarding Pilot study:

- Ongoing science sessions with three groups of preschool Roma children from HESED Kindergartens – February-May 2022
- Conducting the second (post-project) measurement with RMTS – April-May 2022
- Conducting a general curiosity task – April-May 2022
- Training of students for how to encode the C4S Observation codes
- Video-recording of 6 science learning activities per each CLLs (HESED kindergarten group) - February-May 2022
- Coding and preliminary analyses of the Observations along the C4S Observation codes – June-September 2022
- Analyses of RMTS data – July-September 2022

YEAR 3 OF THE C4S PROJECT:



Project activity phase regarding its effectiveness:

- application of consortium qualitative assessment based on videotaped science learning activities
- Focus group with the HESED teachers and assistant-teachers
- Meetings with parents from the Roma community in Faculteta district, Sofia, in collaboration with HESED – September – October 2023

Project activity phase regarding the dissemination of the Sofia Hub know-how:

- Paper publication in scientific journals:
 - Mateeva, A., Hristova, P., Koltcheva, N., Vasilev, B., Ivanova-Shindarska, Ts., Mikova, E. & Savova, S. (in press). An Educational Approach for Promoting Active Participation of 3-4-Year-Old Children from the Roma Community in Sofia in the Process of Learning Science in Kindergarten. Psychological Research (in the Balkans), IBSN 1311-4700.
 - Hristova, P., Kolcheva, N., Mateeva, A. (in press). Child participation in science learning helps 3–4-year-olds to encode relations between everyday entities, Proceedings of Science Since Birth 2023 (abstract)
 - Hristova, P., Kolcheva, N., Mateeva, A. (in prep.). Participatory science learning as a way to foster relational thinking in 3-5-year-olds: Evidence from RMTS with Roma children. Frontiers of Education, ISSN (online): 2504-284X
- Participation to a scientific conference:
 - project presentation during Annual Conference and Winter School in Cognitive Science and Psychology, 25-28 February 2021, DCSP, NBU, Sofia, Bulgaria, online, 25-28 February 2021
 - project presentation during National Scientific Conference on Children's Neurology, Psychiatry and Developmental Psychology with International Participation, 2-3 September 2021, Sofia, Bulgaria
 - a talk during Interdisciplinary Scientific Hybrid Conference Migration, Cultural Diversity and Life Prospects Under Conditions of Global Crisis, November 24-25, 2022
 - two talks during Pannel for C4S Project, Annual Conference and Winter School in Cognitive Science and Psychology, 17-19 February 2023, NBU
 - Presentation of two posters at "Man - the measure of all things?" The challenges of the post-industrial information society", 17-18 October 2023, Technical University-Sofia
 - Presentation of two posters at X Jubilee International Congress of Psychology, „THE CHALLENGES FACING MODERN PSYCHOLOGY", 3-5 November 2023
- Organization of a Pannel for C4S Project, Annual Conference and Winter School in Cognitive Science and Psychology, 17-19 February 2023, NBU. Moderator Nadia Koltcheva:
 - Gabriel Lemkow Tovas (UMANRESA, Universitat De Vic, Universitat Central De Catalunya): General presentation of C4S project
 - Luisa Zecca, Valeria Cotza, Petar Lefterov (University of Milano-Bicocca, "Riccardo Massa", Department of Human Sciences for Education): For an inclusive science approach. A comparison of two case studies in the preschools of the municipality of Sesto San Giovanni
 - Antoaneta Mateeva, Penka Hristova, Nadia Koltcheva (Know-How Centre, NBU; DCSP, New Bulgarian University): Kindergarten Teachers' Implicit Knowledge on Child's Science



Participation from Their Experience with 3-4 Years Old Children from Roma Community in Sofia

- Penka Hristova (DCSP, New Bulgarian University): Child participation in science as an accelerator for relational choice
- Dissemination of C4S vision and Sofia Hub scope and work with leaflets about the project at various scientific forums related to inclusive education, including children of Roma origin. (EU-Self Project Conference, 26 September 2022, Sofia, Bulgaria; Alliance for Early Childhood development in Bulgaria, 26 September 2022, Sofia, Bulgaria; kindergarten with children from vulnerable communities including from Roma origin, 11.5.2023, village Rumiantsevo, Pleven, Bulgaria; kindergarten with children from vulnerable communities including from Roma origin, 12.5.2023, village Hotantsa, Ruse, Bulgaria; three kindergartens with children from vulnerable communities including from Roma origin, 15.5.2023, Stara Zagora, Bulgaria, village Svoboda, Bulgaria, Chirpan, Bulgaria; kindergarten with children from vulnerable communities including from Roma origin, 22.5.2023, village Glozhene, Kozludui, Bulgaria; "Conference of the Future", organized by Alliance for Early Childhood Development, 18 - 19.05.2023, Forum Hotel, Sofia, Bulgaria; TCA Focus on South-Eastern Europe: A New Vision for European Cooperation, University of Regensburg, September 10 - 12, 2023, Regensburg, Germany; National Scientific Conference on Children's Neurology, Psychiatry and Developmental Psychology with International Participation, 11-12 October, 2023, Sofia, Bulgaria; X Jubilee International Congress of Psychology 2023, „The Challenges Facing Modern Psychology", 3-5 November, 2023, Sofia, Bulgaria, etc.).
- Exhibitions to promote the work of Sofia Hub:
 - o Exhibition of the C4S Project and Sofia Hub at NBU, 4 - 14.07.2023, NBU, Sofia, Bulgaria
 - o Exhibition of the C4S Project and Sofia Hub at HESED, Kindergarten, Center MIR, 7 - 30.09.2023, HESED, Sofia, Bulgaria
 - o Exhibition of the C4S Project and Sofia Hub at HESED, Kindergarten Center Papanchev, 8 - 30.09.2023, HESED, Sofia, Bulgaria
- Common meetings with parents from the Roma community to raise awareness and share information about C4S project and activities
- Design of a Booklet promoting the work of Sofia Hub

3.4.5. Best practices

- Exploration of teachers' implicit understanding of inclusive science education for children in early childhood. At the beginning of our work with the teachers we started with collecting their own views and experiences of including children in science learning. This way we recognized their own efforts, empowered them and motivated them to participate on an equal level with the researchers to promote such thinking and practice in the kindergarten education.
- Demonstration workshops of the approach. Researchers and students from NBU developed demonstration workshops and offered them to the children in the presence of their teachers in order to present some inclusive practices and to discuss them further with the teachers.



- The reflexive sessions for supervision done regularly during the implementation of the approach by the teachers help them to share their experience and to learn by each other, to explore the differences between the groups of children, to describe the context in which they work and how it supports their active efforts for Roma children inclusion and support to learn despite the challenges that they face.
- The articles and the conference presentations made by the team helped to start discussing the importance of children inclusion in science as an important tool for children motivation to learn science, and for the development of basic social and emotional skills. This way the knowledge collected from the Hub was spread out and inspired students and professionals from the fields of education and social care.
- The experience from the Hub was included in the education of the students of two departments: Cognitive Science and Psychology Department and Health and Social Work Department. It broadened their knowledge about inclusive approaches in education and work with young children.

3.4.6. Photos, Links















Общности за наука (C4S)

За насърчаване на приобщаващ подход в обучението по наука

www.communities-for-sciences.eu

Представяне и цели

Надгледът на общностите за наука (C4S) е насочен към подпомагане на образователните институции и гражданите да се ангажират в научното обучение. C4S е мрежа от организации, които работят заедно, за да насърчат приобщаващ подход в обучението по наука. C4S е мрежа от организации, които работят заедно, за да насърчат приобщаващ подход в обучението по наука.

Консорциумът

Консорциумът за наука (C4S) е резултат от сътрудничеството между различни организации, които работят заедно, за да насърчат приобщаващ подход в обучението по наука. C4S е мрежа от организации, които работят заедно, за да насърчат приобщаващ подход в обучението по наука.



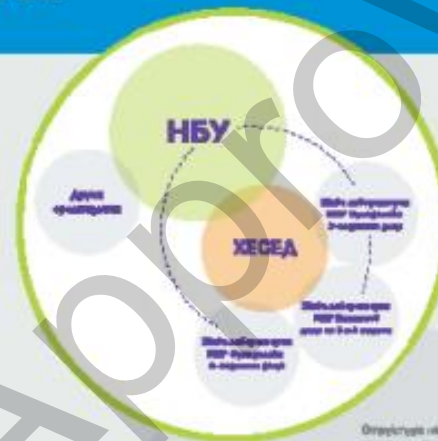


C4S София Хъб

www.comunities-for-science.eu/softs-hub/

CAS София Хъб
Лаборатории

Российский институт «Детские проблемы» (www.dpb.ru), ИАФ
Фонд «Спаси ребенка» (www.sprf.ru) и другие организации, занимающиеся
исследованиями в области профилактики детского насилия» (www.dpb.ru).

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C4S София Xb6

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Прогнози на отбег на бегалци од Авганистан и Пакистан кон Европа, 2014-2015

Това да означава, че политическите движения, които са обединени само от идеята за промяна, могат да бъдат и силно ефективни в своята борба за промяна, това не да бъдат разглеждани като неадекватни и неадекватни, защото те са изключително ефективни и ефективни.

Таблицата съдържа данни от обществено достояние на работещите в областта на енергетиката, които са публикувани в годишния доклад за енергетиката на страната. Тези данни са публикувани в списък с енергийни данни на ЕС, който е достъпен на ec.europa.eu/energy.





Communities for Sciences

Представяне Хесег

<http://hesed.bg>

Фондация „Здраве и социално развитие“

Фондация „Здраве и социално развитие“ (HSEB) е чужденска, безплатна работеща в полза на българските общности, извършваща и разпространяваща социални проекти, насочени към подпомагане на социално-икономическото развитие на общините. Фондацията е основана през 2014 г. и е регистрирана в Общинския център за социално-икономическо развитие на община Хесег. Фондацията е основана през 2014 г. и е регистрирана в Общинския център за социално-икономическо развитие на община Хесег. Фондацията е основана през 2014 г. и е регистрирана в Общинския център за социално-икономическо развитие на община Хесег.

Общински център за социално-икономическо развитие на община Хесег

Общински център за социално-икономическо развитие на община Хесег



Този документ е резултат от проект, финансиран от Европейския съюз и от националните власти на България. Съдържанието на този документ е изцяло отговорност на авторите и не може да се използва за други цели.





Барьеру и ресурси

За да се преодолее барьеру и ресурси, потребно е да се развие глас и да се воспользуваат ресурси. Гласот е потребен за да се изразат мислењата и идеите на граѓаните и да се воспользуваат ресурсите. Гласот е потребен за да се изразат мислењата и идеите на граѓаните и да се воспользуваат ресурсите. Гласот е потребен за да се изразат мислењата и идеите на граѓаните и да се воспользуваат ресурсите.



Барьерите, идентифицирани во истражувањето, се групирани во четири категории: образовни, финансиски, инфраструктурни и социјални. Барьерите се групирани во четири категории: образовни, финансиски, инфраструктурни и социјални. Барьерите се групирани во четири категории: образовни, финансиски, инфраструктурни и социјални.

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Дейности на C4S София Хъб

Значение на Включващата учебна среда за обучението по наука

Тяга на двигател на изпитанния едновременно с увеличаване на скоростта на движение, като се наблюдава и извършва деформацията на изпитваната конструкция. Измервателните уреди са свързани с електронна измервателна система, която автоматично обработва измерените данни и изготвя отчетна таблица.

Значение на включващата учебна среда за обучението по наука при деца от ромски произход

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Примери за добри практики за участие, наблюдавани в лабораториите

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3.5 Reflection

3.5.1. Challenges and risks

- HESED - alignment with their organizational culture and needs
- Teachers – engaging actively and long-term for the C4S cause and activities, taking into account their needs, interests, etc.
- Alignment of the C4S activities for children with the internal procedures, curriculum, rules, etc.
- The COVID-19 situation and all the difficulties it brings with the insecurity and unpredictability - access to the kindergarten, activities with children, face-to-face gatherings of people, etc. This is a big challenge regarding the planning of the activities, communicating and interacting with partner organizations and also other potential partner



- Withdrawal of a partner (I.e., Muzeiko) - and update of the preplanned activities to the new situation
- Challenge for the application of the Child participation in early science education - Teachers mentioned that it is challenging for such young children to participate because they are faced with their own feelings of insecurity, impatience, and competitiveness, as well as those of other children in the group. This can create a very emotional and complicated atmosphere that is sometimes difficult to manage. However, the fact that they always work in pairs (teacher and assistant-teacher) helps a lot in such situations.
- Challenge for application of Child participation in Roma community – Successful implementation of the approach requires regular attendance of children, which is a problem for Roma community and teachers spend a lot of time to cultivate a culture of regular kindergarten attendance among parents. When children are not brought to kindergarten, teachers actively engage with the parents by visiting their homes, providing support such as food or clothing for the children, and holding consultations with the parents.

3.5.2. Main findings or discussion points

DISCUSSION POINTS

- *The importance of context:* Teachers acknowledged the importance of the institutional context they work in. An NGO runs the two kindergartens and the educational team have more freedom to implement new practices and to develop certain activities for children with their more active participation in the learning process. Also, parents were important and the broader community of the children, since they do not value education and hence should be educated too in order to allow children to study at school and to develop their interests, including in science.
- *The Importance of Age:* Teachers and assistant teachers question whether the participatory learning environment they have created gives children enough choice and space to learn science. After all, they are responsible for what happens in their groups of children, and as adults and teachers they are expected to know more than the children. Therefore, the big debate was how to create a participatory learning environment for such young children.
- *The lack of a clear definition of what child participation is, and therefore what child science participation can be:* Teachers struggled a lot with defining the approach to science learning that they should implement, and with the idea that there was no recipe or algorithm that they could implement.

MAIN FINDINGS

- *Teachers' Implicit Definitions of Good Child Participation:* According to the teachers and the assistant teachers involved in the projects "good child participation" is relational and created through the interaction between the teacher and the child, in which a specific environment is created to encourage and support the child's active participation in the learning process. This relationship supports a culture of active child participation in the learning process, which is especially important when working with children from minorities and families that do not value education.



- *Levels of Child Participation Identified by the Teachers in the Process of Science Learning:* During supervision with teachers, they described different moments of their work with children that encourage child participation. After summarizing these moments, two different levels of participation of children in the learning process were identified. The first level is related to the teaching discourse "with the child in mind". This means that the teacher takes into account each child's individual developmental characteristics, temperament, learning styles, family culture, interests, and other factors in the learning situation. A different level of child participation can be achieved through listening to children's voices, which promotes a culture of dialogue and scientific exploration. This approach involves hands-on interaction with real objects or artifacts to encourage active engagement and learning.
- *Significance of the participatory learning environment for science education:* This approach to science learning is highly flexible and pragmatic, allowing teachers to integrate scientific concepts and skills into a variety of contexts and activities. For example, teachers might use mealtime to introduce children to the science of nutrition or encourage them to explore the properties of plants during outdoor playtime. Whether through structured lessons or informal activities, this approach emphasizes the importance of hands-on exploration and active engagement in the learning process.
- *Significance of the participatory learning environment for science education of Roma children:* According to the teachers, the use of participatory science learning techniques is particularly important for Roma children, who often face social and cultural barriers that can make it difficult for them to fully participate in the classroom. By creating a safe and inclusive learning environment that values their contributions and perspectives, teachers can help to build their self-confidence and encourage them to express their ideas and opinions. This is especially important given that many Roma children come from homes where their voices and opinions may be neglected or dismissed.
- *Child participation in science as a factor for the development of transferable skills and competencies:* In addition to the positive attitude and interest in science that children develop thanks to the child participation approach, various transferable competencies and skills, such as relational thinking, were developed. The latter is important because it helps children not only to learn and understand science, but also to transfer the relations they have learned to new situations. The relational preferences of children in the Child Participation group doubled both in the long term and when compared to a control group from the same community at the same age.

3.5.3. Implications on practice or policy

- Giving teachers more freedom to determine the *content* of their science lessons, or at least to be more flexible in choosing which aspect of science to discuss during a science activity, rather than following a predetermined schedule as is usually the case in state-run kindergartens in Bulgaria.
- Support teachers to *explore* their best practices to try different strategies to foster children's curiosity and interest in science.
- Promote a *participatory learning environment*, especially for science learning, where each child should have the opportunity to experiment, explore and inquire at their own pace and according to their ability.



3.6. Recent evolutions and adaptations

3.6.1 Evolution or major changes (if applicable)

- *Participatory science activities as an engaging way to reach a correct conclusion:* During the focus group, teachers said that they had found their efforts in the C4S project useful and rewarding because they had been able to encourage children to explore and be active in non-art activities, while usually leading them to an important and correct conclusion. Hence taught them to be critical and how to proof, measure, and explore with a specific goal in their mind.
- *Sharing know-how within the team:* during regular supervision of child participation, teachers learned that they have a greater potential to change and stimulate their groups of children if they share their successful experiences and failures. During the focus group, they stated that they would keep these regular meetings after the C4S project as they were useful and needed as motivators for successful work.

3.6.2 Inclusive aspect (what? How? Recommendations?)

- The existed in Bulgarian education policies new tendencies first, for more inclusive education for children and for the adjustment of the teaching methods to the needs of each child, and second, for the inclusion of experiential and interactive methods of learning in all levels of education are a good ground for the promotion of inclusive science learning approach both on the policy and practice level.
- There are also foundations, NGOs and parents' organizations that are very active in the efforts to transform educational system in the country, and they could be used as future partners for the promotion of this approach when refining the curriculum and the additional activities of children on kindergartens and schools.
- New Bulgarian University is a member of ERUA network of universities promoting the third mission of the academic institutions to become socially engaged and implement their knowledge in the real practice. Our team could promote its experience and the philosophy of the project amongst this community of universities.
- The exhibition prepared by the team presenting the project activities helps to make the larger academic community at NBU from different departments and specialities familiar with the science inclusion approach.

3.6.3 Stakeholder map

- Ministry of Education
- Parents' organizations related to the fields of education, social support for Roma children and for children with disabilities
- Centres for Personal Development to the Ministry of Education
- Inclusive Education Centres
- State and private kindergartens and schools
- Foundations and other NGOs in the field of education and social support
- Museums and galleries, workshop and art places working with children



- Municipalities Association
- NBU and other universities
- Bulgarian Academy of Science
- National broadcast media and social media.

3.6.4 Impact of activities

- During the training and the supervision reflective sessions educators became clearer about the levels and the quality of their inclusive work with the children. They were able also to become more creative in finding new opportunities to increase child participation.
- Educators started to explore the specific skills and attitudes that they have to develop when engaged with child inclusion in the learning process.
- Psychologists in HESED who gathered the pilot data for children relational preference were highly motivated from the possibility to be involved in the research work: (1) to learn new tasks and new approaches to assess the curiosity and reasoning of the children, (2) to be involved in the discussion of the obtained preliminary results, and (3) to be included in the adaptation of the procedure and stimuli to the HESED children.
- Children discovered new materials and toys applied during science learning and they enjoyed playing with them.



4 Brussels Wonderlab C4S Hub

4.1 General presentation (and origin of the Hub)

In Brussels research, pilot design and implementation find common ground in the new campus building of the Erasmus Community College. The new Hub is set in a very diverse and vibrant part of the Belgian capital. The target group of migrant children and families is consequently logical. In conceptualising the new campus, EhB has chosen to create a building that reflects innovative ideas on education. There are rooms dedicated to certain transversal skills like developing, creating, presenting, investigating and exchanging. On the other hand, there are also rooms for special activities and areas of expertise like a theatre room, a dance studio and a creative arts atelier. The **Wonderlab** is one of those specialised spaces.

In this space, the idea of children playing and experimenting with open ended, low-tech materials come to life. The research on development of play and on the investigative skills of children take place in conjunction with the training of future teachers. The pilot design will come to life in the crossover and intersection of theory, research and practice. Through play children investigate the different characteristics, qualities and attributes of materials and scientific phenomena. They will encounter science in a playful and inspiring hands on manner. The space is inviting, playful and challenging. Children are stimulated by the materials, adults present and the documentation on the walls. This documentation shows images of exploration and discovery processes, as well as female and migrant scientists as a new inclusive visual language. As a new way of approaching and representation of science with regard to gender, age, background,

All these components will lead to establish a well-founded theoretical framework and deepening of scientific approach within ECE (Early Childhood Education).

4.2 Structure

4.2.1 Partners

International partners

We consult and look for inspiration from our international partners in this project through workshops, trainings and meetings.

Students

Our students are actively involved in the Hub. (see 2.4 student participation) Students graduating during the project will be included, if possible, in the group of former students.

Former students



To disseminate and deepen our acquired knowledge and to broaden our view we work, during the project, together with a select group of former students in the professional field. They will not only advise us from their practical experience, they are also experimenting with our developed materials and programs in their classroom or school.

Advisory board

A board of specialists in gender, diversity, ... is put together to ensure that we take into account the social diversity in society. According to the needs of the project the board was consulted.

Group of science experts

With this group we refined and adjusted our strategies on a regular basis according to the needs of the project.

Team of lecturers

The project can count on the support of the team of lecturers. To make sure the Steam approach is embedded in the whole teacher program for preschool teachers, the team of lecturers were informed and consulted about the different steps in the project.

The education provider of the Flemish Community, GO!

In GO! we have found a strong advocate and supporter of this approach and project.

In collaboration with every partner mentioned above and other interested parties we've met during the project, a member of staff developed content and managed the space and the materials for the living lab.

4.2.2. Living lab(s)

The **Wonderlab** is part of the teacher training program for preschool teachers of the Erasmus University College. The teacher program is focused on pre-service training but is also invested in the shared training in collaboration with the field of educational professionals (education, socio-cultural, welfare). As a third pillar we aim to stay connected to in-service preschool teachers, to keep innovation top of mind. In working with students and visiting schools and teachers, the ideas and methodology of the C4S-project and -pilots are replicated. The accompanied visits and joined workshop establish a multiplier effect that foster innovative and sustainable science education in formal pedagogical settings.

Through working with children (from migrant communities), we are able to reach families and especially mothers and women. Families were also invited to the Wonderlab and discovered fun ways of interacting with every day materials in a playful and scientific way. With a **C4S-box to the streets**, families from the neighbourhood can take part in playful science activities and watch students mediate exploration, experimentation and discovery in a low-tech environment. Here we focus on a multiplier effect in a non-formal pedagogical setting.



4.2.3. Team

The core team consists of an overall project coordinator, an internal Hub-coordinator, a curator of the living lab and materials and a researcher.

- Marleen Rosiers
Course director teacher training program
Overall Coordinator H2020 project EHB
Research and Development, Work package 3: coordination of the Hubs
- Inge Laenen
- Lecturer of Pedagogy
Research and Development, Internal Hub-coordinator
- Bram Malisse
- Lecturer of Arts
Research and Development, curator materials and play area
- Annick Biesmans
Lecturer of Pedagogy
Research and Development, theoretical frameworks play area

4.2.4. Student participation

Because the Wonderlab is part of the teacher training program for preschool teachers, students were very closely and actively involved as co-creators in the project. Their experiences in the different schools and in the Wonderlab were valuable and important for making adjustments to the initiatives taken during the project.

(All) Students used the Wonderlab as a research room. Here the exploration of materials and the investigation into the meaning and the potential of play are central. Students experimented and explored how playful science education can be designed according to STEAM principles and with the use of STEAM approaches. They have done this as part of their training and took these principles and approaches to the educational field and reported back their experiences and reflections through pedagogical documentation. This feedback feeds the ideas and design for the Wonderlab and helped the team to adjust the proposals in the space. As students progressed through the program the fundamentals of playful science, inclusion and intersectionality were broadened by insights from experts, dialogue with organizations and meeting with families in outreach activities. Students were stimulated to reflect on their process by pedagogical documentation in different forms (pictures, short reports, clips,...), that way we could collect input and get suggestions from the students.

When the Wonderlab was set up and outfitted (by the students), young children were invited to visit the lab to play. At that point students researched the investigative approach of the young children and the supporting actions of the in-service teachers.

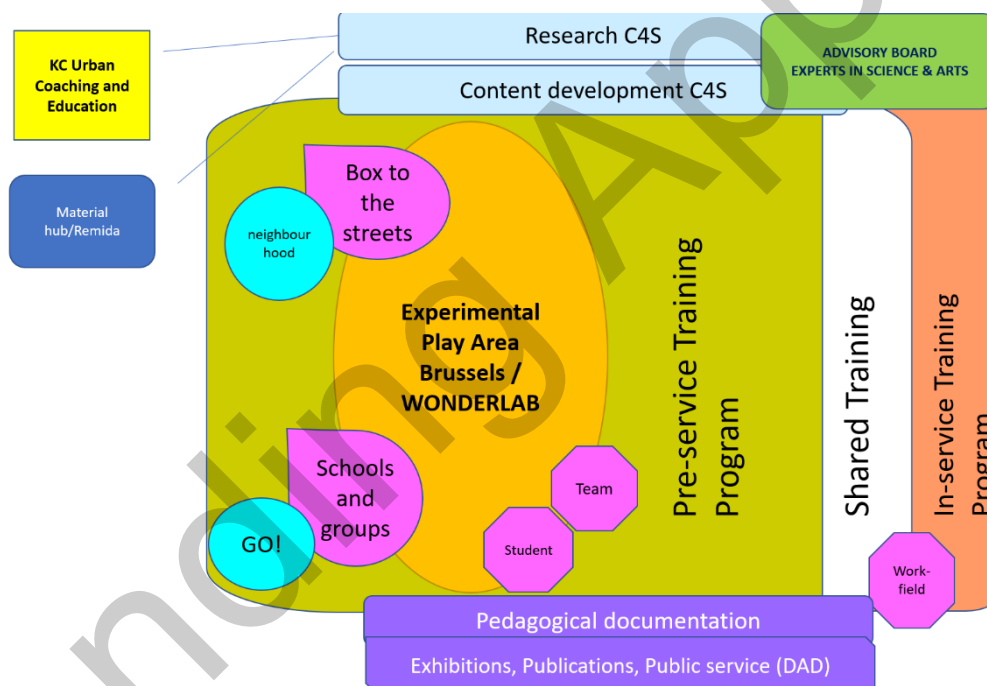


In collaboration with two schools we organized a pre-school take-over. During this day students (2nd year in the study program) got the chance to investigate the impact of materials on the play of children.

In the future we would like to set up a variant of this method and let students take the 'box to the streets' out into the neighbourhood or the schools. On these occasions they will replicate the method described above, but in open air and with children accompanied by parents or families instead of teachers.

At the end of our project, students with a particular interest in research and neighbourhood oriented activities act as project collaborators (internship based).

4.2.5. Schematic presentation



4.2.5. Consultative bodies and structures

In the Brussels Hub we will deploy several consultative bodies to ensure a smooth running of the Hub and a solid validity of the work.

Core team

The internal team at EHB. Responsible for the coordination of the Hub and living lab. Ideas and initiatives are presented and carried out by the design team.



Design team

Current and former students, teachers in the professional field in collaboration with team members charged with research and development. This team works closely with the core team. They reflect on the ideas of the core team, experiment with the ideas and give them feedback about the outcomes.

Advisory group

Experts on social diversity in society and representatives of various social and societal groups. This organ was informed by the core team about the initiatives in the project and ensured that social diversity and intersectionality is addressed. They were consulted on a regular basis.

Expert sounding board

Group of science experts. This group of experts were consulted on a regular basis by the core team

4.3 Theoretical framework and methods

4.3.1. Vision

The core of our STE_A_M approach is Artful. Art has an essential central role in our vision. Within our *holistic STEAM* story, “art” is at the heart. By art we do not mean the approach of traditional art education where the arts as disciplines are studied, explored and applied themselves. Art is the medium to move, to stimulate, to fascinate. It is a medium that evokes, evokes wonder, touches, arouses curiosity.

Teaching children to recognize the choices an artist or designer makes when portraying a subject helps children understand the concept that what they see may be someone's interpretation of reality. It breaks cultural, social and economic barriers. While art cannot really solve poverty or promote social justice on its own, it can be used as a level playing field for discourse and expression. The reason anyone can relate to art is that everyone has emotions and personal experiences. Therefore, anyone can learn to appreciate art, regardless of their social background, economic status or political affiliation. It is clear from the above that we encourage our students to go and do some research. We want them to realize an "artful steam approach" from a research attitude in this "playful science education or education in playful science" to let them explore the possibilities themselves.

4.3.2. Theoretical and conceptual framework

The final theoretical and conceptual framework was shaped during this project in consultation with all the partners (see 2.1). We see this as an ongoing process and find it import to always reflect critical on our framework and to make adjustments if necessary.

As mentioned in our vision artful is given an essential central role forms the framework / pillar / foundation. It is the core of our STE_A_M approach.



Art is *an impetus for further exploration and research*. Art as a medium for communicative expression, because the boundaries of our language are not the boundaries of our thinking. Art offers cross-language possibilities for communication and understanding, insight and knowledge acquisition. As a result of which we are able to visualize / materialize our thinking, learning process and insights in a different way than purely in verbal or linguistic thinking. Because we do want a connection with “the arts” in the sense that “art” is universal and that every individual is moved by art, we speak of an *artful approach*. It cannot be described precisely which criteria this artful approach must meet. It is precisely the power of the medium and of Arts that it cannot be described in definitions, that it transcends this ...Central are common multi-layered experiences; attention to sensitive and sensopathic experiences. Stimulating the senses. Our senses are stimulated, our wonder is aroused and we experience a total and personal touch that drives us to reflection and action. **In meeting and dialogue** we exchange these experiences and we enrich ourselves personally with impressions and expressions of others, whereby a new dimension reveals itself to us. We share a fascination from wonder and surprise. To achieve this it's important to stimulate cultural awareness among our students. As we live in an increasingly diverse society, the images of different groups in the media can also contain mixed messages. "When a child plays with toys that suggest a racist or sexist meaning, some of that meaning arises because of the aesthetics of the toy - the colour, shape, and texture of the hair," says Freedman.

4.3.3. Aims

One of the goals of the H2020 project is to make “playful science education” accessible to young children (2.5 to 6 years) and to develop conscious strategies to give vulnerable children and their families access to this specific game domain. In other words, our task is to look for a low-threshold approach that makes this “playful science education” accessible to groups that find their way to it less easily. With this Hub our mission is to train teachers to become counsellors who work on equal opportunities for all children. Brussels is a city with an enormously diverse population of which a large percentage of children grow up in underprivileged families (1/4) and where the school culture is far from the home situation. The multilingualism of the children is also a given in Brussels education; more than 80% of the children speak a language at home that differs from the school language (Dutch). Within this complex and challenging environment, the study program is looking for a training offering that delivers teachers who can tackle these challenges in a positive and powerful way. Within this project we focus on a range of play environments that are “steam based”, inspiring, creative, sustainable and not culturally bound.

How did you engage students?

Not only did we involve students in the classes we teach on SteAm and in the Wonderlab, but we also have students running as interns (Commitment to connection) in the workings of the core team. Here they are and were involved in the practical organization but also in the development of the framework. During the project students were actively involved in an ongoing literature study and intervision within the core team. (see 2.4 student participation)



4.3.4. Paradigm and methods of Hub

As mentioned in 3.1, 3.2 and 3.3 we used the creativity of “others” to stimulate our own creativity and to shape SteAm from there.

- o The impressions and stimuli are chosen in such a way that it creates astonishment, moves, fascinates and touches our total person.
- o It suits everyone's individuality, so it is open to interpretations.
- o It has an artistic component (again the indefinable) and can be linked with existing art movements and forms
- o The play object / material itself can surprise and encourage research and be the basis of inspiration.

With the above, we stimulate the creativity of the students / children to explore SteAm from there.

We also attach importance to common experiences because we want to help shape the socialization process within these games. Children learn from each other, as the Reggio pedagogy points out, they are an important educator in stimulating each other's growth process.

This also places demands on the way in which the space takes shape and the playing environment is set up. (e.g. when developing The Box)

4.3.5. Analyses of needs

As our Wonderlab is situated in the super divers and vibrant part of the Belgian capital. The target group of migrant children and families is consequently logical. Many of our students live in this neighbourhood and feel the need to explore and investigate themselves to experience the impact of materials and a pedagogical environment.

4.4. Day to day approach of the Hub

4.4.1. Partners

See also 4.2.1 partners.

An important external partner is also ‘Steunpunt Stem’. This is an organization of the University Association of VUB and EhB. They specialize in providing advice and hands on lesson packages about Stem-activities for secondary education and will expand their field of interest to science education for younger children.

4.4.2. Participants

Our primary participants will be our students and school children of the pre-schools of Brussels. At several moments the Wonderlab was also open to families.

Through working with children (from migrant backgrounds), we were also able to reach families and especially mothers and women. Families were also invited to the Wonderlab



and discover fun ways of interacting with every day materials in a playful and scientific way. Here we focus on a multiplier effect in a non-formal pedagogical setting.

We have reached the children of two pre-schools where students did the pre-school take-over.

To involve families from the neighbourhood more we plan to go with the box to the streets so they can take part in playful science activities and watch students mediate exploration, experimentation and discovery in a low-tech environment.

4.4.3. Collaborators and co-creators

see partners 4.2.1

One of our most important co-creators and critical friends are the children. They will help us develop and adjust the Hub. We expect them to give us insights and inspiration for new materials/activities through their play and their research.

Other important partners were the pre-schools we worked with in the Hub and in the pilot.

4.4.4. Day to day activities and outreach

Jan 2021 – April 2021: Material-box – Magnetism in 2 classes of preschool

March 2021 – May 2021: Steam with students – 4 play workshops with students

Scientific phenomena: balance, stability and height

Nov 2021: Chat parent group: postponed due to COVID-19

Nov 2021: Official ceremonial opening of the wonder lab

Dec 2021: Dissemination of Steam in the Ehb-team

Workshop for colleagues (teachers): Play with scientific phenomena: balance, stability and height.

Developing and deepening the Steam approach

Brainstorm Steam materials in the Wonderlab

Feb 2022 – June 2022: start up of the pilot: Steam sessions for students: theoretical sessions and practical sessions about the Steam vision and framework.

Feb 2022- May 2022: Steam with students from (or lead by) students: Peer teaching– 2 Play workshops Scientific phenomena: balance, stability and height

Feb 2022 - March 2022: Investigation and creative exploration for students. Steam in the different domains of art

Internship with focus on play and scientific phenomena in pre-school (2,6y- 6y)

23 Feb 2022: Play afternoon for children (and families) in our 'Wonderlab' Hub

23 Feb 2022: Introduction and play for students in our 'Wonderlab' Hub

Feb 2022 – June 2022: In course Commitment to connection

Strong female figures in science

Compiling a playbox with science materials

March 2022: Assembly of mentor-teachers

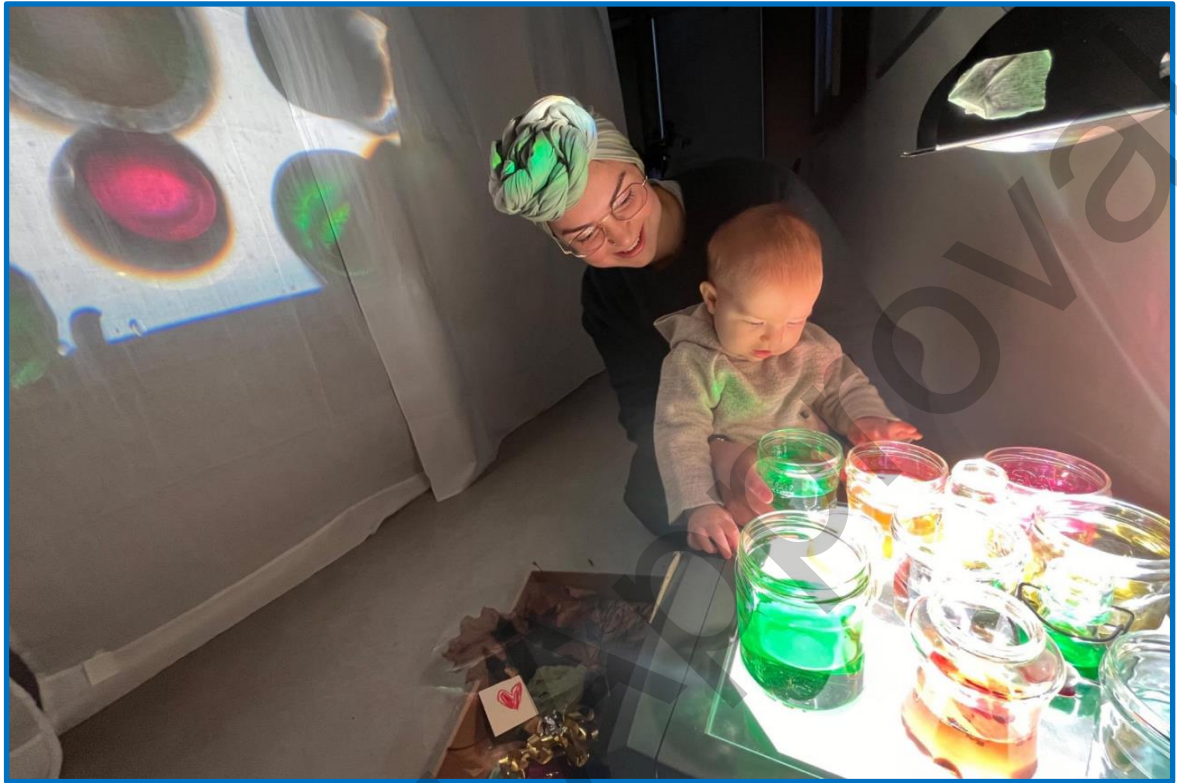


9 March 2022: chitchat parent group: short play session and discussion about play and science at school and at home from parents perspective
11 May 2022: Chitchat parent group@ the Wonderlab.
Sand is that science? Let's play!
Aug 2022: Directors of the GO! Schools visited our Wonderlab
Sept 2022: Pacheko pre-school visited and played in our Wonderlab
Oct. 2022: Pre-school teacher teams, Brede school -Buiten de lijntjes, visited and played in our Wonderlab
Nov 2022: Juliana pre-school visited and played in our Wonderlab
Dec 2022: Inspector General of the city of Brussels visited our Wonderlab
24 Feb 2023: Manresa-team visited and played in our Wonderlab
Feb 2023- March 2023: Investigation and creative exploration for students.
Steam in the different domains of art
Internship with focus on play and scientific phenomena in pre-school (2,6y- 6y)
17 Feb 2023 – 8 June 2023: Assembly of mentor-teachers to implement STEAM in the last internship
15 March 2023: Chitchat focus group
17 March 2023 and 25/4: Introduction in play for 1st year students in our 'Wonderlab' Hub
21 March 2023: Research for 2nd year students:
investigation materials and Pre-school take-over
24 March 2023: Meeting with Dox (firm to make adjustable furniture) for the Wonderlab
27 March 2023: Erasmus Steam+ project partners visited and played in our Wonderlab
27 April 2023: Assembly of mentor-teachers to introduce the STEAM internship

4.4.5. Photos, Links

<https://www.erasmushogeschool.be/nl/ehblog/horizon-2020>









4.5. Reflection

4.5.1. Challenges and risks

- Setting up a diverse advisory board and a diverse group of science experts to maintain a broad view.
- Reaching and inviting children and families to the Wonderlab to let them explore playful science education.



- To put together a well-thought-out range of materials per phenomenon
- To gain the trust of families in order to invite them to the Wonderlab, so that they could explore different phenomena themselves

4.5.2. Main findings or discussion points

- Throughout the project, we saw a change in families' view towards the place of science in the daily lives of their young children. Thanks to the workshops we held with parents, they gained knowledge and understanding that science shows itself in many areas. As a result, we dare to conclude that knowledge of what science is and confidence in one's own understanding are important factors in getting parents to come along. The growth in self-confidence we saw in the families also had a positive effect in the parents' offering science to their children.

- We also saw positive progress among students. By offering it hands-on with them too, letting them discover materials themselves, letting them name what they had discovered and researched, documenting this pedagogically. After having them try the same with the children, they too gained more insight and confidence that playful science education is an added value in the classroom and by extension in the lives of young children.

-The overall finding we have is that for children to experience science, there needs to be a well thought-out range of materials. And for children to explore further in depth, there does need to be a knowledge and understanding on the part of the facilitator. So that he or she not only sees the added value of science but can also make targeted adjustments to the offer in order to allow children to fully explore different phenomena. The facilitator certainly does not have to be a scientist but an important criteria is that they themselves discover and investigate the phenomena and remain open to exploration of different materials that can contribute to the deeper exploration of the phenomenon

4.5.3. Implications on practice or policy

To ensure that schools offer science to young children, it is important that they are supported by policy. By giving them opportunities to discover and investigate phenomena themselves. Investing in professionalising teachers requires space and time within their task load. If teachers are more confident in how to offer science playfully, they will be able to reach parents more quickly by involving them in the play and investigation of the children.

4.6. Recent evolutions and adaptations

4.6.1. Evolution – major changes

We adjusted, during the project, our approach towards inviting families and children to our Wonderlab.



We found that it was important to first gain the trust of the families in their familiar environment, the school, before they could take the step to the Wonderlab. Therefore we went several times to the chitchat group at the school and played with the parents at their own school.

When we gained their trust, they were curious to come over to visit and play in the Wonderlab. Because logistical it is not always easy for schools to come over to the Wonderlab with the children, our students did a 'school take-over'. They went to the school and introduced playful science education with the youngest children (2,5y- 5y) by taking over the school.

4.6.2. Inclusive aspect

We want to be inclusive:

- by making a play area for science education that is accessible for our students and for families of the neighbourhood.
- by choosing the play materials very carefully, e.g. the materials have to be accessible for everyone.

We focus on our students and their families. A certain amount of student are also parents of young children. Therefore, we've invited them to our Wonderlab. To play together with their child(ren) and discover science in a different way. Students were very positive about our approach and thanks to this initiative other student were also enthusiastic to come and play next time with children they know.

Yet we struggle with the accessibility towards other families in the neighbourhood (who are not related to our students) With the help of a member in our advisory group we were introduced to a chit chat (parents)group in a school. The parents were invited in their own well-known environment (the school of their children) and got an introduction by play in the different scientific phenomena. This way they could get acquainted with our vision on play and our 'Wonderlab' in order to reduce the barriers of coming into our University and to enter our Wonderlab with their children. In May we played with the parents in our Wonderlab.

We consult our advisory board on a regular basis on how to reduce the barriers and how to get an easier contact and connection with the families.



5 Manresa-Vic C4S HUB

5.1. General presentation (and origin of the Hub)

Manresa:

This Hub departed from the expertise of the *Lab 0_6: Discovery, Research and Documentation Centre for Science Education in Early Childhood* and the GRECC Research Group (Knowledge Construction Research Group; Previously named as GRENEA Research Group - Research group in Education, Neuroscience, Experimentation and Learning). GRECC aims to deepen the understanding of how knowledge is constructed in different learning contexts, to identify key aspects related to the design of educational practices and how they shape knowledge production models that guarantee the democratization of education in the broadest sense and diversity. GRECC focuses its research on the construction of knowledge both in areas of specific knowledge, such as science, mathematics, artistic expressions, history or geography, but also in more transversal areas of knowledge such as educational technology or sustainability, among others. This research group focuses in four distinct research lines, one of them focused upon *science spaces and inclusiveness in the construction of knowledge*, managed by the PI of the C4S project, Gabriel Lemkow.

This line of research “*Science spaces and inclusiveness in the construction of knowledge*” provides expertise in topics about science education in early childhood from an inclusive standpoint. The Early Childhood Education Department, has also provided advise in the co-design of a diversity of science spaces in museums (such as the *Explora 0_6* space in the Science and Technology Museum of Catalonia MNACTEC, the *Science Nest* in the Blue Museum of the Natural Science in Barcelona and a science space for a temporary exhibition about childbirth in the Museum of Manresa).

The *Lab 0_6: Centre for discovery, research and documentation for science education at an early age* is a science space for children aged 0 to 6 years and is located within the university of Manresa premises, with the aim of providing a science equipment for schools and families and also as a pedagogical resource for university students and researchers to learn about children’s enquiries and learning processes. This space is designed as a free-choice space where children decide on their own where to go and what to do with the different science proposals aimed at developing different scientific procedures and to learn from different science phenomena. The Lab 0_6 allowed thus to dynamize the territory and provide new ideas to school and nursery educators on how to promote science education activities.

Given previous experiences of involving local schools as well as institutions such as museums and associations working towards the promotion of diversity and inclusion, through the expertise of the Lab0_6 educators and researchers, this Hub departs from such framework to strengthen and interconnect the different initiatives towards the aim of establishing Community Living Labs in different spaces. Also, to connect with the local interests and needs from the involved communities and institutions.



Regarding the internal Hub relations, Fundació Universitària del Bages (FUB) was, since 2014, federated with Fundació Universitària Balmes (UVic), also a partner of the project. The resulting federated institution is the University of Vic - Central University of Catalonia (UVic-UCC), with a Campus located in Vic (UVic) and a Campus located in Manresa (FUB). The reason of being two different partners of the C4S is the federative principle from which each one the federative entities preserve their own juridical personality, heritage and responsibility. FUB and UVic will work closely and provide mutual support when necessary. Due to this close relationship with UVic, these two institutions will form a dual Hub based, respectively, in Manresa and Vic with the aim of working with the immigrant communities. The Hub will be coordinated by FUB. Manresa and Vic are very diverse cities with a high percentage of migrant population. Given the aim of the C4S project the Hub will focus especially upon those neighbourhoods and schools with more migrant population and trying to provide tools that allow the local communities to intersect and relate to their local realities of the two cities. The aim is to make visible how these communities are also very active in the promotion of the local initiatives and cultural life and to be able to interconnect children from different schools and education initiatives so that they can know and support one another in their science activities and ideas.

FUB intervened in Manresa through the expertise of the Lab 0_6 and the GRECC research group in collaboration with different city institutions and local schools.

In the Campus Vic, the research group of ISAMBES (Innovation in Mental Health and Social Innovation research group) and the Early Childhood Department, intervened as well in the city of Vic with their local schools and associations to promote an inclusive science education adapted to the reality of this city. The specific collaborations and interventions in both Manresa and Vic are described below in detail.-

The aim of the project is to engage the children's groups and their surrounding communities in creating and boosting real living labs with a real impact in the territories of Vic and Manresa.

5.2. Structure

5.2.1. Partners

Consolidated partners (Manresa):

Manresa Schools involved in C4S activities:

Valldaura School (Pilot Community Living Lab)

Oms I de Prat School (Working group member)

Bages School (Working group member)

Muntanya del Drac School (Working group member)

Manresa local entities:

NANA family space (Working group member)



Dones Al-Noor (Working group member)
Museum of Manresa
Museo de la Técnica de Terrasa.

Manresa local institutions:

Manresa City Council.

Advisory Board

A board of specialists in diversity, migration, Roma communities, gender and disabilities was built up in which also specialists members of these communities participated in some of the main C4S activities and initiatives. According to the needs of the project the advisors were consulted to take in account the social diversity in society and especially in science and education areas/initiatives. Some of the local C4S initiatives in which AB members participated as experts, co-coordinators and lecturers were:

- 1st and 2nd National Conference on Inclusive Science Education
- Working Groups on Inclusive Science Education (2020-21)
- Working Group "Son Inclusive Science Education from Research-Action (2022-23).
- Workshop "Inclusive Science Communication".
- 2 coordinating Interinstitutional working groups with Policy-makers and experts institutions experts in science education.
- Members of the Scientific Committee of the 1st Internacional Conference "Science since Birth" organised in Manresa-FUB.

Other National Institutions

CESIRE, Institution for Pedagogical support of educators in Catalonia (Interinstitutional working groups)
STEAMCat Project, Dept of Education – Catalan Government Interinstitutional working groups

International Institutions

UNESCO center Andalucía (Granada).

Consolidated partners (Vic):

Schools:

Preschool Dr. Joaquim Salarich, Vic.
Preschool Josep-Maria Xandri, St Pere de Torellò.
Primary School (Dominiques Vic -Santa Caterina).

Vic Local entities:

ATB (Aula Teresa Buscart-LAB for Training and Research in ECEC), Vic
Municipal Family Centre El Remei, Vic

Vic Local Institutions.

Vic City Council (Department of Education).



5.2.2. Living lab(s)

Manresa

- The Riverside Living Lab and its surroundings (Valldaura School)
- Public Allotments (Oms I de Prat School)
- Free-choice Science space (Nana family space)
- School Playground Lab (Bages school)

Vic

- ATB (Aula Teresa Buscart-LAB for Training and Research in ECEC), (Vic)
- Dominiques, Vic (Santa Caterina) Primary School (Vic).

5.2.3. Team

Manresa:

Maria Lluïsa (Research Office)

Miryam Navarro (Researcher)

Gabriel Lemkow (Early Childhood Education Researcher)

Montserrat Pedreira (Director of Lab 0_6, BA and member of Research group)

Judit Onsés (visiting researcher)

Lyudmylla Kokorina (Researcher)

Vic:

Salvador Simó (ISAMBES) Research group coordinator, Adjunct Director Mental Health Chair)

Mireia Canals (Primary Education)

Gabriela Galván (researcher, both primary & early childhood stages)

Francesca Davoli (Early Childhood Education & Care)

Berta Vila (Early Childhood Education & Care)

Marta Camps (Early Childhood Education & Care)

Mariana Piccioli (University of Firenze & UVic-UCC researcher)

Nestor Aparicio (Occupational therapist UVIC-UCC Ph.D. Student)

5.2.4. Student participation (if applicable)

University students:

Manresa:

Manresa-FUB students collaborated with UNESCO-Andalucia Centre, through the exhibition about 35 years after Chernobyl catastrophe (environmental issues, science, forced migration, working with children with disabilities...). Also, BA students were invited to participate in the International Conference about Science Education in Early Childhood “Science since Birth” (which had a specific research line about Inclusive Science Education) organised by Manresa-FUB.



FUB Students also collaborated in developing ideas for the local Museum ([Museu Comarcal de Manresa](#)) with the aim to develop a Living Lab based on Archaeology and Engineering, Ideas for this Lab were initially developed by Manresa C4S team to work on the extension of the *Lab0-6* and were handed afterwards to BA students to further develop the specific proposals for this future space in the Museum . This activity in working progress, has been extended during the 2021-2022 and 2022-2023 courses with students from the Early Childhood Education degree through a transversal course based in developing local projects named I “[Integrative Actions](#)” by conducting STEAM activities with children in the local Museum of Manresa.

During the academic course 2023-24 BA students also are taught issues on Inclusive Science Education in the BA course “[Didactics of Environmental Knowledge II](#)”.

In addition to this, a student was invited to participate in the Workshop about “Inclusive Science Communication” due to her active work with deaf people and hence her expertise was very much valued during this workshop

5.2.5. Schematic presentation

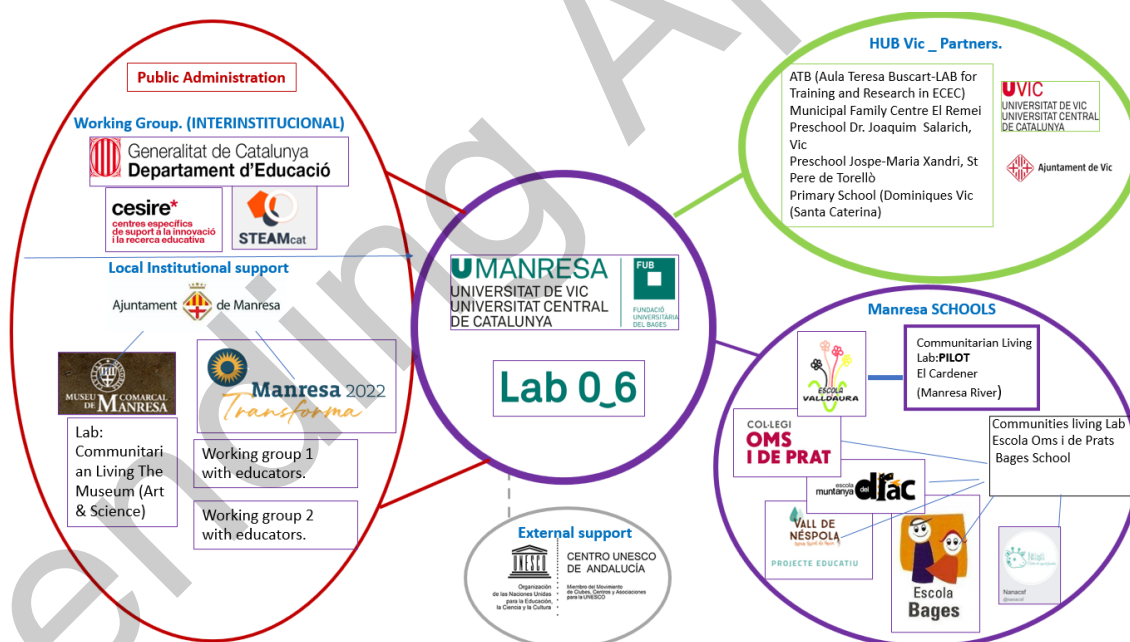


Figure 10 - Hub Manresa-Vic schematic presentation

5.2.6. Consultative bodies and structures

Manresa:

- 4 Working groups addressed to teachers & nursery educators:

2020-2021:

- Inclusive science education



2021-2022:

- Inclusive science education (online, in collaboration with UVic)
- Science from co-participation and community

2022-2023:

- Inclusive Scientific Education from Research-Action

- **2 Interinstitutional Coordinating Working groups** with policymakers and experts (with Dept of Education – Catalan Government & CESIRE, members of the C4S Advisory Board & other collaborators)
 - **2020-21:** coordination of pedagogical materials and preparation of the 1st National Conference on Inclusive Science Education
 - **2021-22:** coordination of pedagogical materials and preparation of the 2nd National Conference on Inclusive Science Education

2022-23: Coordination of the Research Line on “Inclusive Science Education” for the 1st International Conference on Science Didactics in Early Childhood “[Science since Birth](#)”. C4S Advisory Board Members also participated as members of the Scientific Committee

The new [GRECC](#) Research Group from UManresa has a new line of specialisation about “Inclusive Science Education”

Vic:

- **1 working group** addressed to teachers & nursery educators (0 to 6)
- **1 coordination group** composed by experts in the fields of Education, Science & Inclusion

5.3. Theoretical framework and methods

5.3.1. Vision:

To promote an intercultural approach in Manresa & Vic Cities, especially considering their diversity and their role as active industrial cities (in the past & the present), the aim was to create spaces for intercommunication between communities (children, teachers, families) and the associative world through science activities. Also, to make all citizens (including migrant citizens) visible as active positive actors for the city cultural life.

5.3.2. Theoretical and conceptual framework

The Catalan Hub of Manresa-Vic departed from the pedagogical innovations promoted and studied in their respective departments and Research groups, especially those undertaken in the pedagogical spaces ATB Aula Teresa Buscart (UVic) and Lab 0_6 (Manresa-FUB). Previous research undertaken by the GRENEA research group shows how promoting hands-on activities through enquiry processes with open-ended and natural materials is a very important and valuable resource for children to allow them to explore and discover new phenomena by themselves, especially through free-choice enquiries and active approaches. Children like to explore their



surrounding environments and when they require or when having endogenous interest of their own, they try to solve problems and find solutions (and explanations) by themselves and through the support of their peers and adults. The spaces for discovery should be well-managed and designed by adults so that children can explore freely but also with an intentionality behind that promotes or facilitates those certain types of activities or phenomena occur. Engaging children in these enquiry process, both individually and in peer-groups, allows also promoting in children decision-making and communicative interventions with a real impact in terms of their learning processes and also in terms of the implementation of changes.

5.3.3. Aims

The Catalan Hub of Manresa and Vic aimed to promote the active engagement with members of the communities in vulnerable risk situation to participate and to make our Hub more plural and diverse and allow real participation to all actors. It also aimed to promote more awareness about the importance of diversity and the active role of migrants through other university initiatives (through courses addressed to educators/teachers and also to BA students). In all cases an intersectional and gender equity approach were considered as priority by providing visibility, through different initiatives, to women experts and / or scientists (e.g., as advisors and also as speakers for the conference events) or by recommending books for children and educators with a gender equity approach either in the working groups or in the social networks. In addition to this, the SAMiS group, located in Vic site aimed to promote inclusive science education activities to children from deprived neighborhoods via the engagement of technological and digital competences to avoid their future social and economic exclusion and provide them opportunities through a process of scientific literacy.

How did you engage students?

The Manresa site proposed a teacher from the BA in Early Childhood Education to ask students do some creative work with children around the 35 years after the catastrophe of Chernobyl. The aim was not only to do a pedagogical work with children but also to provide support to an exhibition organised by UNESCO Granada that took place in several cities around Spain. Students also were engaged by participating in the International Conference about Science Education in Early Childhood “Science Since Birth” (with a specific line on Inclusive Science Education), in the Workshop about Inclusive Science Communication and also in the BA course about “Didactics of Environmental Knowledge II”. Students also proposed Inclusive Science Education Activities through STEAM science Proposals with an Inclusive Approach for the local museum of Manresa (Museu Comarcal de Manresa).

In the Vic site, students from the subject Community based Occupational therapy participated in the C4S project via Service-Learning methodologies at UVic.

5.3.4. Paradigm and methods of Hub



The Manresa site was based on the *Lab 0_6: Center for discovery, research and documentation for science education at an early age* is a free-choice & hands on space (based on Reggio Emilia approach and experts from science didactics as well, such as Wynne Harlen, Deanna Kuhn or Osborne), to promote activities in children based on their own interests and autonomy.

In UVic, also the model of reference, was inspired from the Reggio Emilia approach and has the creative & pedagogical spaces for applied didactics *Teresa Buscart classroom* and *Montessori classroom* in their settings in order to develop science activities in children (based on their endogenous interests and specific pedagogical materials).

In both sites from the Catalan Hub the aim was to provide children and families from vulnerable communities with new Science education and inclusion skills and awareness, STEAM skills and competences related to science and technology play also a relevant role for the ISAMBES group as a pre-emptive measure against their futures social and economic exclusion.

5.3.5. Analyses of needs

Note here if and how you performed an analyse of needs. And the results

Manresa and Vic are two cities with a high percentage of migration and also with neighbourhoods with particular needs that ought to be covered and taken into account to avoid their social and economic exclusion. There are several communities in special risk of vulnerability (specially population arriving from Magreb) and some schools are in special need of support given the high number of children from low economic and/or migrant background that they have. In both communities we can identify a structural unemployment and high rates of poverty. It is necessary create tools and at the same time extreme right movement has arisen during the last years, especially in Vic.

In Manresa Hub, case, the living lab really arrive to introduce what Inclusive science education is, to educators, schools a policy-makers. It had a real impact to the territory and a nice direct return to the city. The River-Lad Valldaura school create a publication made by the kids to communicate the community and to the city the diversity of tree they have next to the river. All the citizen can walk and consulta a PDF with the draws and explanation of the tree's characteristics. This lab conned the kids, the school, the families and the policimakers; and contribute to open a non-so visited area and give a new meaning as a new green part of the city to discover.

It is necessary to developed more and better strategies to arrive to the families with migrant background, with sociocultural diversity and living in precarity and low income to undertint their reality, motivations and barriers. We need to understand how the families could be more linked to the inclusive science education activities , not only our approach to them, but our way also to communicate too. That way we could include their knowledge and values to the community activities.

5.3 Day to day approach of the Hub

5.4.1. Partners

Manresa:



- Department of Education (Catalan Government). Project STEAMCat : collaboration in the Interinstitutional Coordination Working Group on ISE
 - CESIRE-SEDEC: collaboration in the Interinstitutional Coordination Working Group on ISE
 - UNESCO Granada: collaboration with the3Exhibition about the 35 years of the Chernobyl Catastrophe
 - Museum of Manresa: Collaboration in the design of ideas for a future STEAM living lab about Archaeology and Engineering
 - Valldaura School: Community Living Lab in the Riverside of Manresa, Pilot research activities
 - NANA family space (Manresa): assessment in the Creation of a Community Living Lab in collaboration with Maghreb families and their children
 - individual social actors from different communities in vulnerable risk situation providing advice and/or training in different local C4S initiatives
 - Research group GRAFO: of vulnerable situation from Autònoma University of Barcelona: organisation of meetings to exchange ideas and initiatives
 - Association “Black Women who changed the World” : Coordination of the Workshop about “Inclusive Science Communication”.
 - Manresa 2022 initiative (organised by Manresa City Council). Gave support in the development of 2 Working Groups on Inclusive Science Education (2021-22 & 2022-23), a lifelong course addressed to teachers and educators.
- Vic:
- University of Florence (Italy) / Ongoing Consultancy
 - Scuola dell’Infanzia Valdibrana (Pistoia, Italy) / Cooperation in the Field of ECEC Investigation with University Students (Florence & Vic).
 - Col·legi Oficial de Teràpia Ocupacional de Catalunya.
 - Municipal Family Centre El Remei, Vic
 - Preschool Dr. Joaquim Salarich, Vic
 - Preschool Josep-Maria Xandri, St Pere de Torellò
 - Primary School (Dominiques Vic-Santa Caterina)

5.3.2 Participants

Manresa:

Children & families & educators from schools involved in the Working Groups about Inclusive Science Education (Oms I de Prat, Valldaura, Nana Family Space, La Muntanya del Drac School, Bages School, Vall de Nèspola School), also Manresa Museum was involved in initiatives to progressively co-create a Lab STEAM space about Archaeology and Engineering with an inclusive approach. Also scientists and experts from a diversity of backgrounds collaborating at a local level (in the Working Groups, in the 2 National Conference Events about ISE and in the International Conference “Science since Birth”).

Vic:

Children, educators & families from schools involved (Municipal Family Centre El Remei, Preschool Dr. Joaquim Salarich, Preschool Josep-Maria Xandri, St Pere de Torellò); as well as university students and professors. Lab at Dominiques (Santa Caterina) School in Vic, based in



empowerment philosophy, meaningful occupations as the soul of the intervention and learning by doing methodologies. Ensuring universal access to STEAM learning.

5.3.3 collaborators and co-creators

Members of the communities that are actively working in science

Experts in science education

Experts in issues related to cultural diversity

Experts in issues related to functional diversity (SEN / disability), Cultural & disabilities studies.

Institution representatives giving support (and/or boosting) the initiatives around Inclusive Science Education

Experts in human occupation.

Experts in migrations.

Experts in inclusive education.

How did you engage students?

Manresa

FUB proposed a teacher from the BA to ask students do some creative work around the 35 years after the catastrophe of Chernobyl so that they could promote awareness to children about the historical event that created new vulnerable groups due to a crisis involving technological and scientific devices. Also, to provide support to an exhibition organised by UNESCO Andalucía (Granada) that took place in several cities around Spain. Students also participated as public in the International Conference of Science Education in Early Childhood “Science since Birth” (which had a specific line on Inclusive Science Education”, also with Inclusive Science Education proposals for Manresa’s Museum through the course “Integrative Actions” from the BA in Early Childhood Education”. During the course 2023-24 a new module is added in the course about “Didactics of Environmental Knowledge II” about Inclusive Science Education.

Vic:

UVic has two students engaged in Valdibranza Preschool (Pistoia, Italy) for a Final Degree Research and an ECEC Erasmus Placement/Internship for the investigation related to the project C4S.

5.3.4 Day to day activities and outreach

- **Manresa:**
 - Teacher training activities for educators
 - 4 Working groups for teachers & educators (on site and online) Providing external assessment to teachers & schools
- **Organisation of National Conferences:** 2 National Conferences on ISE were organised.



1. International Conferences: an International Conference about Science Education in Early Childhood "[Science since Birth](#)" (with a specific line of research on "Inclusive Science Education") was organised
 - Coordinating activities with other institutions (Manresa Museum, STEAMCat project, Science and Technology National Museum in Terrassa city...) including relevant social actors from these communities, and/or science experts
 - International and National Workshops: Critical image analysis of inclusive science education in media; Workshop about "Inclusive Science Communication" addressed to Journalists and expert communicators.
 - Dissemination and Communication activities: pedagogical materials accessible for free were uploaded in the C4S website and in the Social Networks for the [1st](#) and [2nd](#) national Conferences on ISE, other forms of dissemination were promoted such as coordinating a Monograph on ISE topics for a Catalan Journal addressed to educators, periodical publishing of articles about ISE issues in a Catalan e-magazine about social issues ([Social.Cat](#)), and publication of a [Riverside Guide made by the Children of Vallldaura School](#)
2. **Periodical involvement of local teachers and BA students:** the [2 working groups](#) (one on-site and another online- 2nd edition) allowed to reach teachers at local level (Manresa) and at a larger level (territory of central Catalonia). Also the BA students of Manresa, through the project on the 35 years after the Chernobyl Catastrophe reached children from different local schools and associations.
 - Conducting periodical meetings with relevant social actors from these communities, and/or science experts
 - Coordinating activities with other institutions (Manresa Museum, STEAMCat project, Science and Technology National Museum in Terrassa city...)

International and National Workshop: Critical image analysis of inclusive science education in media; Local Workshop – Critical image analysis of inclusive science education in media

Vic:

- Meetings among the participants to the research group (teachers, educators, researchers)
- 1 working group for teachers, educators and researchers
- Training sessions for the people involved in the project
- Coordinating activities among the participants (ECEC) and the institutions involved

5.3.5 Best practices

Manresa:

- Creating a Living Lab with Vallldaura School in the **natural environment of the River** (explore plants, do a herbarium plant a garden for butterflies, create a document with



flora & fauna made by the children) . During the course 2022-23 a Guide about the Riverside trees was published presenting the botanical work made by the children. The booklet was distributed for free to Valldaura School families, and also to all Manresa's School, Manresa's Public Libraries and also those schools beyond Manresa city that also have some connection with the Cardener River. Also flyers were designed with a QR code that links to the [online version of the Booklet](#) so that anyone can download it for free in his/her mobile phone while visiting the Cardener riverside.

- Creating a Community Living Lab inside Nana's **family space** specialised in attending families from vulnerable and migrant backgrounds
- June 2022: 1st Children's Conference Event Day (online) "Children do science too!": Kids (5-6 years old) share their learnings about inclusive science education by presenting their science work undertaken during the year through the assessment provided in the Working Group on Inclusive Science Education to educators from diferents schools from Manresa city.
- Periodical publications in a Catalan online magazine (Social.cat) about issues related to the C4S project. The articles were written together with the coparticipation of a person with cerebral paralysis who is also activist and writer of children's books
- Develop ideas and activities for a **Living Lab in the museum** that connects activities of science and art (archaeological sites, restoration processes of artworks, curating historical materials, etc.) with the participation of BA students from the Early Childhood Education Degree
- Lifelong training courses/working groups/National Conferences co-coordinatedw ith members of the C4S target communities (who also were invited as lecturers), to train educators from schools in Manresa city and surrounding territory on inclusive Science Education. Schools implement changes during the sessions towards science and inclusion and report their findings/improvements to the group.
- Creating and disseminating didactics materials with positives referents and experts from the communities targets of the project.
- **2 National Conferences addressed to Educators and teachers with impact at a local level.**
 - 15th May, 2021. Science education to the local communities, policymakers, institutions professionals of science, inclusion and education. The following experts members of communities in vulnerability risk situation participated as lecturers in these events:
 - Main conferences: Science for and for all: facilitating the scientific participation of vulnerable groups, by Andrea Khalfaoui, PhD in Education and postdoctoral researcher at the University of Deusto.
 - Fátima Dalmau, teacher at Camins school (Banyoles): Promoting contexts and practices in the classroom to build meaningful scientific knowledge.
 - Jerry Tchadie, director of Research and History, Investigative and trainer in Didactics of Experimental Sciences at the CTIF: Mathematics through African designs.
 - Cristina Oliveros Masakoy, Primary Education teacher at the Arc Iris school and expert in education, inequalities and minorities, and Gabriel Lemkow, teacher of the Master's degree in Early Childhood Education, IP of the H2020 "Communities for Sciences" project: Discovering childhood the world: learning science from diversity.
 - Ramon Coma, ONCE support teacher and coordinator of science specialists: Science, a subject of particular difficulty for blind and visually impaired children.



- Carles València and Carme Mesalles from the Parc de l'Aigua School: Art as an engine of science.
- Nona Aixalà Gelonch and Helena Aznar Barrera of the Escola Magraners Institute: Why are we still talking about inclusion?
- Gisela Farnós Pallarés and Helena Borràs Ten from the ZER Font de l'Aiguadí-Ginestar: Inclusive science in a rural context
- Fátima García, former director of the special education center "Manuel López Navalón", PhD in Didactics and Educational Organization, expert in communicative competence and functional diversity and author of the blog "Discapacitados": Más de cinco sentidos para aprender.
 - Roundtable with local educators, policy makers and communities background experts: a) Center for Specific Pedagogical Resources to Support Innovation and Educational Research (CESIRE); b) Special education teacher at the Llebeig school in Vilanova i la Geltrú and inclusive education trainer (FEI-BCO) of the Department of Education of the Generalitat de Catalunya; c) Primary Education teacher, journalist and writer; d) Health expert, Nursing student, Afro-activist and coordinator of the Black African and Afro-descendant Community of the Spanish State in Euskadi.
 - Dissemination of information through the C4S Social Networks and Website about Inclusive Science Education Didactics Materials (children's books) and also of videos related to Inclusive science (interviews to scientists members of communities in vulnerability risk situation, or other videos with related topics about ISE issues).
- International Conference with the participation of members of C4S target groups: Members of the Advisory Board (AB) who are also members of communities in vulnerability risk situation, were part of the Scientific Committee and Honour Committee. A specific Line of Research on Inclusive Science Education was developed and a Round Table about this topics was also conducted as well, with C4S researchers, and other experts members of communities in vulnerability risk situation.

Vic:

- Creating a Living Lab at **ATB (Lab)** for children and family to explore play materials and Montessori Material
- Involving Families attending the **Space for Families El Remei** for visiting and experience the ATB Lab with their children
- Getting University students engaged with the project (both for **Final Degree Report & Internship/Erasmus Placement**)
- Fostering scientific/STEAM Research on **Digital 3D printings** (Primary stage)
- Involving children, educators and families from **pedagogical initiatives** in La Sinia school project. Congost school project. And Dominques-Vic School (Santa Caterina)



5.3.6 Photos, Links

Manresa:

- Lab 0_6: [Lab-06 | UManresa](#)
- Lab 0_6: [Lab 0_6 - Aprendre Ciència des del néixer](#) - Bing video (optional: **with subtitles in english**)
- Lab on wheels project: [Lab 0_6 sobre rodes](#) - YouTube
- Space Explora 0_6 (MNACTEC): [Explora 0-6 - Museu de la Ciència i de la Tècnica de Catalunya \(mnactec.cat\)](#)
- Video Promo of Space Explora 0_6 (MNACTEC): [Espai Explora 0-6](#) - YouTube
- Experimentation Fair for children: [9a Fira d'Experimentació per a infants de 0 a 6 anys](#) - YouTube

Vic:

ATB Lab

- <https://mon.uvic.cat/u360/espais-i-equipaments/laboratoris/aula-teresa-buscart-laboratori-deducacio-infantil/>
- <https://www.youtube.com/watch?v=oPuStegNtVg>
- <https://www.youtube.com/watch?v=kM3OqWGM4j4>

5.4 Reflection

5.5.1. Challenges and risks

What challenges or risks did you take into account when rolling out your Hub?

- To challenge the main idea of migration in Manresa as a passive reality
- To create new neighbourhood dynamics and make visible what the communities are actively doing as part of the city activities
- To adapt activities for a transcultural audience.
- To tighten the relations between the different neighbourhoods and collaborate with the museum as a nexus between communities
- To create more awareness in the city governments about the social actors from these communities
- To ensure economic sustainability for the project.
- To accomplish long term impact.
- To ensure to empower teachers and students.

Risks: Lack of support, barriers (bureaucratic barriers or lack of institutional interest, COVID-19 lockdowns), lack of participation of members of communities as co-designers, schools or educators leaving the project due to COVID-19 (or other reasons...)

5.5.3. Main findings or discussion points

What are your main findings and discussion points during the project?

Schools and educators seemed to be very interested (more than expected) in the project as such and project ideas. There were difficulties for educators to conduct their daily activities with normalcy due to COVID19. We also explored ways to engage educators & children with their local neighbourhoods and communities. We stressed the relevance of incorporating a plurality of



voices and co-designers from these communities in the project to make it coherent with its values of celebrating diversity as a richness and promote inclusion not only outside but also inside the core-group of decision-makers.

Students and teachers were highly motivated.

5.5.4. Implications on practice or policy

What implications or influences do you see for practice or policy-makers?

Involving schools and educators from a larger territory. Promote some trainings about inclusion for local technicians from city council or policy-makers, promote changes in local realities, making more accessible to visibility and voice of social actors from communities in vulnerability risk situation, ...

To work directly with policy makers.

Changing the perspective, within the city of Manresa, about what children can do to improve the city life, with the publication of a Guide about the Riverside Trees, made by the children themselves and available for free (in paper and online). . During the pilot undertaken in Valldaura School children have directly addressed specific demands and queries to the City Council, which responded promptly. This is relevant to show how children can engage in an active citizenship if there are adequate channels of communication with policy makers with the work of mediators (the teachers from the school acted as mediators with the city council)

5.6 Recent evolutions and adaptations

5.6.1. Evolution – major changes

The Catalan Hub of Manresa-Vic has been evolving in coherence with the new occurring needs and possibilities of the local contexts. While initially the aim was to configure, from scratch, a network of institutions and social actors, there was much effort to provide an individualised assessment to these newly added institutions. In this sense new ideas and training opportunities were provided to educators on how to approach science to children from the target groups. In a second period in which the aim was to consolidate these networks and prepare the settings for the pilot, a different approach was implemented, based in providing common courses for all educators and teachers at different schools. This allowed to attend together, in the same trainings, teachers from different schools at the same time, allowing establishing personal and professional interconnections between them while also making possible a more consistent course programme with more solid basis on science and didactic strategies for all.

Also, the internal coordination of this Hub with 2 local sites evolved to make their respective work functional, as well as coherent, between them. Initially each city (Manresa and Vic) established their own networks and activities. For the sake of a major internal coherence and sharing of useful experiences, more solid channels of communication and professional interconnections were established: On the one hand a monthly meeting was set to share ideas, doubts, initiatives etc between members of Manresa and Vic universities (as members of the same Hub). On the other hand, a Working group on Inclusive Science Education (online) addressed to educators and teachers as co-participated by members of both the universities in Manresa and Vic. The latter



increased the mutual collaboration and exchange of experiences from both Hubs and reinforced their mutual collaborations.

5.6.2. Inclusive aspect

The four working groups addressed to educators were offered to provide tools to educators and teachers on how to detect non-inclusive aspects in science education (e.g., sexism or racism in science communication, pedagogical tools...). Also to promote more inclusive approaches (e.g., by discussing about inclusive strategies, pedagogical resources, etc.). Also, in three of these working groups the facilitators were from a diversity of backgrounds (including members of communities in risk of vulnerability) which helped providing a wider and more inclusive view of science education to the teachers assisting to the sessions. Also 2 National Conferences on Inclusive Science Education, with the support of the Catalan Government (Generalitat de Catalunya) were organised, with speakers from different areas of expertise and backgrounds, including among them, scientists or educators from communities in risk of vulnerability. This also allowed offering and making visible new plural referents in science and pedagogy to educators and teachers. In the International Conference about Science Education “Science since Birth” (with a specific research line on “Inclusive Science Education” also were invited, as members of the Scientific Committee and the Honour Committee, experts members of communities in vulnerability situation and also Members of the C4S Advisory Board (AB). The schools participating in the project through their respective CLL’s, also are schools from low socioeconomic contexts and with a high number of families and children from migrant backgrounds. This allowed making possible approaching science education and new didactic strategies to areas or local sites where currently there is not sufficient accessibility to science spaces or activities.

5.6.3 Stakeholder map





5.6.4 Impact of activities (See 4.4 and 7. inclusive aspect)

- **Conferences:** The 2 National Conference on Inclusive Science Education addressed to Catalan educators and teachers from all the territory allowed reaching a wider public than originally expected. Especially taking into account that it had the institutional support of the Catalan Government (Generalitat de Catalunya through the STEAMcat project and the CESIRE institution). This allowed the use the communication Networks at national level for teachers and educators to disseminate the conference and the events and activities related to it.

The topic about Inclusive Science Education, promoted by the C4S project in different national events was also included as well in the 2 national workshops organised by the Education Department from the Catalan Government. As a result 2 workshops were presented in the STEAMCat Conference events of 2021-22 and 2022-23 reaching wider public and educators from the Catalan territory

Within the university of Manresa-FUB also there has been an impact about ISE topics: a workshop about ISE topics was included within the new “E-Healthinking” course addressed to experts in health and innovation. Also ISE topics have been included in one of the modules of the BA course “Didactics of Environmental Knowledge” in the Degree of Early Childhood Education.

In relation to research priorities, Manresa FUB has considered priority this line of research, consolidating one of the lines of the GRECC research group directly addressing the topic about “Inclusive Science Education”. Also, during 2020-21 and 2021-22 Manresa-FUB has participated in 2 other National competitive projects (FECYT) addressing ISE issues in robotics QUI_BOT H2O (especially addressing issues about intersectionality and girls participation in robotics); also recently a National competitive project from the Spanish Ministry (I+D: Generación de Conocimiento) promoting an evaluation of the Lab0_6 impact with and ISE approach has been granted. A booklet about the Riverside trees from the Cardener River in Manresa made by the Children of Valldaura School (a high complexity school in Manresa with a high % of migration) was published and free-copies were distributed among the school families, as well as among all Manresa’s Schols and Public libraries, and to all the schools outside Manresa that are close to the river. In order to ensure this impact also flyers have been distributed with a QR code that allows a free downloadable copy of this guide in the mobile phone, ensuring that people willing to visit this natural landscape in the city can have free access of this work make by the children.

Also C4S impacted a wider public (beyond the target groups of educators and teachers) by periodically publishing in a Catalan e-magazine (Social.cat) , presenting topics related to ISE issues, inclusion, STEAM , etc. Furthermore, these articles were written with a C4S collaborator who has cerebral palsy and who is also very active in promoting the awareness of inclusion in society. She has written 2 books addressed to children. Such collaboration and media allowed widening the topics presented and the audience reached.

Also, the 2 working groups (one on-site and another online- 2nd edition) allowed to reach teachers at local level (Manresa) and at a larger level (territory of central Catalonia). Also the BA students of Manresa, through the project on the 35 years after the Chernobyl Catastrophe reached children from different local schools and associations.



6 Milano C4S HUB

6.1 General presentation (and origin of the Hub)

The two leading partners of Hub Milano were the University of Milano-Bicocca and Giocheria Laboratori, an educational service and science centre for kids from 3 to 12 years of age in Sesto San Giovanni (MI). The partners are both located in the metropolitan city of Milan, in the northern area, and in 2016, with 12 other public and private realities, they concluded a local area agreement (www.distrettobicocca.it) with the goal of developing a network and promoting some synergic actions between public and private entities for the implementation of socio-cultural programmes, in cooperation with local businesses. The Memorandum of the Agreement provides for the promotion of innovation and technological transfer initiatives, with positive effects on the area's attractions and competitiveness, as well as the creation of training and further education opportunities among the partners, also open to the public.

UNIMIB and Giocheria have been collaborating for 20 years for training pre-school education teachers. In particular, the researchers and the pedagogical direction of the Municipality of Sesto San Giovanni pre-school services co-designed science education in-service training programmes and collaborative research. They are both members, since more than 30 years, of the "Nidi e Infanzia" National Group established by Loris Malaguzzi, founder of the Reggio Emilia Approach in 1980.

University of Milano-Bicocca, founded in 1998, is one of the most dynamic, research- and innovation- oriented Italian universities (www.unimib.it); the "Riccardo Massa" Department of Human Sciences for Education manages the pre-service and in-service teachers and educators and pedagogists working in both schools and social and educational services education: it has two Bachelor's Degree Courses (three-year programmes) on Intercultural Communication and Education; one "single-cycle" Master's Degree (five-year programme) for Primary Education (3-11 years old kids); and Three Master's Degree Courses on Human Resource Development, Anthropological, and Ethnological Sciences. The Department offers a range of other postgraduate courses, including Master programmes, Short Postgraduate Courses, Professional Development Courses for Teachers, and PhD programmes. It offers also a Specialisation Course for Educational Support Activities for Pupils with Disabilities: indeed, within the University, there is a B.Inclusion Service, which is the disability and DSA service addressed to freshmen and students with disabilities and specific learning disorders. This Service makes a first meeting available to students with disabilities or DSA to offer a space for listening, sharing information about the students' school life and developing an Individualized University Project (P.Uo.I), which allows to find the services or the didactic and support interventions for each student. The Service is led by one of our main team members, Prof. Roberta Garbo, who is also the coordinator of the CALD network (coordination of Lombardy Universities for disability: www.cald.it).

Giocheria Laboratori is an educational service of the Municipality of Sesto San Giovanni which oversees the design and implementation of inclusive laboratories of informal science education, also in collaboration with subjects and institutions that live and work with disabilities. More specifically, Giocheria Laboratori shall co-design, together with the other subjects of the network, pilot projects, laboratories, and public initiatives around the following research areas: nature and



living; exploration of the world through all the senses; and experimentation of the properties of objects and their constructive and interactive possibilities. Giocheria developed a special focus on children's learning paths and the issues of informal education, more specifically the approaches of informal education to science. The basic idea that guides all its activities is that, in order to educate to science and to its cultural and formative dimension, it is fundamental to be part of the process of spontaneous children development, in order to support their imagination and creativity and maintain their motivation to understand the natural and technological world that surrounds them. So, in this perspective, Giocheria offers itself as a model of extracurricular and informal education, that is born and develops in strong interaction with school education.

Giocheria Laboratori offers every year proposals and workshops to about 4.000 children in 150 classes of public and private kindergartens and primary schools in Milan and surrounding municipalities. It also proposes opportunities for training and professional exchange on the issues of scientific learning and informal education for teachers and educators and active education initiatives and workshops aimed at children and local families.

6.2 Structure

6.2.1. Partners

1. The B.Inclusion Service, which is the Disability and DSA Service of the University of Milano-Bicocca (<http://www.b-inclusion.unimib.it/>), is aimed to freshmen and students with disabilities and specific learning disorders. The Service provides support for the admissions tests and distributes different services, such as: accompanying within the University Campus, coaching during the exams, equivalent tests, compensation tools etc.
2. The Laboratory of Robotics for the Cognitive and Social Sciences of UNIMIB (www.roboticss.formazione.unimib.it) is a multidisciplinary research laboratory aimed to analyse the roles that the robotic technologies play outside the robotic domain, with particular reference to educational robots as tools for the scientific research and to their social applications.

6.2.2. Living lab(s)

1. Bambini Bicocca Scientific Atelier (www.bambinibicocca.it/scuola). "Bambini Bicocca" is a spin-off of UNIMIB, an innovative Toddler and Infant School (from 3 months to 6 years), which experiments innovative teaching and learning approaches through the Scientific Atelier (especially on biology and educational robot) and welcomes children with Special Educational Needs, such as CHARGE syndrome, autism spectrum and language delay. It carries out research on multimedia tools for didactic planning and documentation.
2. Giocheria Laboratori Kids Centre (www.sestosg.net/servizi/giocherialaboratori). It is an educational service of the Municipality of Sesto San Giovanni, which designs and implements inclusive and non-formal scientific learning laboratories for and with children aged 3-11 years (see above).
3. Infant School of Sesto San Giovanni - Monte San Michele (www.ic-martiridellaliberta.edu.it). The Infant School "Monte San Michele" is a State School which is part of the "Martiri della Libertà" Comprehensive Institute in the Municipality of Sesto San Giovanni (MI). The "Martiri della Libertà" Comprehensive Institute, besides "Monte



- San Michele”, includes another Infant School, “Marelli”, plus 2 Primary Schools, “Martiri della Libertà” and “Oriani”, and 1 Secondary School, “Don Milani”.
4. “Antonia Vita” Popular School in Monza (www.avitaonlus.org/scuola-popolare). The “Antonia Vita” Association in the Municipality of Monza offers multiple social and educational services, especially including a Popular School aimed to prevent and contrast youth discomfort, drop-out and early school leaving of students between 13 and 16 years old, in particular helping them to achieve the lower secondary school diploma. It provides educational work for adolescents and also support for families, networking with the schools and other educational and social services.
 5. Infant School of Concorezzo - Falcone e Borsellino (www.icconcorezzo.edu.it). The Infant School “Falcone e Borsellino” is a State School which is part of the “Marconi” Comprehensive Institute in the Municipality of Concorezzo (MB). The “Marconi” Comprehensive Institute, besides “Falcone e Borsellino”, includes another Infant School, “Mario Lodi”, plus 2 Primary Schools, “Don Gnocchi” and “Marconi”, and 1 Secondary School, “Da Vinci”.

6.2.3. Team

Scientific coordination:

- For UNIMIB:
 - o Luisa Zecca, Full Professor (C4S Scientific Responsible);
 - o Roberta Garbo, Researcher, Dean's Delegate for Disabilities and Specific Learning Disorders (University of Milan Bicocca), and Coordinator of the CALD Network;
 - o Valeria Cotza, Research fellow (C4S Assistant Researcher);
 - o Petar Vasilev Lefterov, PhD student (C4S Assistant Researcher);
- For Sesto San Giovanni:
 - o Alessandro Porcheddu, Pedagogist;
 - o Simonetta Vimercati, educator and coordinator of educators.

Expert collaborators:

- For UNIMIB:
 - o Matteo Schianchi, Researcher, expert in special didactics and pedagogy;
 - o Edoardo Datteri, Full Professor, expert in robotics and roboethology;
 - o Andrea Mangiatordi, Researcher, expert in accessibility and educational content design;
 - o Carlo Antonini, Associate professor, expert in Surface Engineering and Fluid Interfaces;
 - o Monica Roncen, UNIMIB collaborator;
 - o Daniela di Martino, Researcher, expert in physics and physics didactic and issues of gender and science;
 - o Antonella Pezzotti, expert in biology and didactics of biology;
 - o Monica Onida, Adjunct professor, expert in geology, physics and didactic of physics;
- For Sesto San Giovanni:



- Alessandra Bai, Pedagogist of the Municipality, responsible for School Educational Area and SEN, also in relation to associations;
- Alessandra Barbanti, Educator;
- Marta Granata, Pedagogist;
- Anna Cuccu, Educator.

6.2.4. Student participation

3 students of the Masters degree in “Primary teacher education” graduated with a thesis regarding the Pilot sites:

- Agostoni Letizia, Infant School “Monte San Michele”, Sesto San Giovanni (MI);
- Miola Simona, Infant School “Bambini Bicocca”, Milan;
- Rebosio Sara, Infant School “Monte San Michele”, Sesto San Giovanni (MI).

1 student of the Masters degree in “Primary teacher education” graduated with a thesis regarding the CLL of Concorezzo:

- Farinazzo Martina, Infant School “Falcone e Borsellino”, Concorezzo (MB).

3 students of the Masters degree in “Primary teacher education” are working on their Master degree thesis repurposing the tools and models implemented during the first pilot phase:

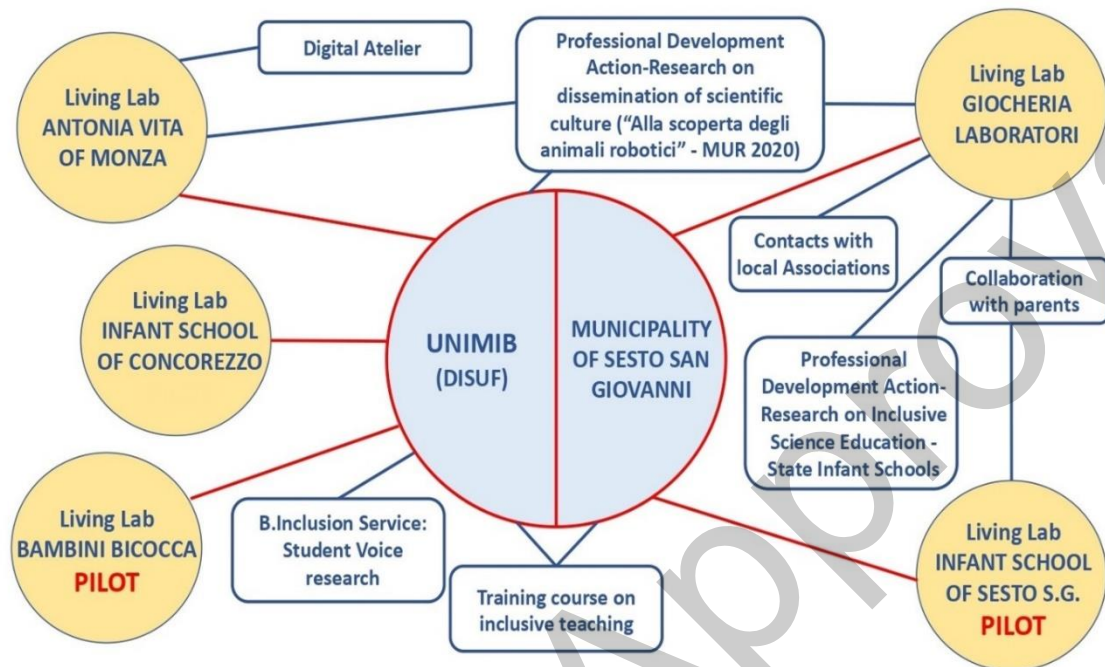
- Chiara Vitaglione, primary school XXV Aprile, Sesto San Giovanni (MI);
- Maria Teresa Papillo, Infant School “Luigi e Regina Sironi”, Oggiono (LC);
- Veronica Corti, school to be determined.

1 student of the Masters degree in “Primary teacher education” graduated with a thesis regarding GiocheriaLaboratori’s Professional Developments Action-Research:

- Chiara Caglio, teacher training programme, master thesis titled: “La Ricerca-Formazione nell’Infanzia per l’inclusività dei contesti scolasti”.



6.2.5. Schematic presentation



6.2.6. Consultative bodies and structures

The design of the actions was shared especially with:

- **UONPIA**, i.e. the Child Neuropsychiatry of the Municipality of Sesto San Giovanni;
- **Several associations** and teachers who joined the project.

6.3. Theoretical framework and methods

6.3.1. Vision

Every educational system should assume an **inclusive perspective**, by sharing discovery and learning experiences and focusing on attentional processes, interactional skills, and pro-social behaviours. This perspective involves redesigning the learning environment in its manifold aspects (physical, relational, social, cultural), to grant accessibility, activities, and participation.

The viable strategy to meet specific needs in a sustainable way is **Universal Design**. From our perspective, the condition of children and young adults in conditions of vulnerability (immigrants, Roma, or people with disabilities) is closely related to poverties and other inequalities, such as family shame, discrimination, lack of access to schools, gender bias, history of exclusion, and bad local and government policies. So, we would like to adopt a **systemic approach** that cares about gross injustices and other sources of disadvantage and that recognizes the multi-problematic and multi-faceted nature of some dimensions and situations.

Within this framework, we will pay particular attention not only to severe disabilities, but also to learning difficulties and disadvantages, that lead to enormous inequalities in educational



contexts. So, we will also consider students with **Special Educational Needs (SEN)**, a term which is used to describe learning disabilities and difficulties more generally.

6.3.2. Theoretical and conceptual framework

Our theoretical framework to scientific teaching-and-learning processes is based on **key practice-based issues and phenomena**, working closely with groups in conditions of vulnerability or communities and local actors involved in projects with children with disabilities and/or SEN: this means engaging associations, organizations, and institutions, too. By educational work we mean typical school activities involving **children and teachers**, social processes taking place in other life contexts (for children and young people), broader learning experiences which may take place inside and outside the classroom, at home, in the playground and other everyday-life situations. On these grounds, we consider it extremely important to assume an **inclusive, intercultural, and multi-disciplinary** approach, as well as promote both **innovative educational methodologies and cooperative learning** strategies. Community Living Labs and activities will take inspiration from the **Participatory Action Research method** and the Laboratory approach, which is based on the Experiential Learning Theory and specifically on the Problem Based Learning, the process whereby knowledge is created through the transformation of experience. Pupils are asked to work above all in small collaborative groups, in order to encourage peer knowledge exchange and confrontation.

6.3.3. Aims

Following a RRI approach, based on Public Engagement, Science Education, Governance and Gender, while designing the pilot activities, target professional figures, who act as bridges between the University and different Social Actors, were identified. Keeping a keen eye on the design of inclusive and sustainable research and innovation Hub Milano worked with researchers, communities, schools, teachers, and education professionals, in general.

Moreover, we conducted in-depth analyses on teaching and learning practices (good as well as bad) and research on how science teaching and special educational needs are related in current educational goals and activities, with the aim to increase general awareness of the importance of implementing Inclusive Science Educational Models, in both formal and non-formal learning contexts.

To promote a more inclusive approach to Science Education, we designed, developed and evaluated scientific labs and activities with children from 3 to 16, engaging their parents and families to take an active part in the project. For a good quality education, labs and activities were primarily addressed to small and inclusive learning groups ensuring participation of children with specific features. To have across the board impact master's degree students were invited to implement an Inclusive Science education approach during their internships.

6.3.4. Paradigm and methods of Hub

Hub members met at least once a month, to compare and share actions and decisions related to the 5 Living Labs; 3 times a month at least 1 member of UNIMIB met with Giocheria, to develop and monitor Giocheria Laboratori's activities.



The Hub is organized in project groups working in 3 directions: 1. Networking; 2. Teacher Education; and 3. Participatory Action-Research.

The Hub has **4 objectives**:

1. **Submitting a closed question interview** to all students enrolled in Science Degrees who have a disability or DSA (Disabled Students' Allowance);
2. **Co-designing and co-evaluating playground experiences and laboratories**, by involving teachers, support teachers, school educators, student teachers and stakeholders in training paths; the aim is also to develop multi-professional and multidisciplinary tables of professionals and practitioners who look after children with disabilities;
3. **Consolidating the network** with the Directorate of the 0-6 Toddler and Infant "Bambini Bicocca" Pole, which is provided with scientific ateliers for biological, ecological and environmental education within the nursery school and kindergarten. We are monitoring the participation of one child with Charge syndrome, one with autistic spectrum and two non-Italian-speaking children;
4. **Implementing the development of extracurricular inclusive environments** for students aged 13-16 (Creative Digital Ateliers).

6.3.5. Analyses of needs

The needs analysis was discussed with the stakeholder partners of the 5 Living Labs. The needs can be identified on 3 levels.

1. **Social cohesion needs of the territories.** This means identifying the critical points in the system of services, work, schools, health, public administration and communication that do not allow children and adolescents and their families to be supported in a coherent and shared way;
2. **Needs within organizations.** It means being sure that organizations have material resources and competences to promote inclusive science education;
3. **Needs of individuals.** It is about bringing together the assessments of individuals, families and all adults who care for children in fragile conditions.

The needs described are not established a priori by the project team, but identified together with the stakeholders according to a **heuristic methodology** that gradually builds up the objectives.

People's needs, development and learning objectives are outlined in **individual portfolios**, in which specific indicators are defined on the basis of the ICF (the International Classification of Functioning, Disability and Health). Organizational needs are identified by top management; the Hub team supports the processes of building specific objectives.

The **main needs** that have emerged by the end of the project are:

- Expand the network with science experts;
- Extend student involvement actions in inclusive science education;
- Train practitioners on Inclusive Science Education;
- Implement system figures for inclusive science within the Municipality of Sesto San Giovanni;



- Implement interventions with stakeholders that have an impact on policies about inclusion in the educational and school system, in both formal and non-formal scientific learning.

6.4. Day to day approach of the Hub

6.4.1. Partners

In our day-to-day activities, we have some new partners:

- 7 State Comprehensive Institutes from Sesto San Giovanni;
- 1 State Comprehensive Institute from Concorezzo, Infant School “Falcone e Borsellino”;
- Social Cooperative “Orsa”.

6.4.2. Participants

Besides the **Expert collaborators** (see 2.3 Teams) and the **Students** (2.4 Student participation) Hub Milano has involved:

- Children through the creation of 2 Pilot sites and 4 Living Labs;
- Families within 4 focus groups (15/12/21, 17/02/22, 02/03/23, 13/04/23);
- Policy makers through the interview with Roberta Pizzochera, Councillor for Social and Educational Policies in Sesto San Giovanni and one of the founding members of the Montessori Public School Association.

6.4.3. collaborators and co-creators

In order to design and implement the day-to-day activities HUB Milano works with both with state and private Infant Schools, with third sector cooperatives and associations, with different experts (see 2.3 Teams), with students (see 2.4 Student participation), and with families.

- State Infant Schools of Sesto San Giovanni (see 2.2 Living Labs);
- Private Infant School Bambini Bicocca (see 2.2 Living Labs);
- Piccoli & Grandi, is a family centre from Sesto San Giovanni (MI), a place for children 0-3 age to grow and play and a meeting and listening space for the adults who care for them.
- “Officine Educative” of the Municipality of Reggio Emilia works to provide value to local educational institutions and agencies on shared issues and goals for children and youth;
- Department of Physics of UNIMIB;
- Social Cooperative “Orsa” a social cooperative operating in the third sector, which was founded in 2009 with the aim of developing the design and management of services dedicated to pre-schoolers 0-6 age;
- Social Cooperative “La Grande Casa” established in 1989 with the aim of fostering and promoting rights, supporting and respecting each individual life project, and promoting the social and labour integration of the fragile;
- Family volunteers who meet at GiocheriaLaboratori with the educators of the service;
- Students were involved both as collaborators in the research process, through the engagement in the participant observation during the Pilot period, and both as co-creators of the activities. Simona Miola designed and carried out 10 sessions with children working on Biology and on how plants grow and behave. Martina Farinazzo and



Maria Teresa Papillo designed and implemented activities around the topic of light and shadows.

6.4.4. Day to day activities and outreach

The day-to-day activities carried out by Hub Milano can be divided into **3 groups**: Pilot period; CLL and dissemination; Teacher training.

- 1) **Pilot Period**: laboratories were designed, implemented and observed by Hub Milano during the entire process.

Infant School Bambini Bicocca – UNIMIB

The Pilot involves **1 classroom** of the school, and **2 adults**: 1 student teacher and 1 atelierista. 18 children, age 3-6, were involved in the Pilot phase, and were divided into 3 groups.

The activity started on the 24th of January and ended on the 5th of June 2022. The Pilot phase was divided into 3 periods:

- **Period 1, 24/01/22 - 02/03/22**: during this phase, 24 scientific laboratories took place involving all the 3 groups. The activities were conducted by the scientific atelierista, inside the scientific atelier. Twice a week, the student teacher was co-present and observed the activities. The topic of the activities was the structure of the trees and everything that surrounded the tree;
- **Period 2, 07/03/22 - 15/04/22**: During this period 10 scientific activities took place. The activities were carried out by the student teacher and were in the schoolyard. The topic was plants;
- **Period 3, 18/04/22 – 05/06/22**: In this phase 20 scientific activities took place guided by the scientific atelierista. The topic was plants and wildlife surrounding them. The activities took place inside and outside.

Infant School “Monte San Michele” - Sesto San Giovanni (MI)

The Pilot involved **2 classrooms** and **4 adults**: 2 curricular teacher, 1 educator, and 1 communication assistant. There are 26 children, which are divided into 4 groups, 2 for each classroom.

The topic of the **activities** is forces and balances and **started on the 13th of January and ended on the 27th of May 2022.** The Pilot phase is divided into 2 periods:

- **Period 13/01/22 - 25/03/22**: this first phase involved the first two groups. 20 scientific laboratories took place, twice a week, once on Thursday and once on Friday
- **Period 31/03/22 - 27/05/22**: this second phase will involve the second two groups. 16 scientific laboratories will take place, twice a week, once on Thursday and once on Friday.

- 2) **CLL and dissemination**: 3 preschools have shown interest in being part of the C4S project by designing and implementing Inclusive Science Education laboratories. In these three realities, Hub Milano assisted the involved practitioners by providing training and periodic meetings. **These three schools are disseminating the inclusive science educational approach implemented by Hub Milano.**



Infant School “Falcone e Borsellino” - Concorezzo

1 classroom of the school is involved in the project. From the class 4 adults are involved: 3 curricular teachers and 1 support teacher. There are 13 children, which are divided into 2 groups.

The topic is about the light and shadow phenomenon, with focus on transparency and reflective objects. **The activity started on the 10th of March and it ended on the 12th of May 2022.** This CLL provided a single period for a total of 16 scientific laboratories, 8 laboratories for each group. The first group is followed by 1 curricular teacher and the support teacher and the second one by the other 2 curricular teachers, with the support teacher in observation.

Infant School “Montevecchia” - Montevecchia (LC) - IC Cernusco Lombardone

A group of 5 children aged between 3 and 4 years old is involved in the project. 2 adults are involved: 1 curricular teacher and 1 support teacher.

The topic is about water. The activity comprised 3 meetings of approximately 30 minutes each, on **17, 26 and 27 April 2023.**

Infant School Luigi e Regina Sironi – Oggiono (LC)

The Sironi School was established in 193, in 2000 it became a paritarian school recognized by the Italian Ministry of Education and on January 1, 2004, it was transformed into the "Dr. Luigi and Regina Sironi Nursery School Foundation." The kindergarten consists of 6 sections. One section took part in the project. Only **7 children** were involved in the laboratories, 3 girls and 4 boys, one of which had a diagnosed language delay. **The first laboratory took place on the 24th of January and the last one on the 4th of April, for a total of 9 laboratories.** The topic was light and shadows.

3) Teacher training

Training Course on Inclusive Teaching at UNIMIB

UNIMIB, in collaboration with the Municipality of Sesto San Giovanni, is conducting a training course on inclusive education. **All the 7 Comprehensive Institutes in Sesto San Giovanni** are involved in the course, for a total of **191 teachers**:

- 65 Infant School teachers;
- 80 Primary School teachers;
- 46 Secondary School teachers.

The teachers are mainly non-specialised support teachers, not in possession of the TFA Support Teachers qualification and curricular teachers. The course consists of 3 lessons.

For Infant School teachers:

1. 21/03/22: First Lesson
2. 31/03/22: Second Lesson
3. 07/04/22: Third Lesson

For Primary School teachers:

1. 07/03/22: First Lesson



2. 16/03/22: Second Lesson
3. 22/03/22: Third Lesson

For Secondary School teachers:

1. 21/03/22: First Lesson
2. 31/03/22: Second Lesson
3. 07/04/22: Third Lesson

Professional Development Action-Research on Inclusive Science Education - State Infant Schools

The project involves **6 State Infant Schools** belonging to 4 Comprehensive Institutes of Sesto San Giovanni. Schools can choose between two different paths (courses):

- **Forces and balances path:** Two Infant Schools are involved in this project, “Fante d’Italia” and “Primavera”, both of which have already participated in the CLL’s Professional Development Action-Research of the past year.
 - o **“Fante d’Italia” Infant School:** 3 classrooms take part in the project. 12 adults are involved in the project, 7 of which are support teachers, and 1 is an educator. The children involved are 59, 6 of which have disabilities or SEN.
 - o **“Primavera” Infant School:** 3 classrooms take part in the project. 3 adults are involved, 1 of which is a support teacher. The number of kids involved is 70 and 2 kids have disabilities or SEN.
- **Light and shadows path:** 4 Infant Schools are involved: “Rodari”, “Collodi”, “Marx” and “Luini”.
 - o **“Rodari” Infant School:** 2 classrooms were involved in the project. 4 adults took part in the activities, 1 of which is a school educator. 35 children were involved, 3 of which have disabilities or SEN.
 - o **“Collodi” Infant School:** 3 classrooms were involved in the project. 4 adults took part in the activities, 1 of which is a school educator. 69 children were involved, 4 of which have disabilities or SEN.
 - o **“Marx” Infant School:** 3 classrooms were involved in the project. 4 adults took part in the activities, 1 of which is a school educator. 73 children were involved, 1 of which have disabilities or SEN.
 - o **“Luini” Infant School:** 1 classroom was involved in the project. 2 adults took part in the activities, one of which is a school educator. 25 children were involved, 1 of which is with a disability and SEN.

Children gained experience in small groups, using both spaces within the classroom and laboratories designed in outdoor and common spaces. The design of the spaces, the choice of materials, the methodology for conducting the experiences and the composition of the children’s groups were the result of close collaboration between teachers, educators and GiocheriaLaboratori. The observation of the children during the activities and so their direct involvement is the basis on which the proposal evolves. **Activities started in January and ended at the end of May 2022.**

3 long group meetings were planned for each of the 2 science paths: one at the beginning of the path, one in the middle and one at the end, during which teachers and educators exchanged and



shared experiences and reflections on the path underway, supported by the project coordinator and the operators of GiocheriaLaboratori and of the school educational area of the Municipality. Between one collective meeting and the next, meetings are agreed with the teachers to plan the laboratory activities in the schools, and then observe and supervise them, with particular attention to inclusion. These meetings are attended by the teachers and educators, the GiocheriaLaboratori operators and the pedagogist from the Municipality's School Educational Area.

Professional Development Action-Research on Dissemination of Scientific Culture - Project "Alla scoperta degli animali robotici" (MUR 2020)

UNIMIB, in collaboration with GiocheriaLaboratori, planned a Professional Development Action-Research on Dissemination of Scientific Culture, "Alla scoperta degli animali robotici" (MUR 2020). The course was held in 4 different editions and it started in February 2022. Each edition will last 30 hours.

- 1° Edition Group A from 19.02.22 till 15.10.22
- 2° Edition Group B from 19.02.22 till 15.10.22
- 3° Edition Group C from 26.02.22 till 22.10.22
- 4° Edition Group D from 26.02.22 till 22.10.22

The participants from our Hub are: Jusy Alconi (Primary School teacher), Alessandra Barbanti, Fiorella Borroni (school educator), Maria Grazia Chiaromonte (Infant School teacher), Monica Defeudis (Coordinator of the "GeneriAmo" Foundation nurseries of Sesto), Alessandra Fanelli (Infant School teacher), Marta Granata (Pedagogist of the Municipal nurseries), Caterina Localzo (educator at "Antonina Vita" Association), Gilda Melis (Infant School teacher), Anna Pinelli (Infant School teacher), Cristina Rustioni (Infant School teachers), Clara Serraino and Sofia Tintori (school educators).

Link to the project: <https://roboticss.formazione.unimib.it/animali-robotici-formazione-unimib/>

Teacher training on Science Education at GiocheriaLaboratori - State Infant Schools

GiocheriaLaboratori carried out a teacher training program with the teachers of **4 State Infant Schools** of Sesto San Giovanni. The training program was carried out in 6 sessions and the topic of the program was **Forces and Balances**.

- **Oct. 4, 2022:** TOPIC Presentation of Training course N°202272023
Attendees tot. 15 including 11 teachers.
- **Dec. 6, 2022:** TOPIC The "Observation Booklet"
Attendees tot. 11 including 5 teachers.
- **Feb. 15, 2023:** TOPIC The focuses to guide observation during workshop experiences with children
Attendees tot. 15 including 11 teachers.
- **March 14, 2023:** TOPIC The "Forces and balance" workshops: inclusion, spaces, rules, the children game
Attendees tot. 7 including 2 teachers.
- **April 17, 2023:** TOPIC Reflections regarding observations made during the "Forces and balance" workshop experiences.



Attendees tot. 10 including 5 teachers

- **May 17, 2023:** TOPIC Verification of learning developed with a view to future prospects
Attendees tot. 21 including 16 teachers.

6.4.5. Best practices

The tasks and activities carried out by HUB Milano that are proven to lead to an optimal efficiency and results involved different groups:

- Practitioners:
 - o **Training Course on Inclusive Teaching at UNIMIB.** UNIMIB, in collaboration with the Municipality of Sesto San Giovanni, conducted a 3 sessions training course on inclusive education. **All the 7 Comprehensive Institutes in Sesto San Giovanni** were involved in the course, for a total of **191 teachers** (65 Infant School teachers; 80 Primary School teachers; 46 Secondary School teachers). The teachers are mainly non-specialised support teachers, not in possession of the TFA Support Teachers qualification and curricular teachers;
 - o **Professional Development Action-Research on Dissemination of Scientific Culture - Project “Alla scoperta degli animali robotici” (MUR 2020).** UNIMIB, in collaboration with GiocheriaLaboratori, planned a Professional Development Action-Research on Dissemination of Scientific Culture, “Alla scoperta degli animali robotici” (MUR 2020). The course was held in 4 different editions and it started in February 2022. Each edition lasted 30 hours;
 - o **Focus Group with practitioners and local Associations,** 23/06/21 and only with practitioners 01/12/22.
- Students:
 - o Inclusion of students in C4S for the development of their master's thesis (see 2.4 Student participation).
- Families:
 - o **4 meetings** (15/12/21, 17/02/22, 02/03/23, 13/04/23) with the parents of the children involved in the Pilot activities.
- Children:
 - o Inclusive Science Education laboratories were designed for children. The two main topics of the proposed laboratories were biology and physics. The laboratories were co-designed with practitioners and external experts (see 2.3 Team) following the **Universal Design for Learning** approach (UDL) and the **Inquiry Based Science Education methodology** (IBSE). In accordance with these threads and the RRI approach, **children played a role as co-designers of the activities during the Pilot period:** teachers observed how the children interacted with the proposed stimuli, and based on their questions, ideas, redesigned the activity. During the Pilot period 18 children were involved in Infant School Bambini Bicocca, and 26 in the infant School Monte San Michele (see 4.4 Day to day activities and outreach).
- Other (practices of dissemination):
 - o Conference IBR21 - Interazione Bambini-Robot (www.ibr21.unimib.it), April 2021. Link to material:



<https://drive.google.com/drive/folders/1HqaYHXJGn9maFzLeMLBs-PU8auMmHG04?usp=sharing>

- Conference of the Journal “Scuola Democratica” (www.scuolademocratica-conference.net), June 2021. Link to material:
<https://drive.google.com/drive/folders/1VtqjvMZicuM7n6dZh4o1gVlxWSQ2jRYz?usp=sharing>
- Festival GenerAzioni (www.festivalgenerazioni.unimib.it), October 2021. Link to material:
https://drive.google.com/drive/folders/1cqRVlVnv2sxKs_bMz8yknhOJnrmFwwLk?usp=sharing

6.4.6. Photos, Links

Please, visit the following link to see some of our photos and videos:

https://drive.google.com/drive/folders/1zCCvDkq9GSe7_fYREytx67fs69T1bbfJ?usp=sharing

We also invite you to visit the different social channels of our Hub members:

- GiocheriaLaboratori:
<https://www.facebook.com/people/GiocheriaLaboratori/100063642249715/>
- UNIMIB:
 - Facebook: <https://www.facebook.com/bicocca>
 - Instagram: <https://www.instagram.com/unimib/>
 - Youtube: <https://www.youtube.com/user/unibicocca/featured>

6.5 Reflection

6.5.1. Challenges and risks

Our Hub has managed to start 5 Living Labs and to build a network with a wide partnership of institutions that are very different in terms of organization and pedagogical culture. The possible risks are:

- **Not being able to sustain communication and exchange of practices over time due to loss of interest or resistance to exchange information.** This risk can be mitigated by the presence of a pedagogist with a coordinating function between the local institution (GiocheriaLaboratori, Sesto) and the State Schools, which in turn are in partnership with medical and rehabilitation services;
- **Not being able to change school practices due to the particular condition of the pandemic;**
- **Having a low involvement of stakeholders from the target group** in relation to the research work and dissemination of results;
- **Having a low involvement of social and health services**, with professional therapists with whom teachers and educators should build personalized projects;
- **Structural problems of GiocheriaLaboratori space**, that limit the number of laboratories and initiatives open to the local area, which we are overcoming by involving and relocating tools and materials in schools and other areas of the Municipality;



- **Expansion of agreements with USRL** (institutional regional level), especially beyond the 0-6 range.

6.5.2. Main findings or discussion points

During the project Hub Milano discussed on various levels the topic of the sustainability and the development of the Hub. These discussions made clear that the following two main point should be addressed:

- **Implementation of strategies to increase the level of awareness of the territory on the issues of inclusion of people with SEN**, in particular how to create tables of co-planning and co-evaluation throughout the time span of the activities, starting the comparison between professionals with heterogeneous specializations, not accustomed to working together. Furthermore, we tried to **“build bridges” for mediation**, between operators of social-educational services and teachers for greater cooperation. Among the results, in addition to a campaign that can communicate good practices spread at the regional level, we would like to lay the foundations to start a dialogue with schools, especially State Low Secondary Schools from which the students who attend the “Antonia Vita” Popular School come from, so an intervention to counter the school drop-out of adolescents at risk of deviance and marginality. **Therefore, the creation of a stable institutional network for long-term planning is a must;**
- **Involvement of families**, both at an informative and advisory level. We did 4 meetings in schools with a high degree of engagement that led to the telling of stories about their own experiences and that of their children, also with disabilities or SEN. One thesis is aimed at understanding the relationship between school and family for educational co-design and support of children with different difficulties. Once a week at Giocheria Laboratori **a group of parent volunteers** has been working for many years on the construction of materials to be used in science laboratories.

6.5.3. Implications on practice or policy

The activities that are taking place in the different realities on a policy level should lead to:

- **Increasing teachers’ professional skills;**
- **Increasing awareness** of the need of shared planning between curricular and support teachers and school educators and of the recognition of each other’s functions also in relation to the entirety of the children in a classroom;
- **Development of in-service training opportunities** and awareness of the impact on professional development for increasing school quality;
Engagement of secondary school teachers, who were involved and trained, just like the infant and primary teachers, on the topic of inclusive science teaching-and-learning.

6.5.4. Inclusive Aspects

Hub Milano worked on different levels by an inclusive standpoint. Experienced members of the SEN community or those with disabilities have been involved in the Hub formation since the beginning. Members of this community have been important both as privileged informants, who are able to take a different look at the inclusion perspective, as functional critical friends in writing



the deliverables required by the project, and as competent researchers who contributed their efforts in writing the literature review.

Following the pilot protocol, the classes that took part of the project had to have at least one child with special educational needs or disability. The main scope of this objective is to design and implement activities that are inclusive for everyone, for SEN children, migrant children, and others, not excluding anybody of the class. This criteria was extended both for the Community Living Labs and for the schools involved in the dissemination; each school participating had to involve at least one child SEN or with disability and to design activities that were accessible to everyone.

The inclusive aspects do not only stop at the research and action during the pilot phase, but also change the Hub's approach of communicating. On the occasion of the General Assembly, which was held May 24-26, Hub Milan organized an exhibition. The usability of the exhibition and the idea of devising an exhibition that is suitable for everyone was a central aspect during the planning of the event. Furthermore, from a gender-intersectional point of view, Hub Milano has tried to involve women scientists and researchers both as critical friends, advisors and Trainers.



Annex 1: List of Hub members with brief description

Vienna C4S Hub

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
RCE Vienna	Research Organisation	Department of the Wirtschaftsuniversität Wien	Local partners research/coordinator	Responsibility for the scientific requirements of the Vienna C4S Part
European Office	Public Organisation	Department of the Board of Education for Vienna	Local partners research/coordinator	Responsibility for the pedagogical requirements of the Vienna C4S Part
BildungsHub Wien	Public Organisation	Department of the Board of Education for Vienna	Social and institutional community actors	exhibition and communication space
Communication Department	Public Organisation	Department of the Board of Education for Vienna	Social and institutional community actors	information zone for SDGs and their possible usage in class
Global 2000	Non Governmental Organisation	Educational organizations	Local partners research/coordinator	gives advice, input & exchange

Galileo C4S Hub

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
Galileo Progetti Nonprofit Ltd.	Non-profit organization	the organization works in the fields of education and teaching, training, citizenship education, youth empowerment and equal opportunity	Local partners research/coordinator	organiser



3.3 – Mid-term Report on local action plans, participants and interventions



JEB Mini-Manó Bölcsőde	nursery school	early childhood education and care	Implementers	Cooperation nursery, lead
JEB Biztos Kezdet Gyerekház	child welfare service	Sure Start Children's House in Hungary are effective initiatives which have provided significant early childhood development (ECD) opportunities to segregated and disadvantaged micro-regions, composed of Roma and non-Roma populations	Implementers	Give advice, contributor
Municipality of Józsefváros, Budapest, 8 th district	Public Organisation	City council	Local partners coordinator	exhibition and communication space



3.3 – Mid-term Report on local action plans, participants and interventions



Sofia C4S Hub

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
NBU	Higher or Secondary Education Establishment	University	Local partners research/coordinator	leading and coordinating
Hesed	Non-Governmental Organisation	Kindergarten	Implementers	Will be conducting activities with the children and families
Muzeiko	Small or Medium Enterprise	Museum	Other supporters	Will give support to actions at a local level
Know-How Center, NBU	Structure of New Bulgarian University		Other supporters	Provides advices on issues relating inclusion of Roma minority and activities from the HUB



3.3 – Mid-term Report on local action plans, participants and interventions



Wonderlab C4S Hub (Brussels)

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
Erasmus Brussels University of Applied Sciences and Arts	Higher or Secondary Education Establishment	Erasmus Brussels University of Applied Sciences and Arts (EhB)	Local partners research/coordinator	organizer
Bachelor of Education Pre-Primary School	Higher or Secondary Education Establishment	Teacher training program	Implementers	lead
students	Higher or Secondary Education Establishment	students enrolled in program	Implementer/multiplier	contributor
former students, teachers	Other	alumni currently in work field	Implementers	contributor
GO! (Education provider of the Flemish Community)	Public Organization	education provider Flemish Community	Other supporters	supporter/liaison with schools
Brussels schools of GO! De Muziekladder Schaarbeek	Public Organization	education provider Flemish Community Brussels Brussels elementary school	Implementers	participants on class or school level/contributor
Knowledge Centre Urban Coaching and Education (EhB)	Research Organization	KC of EBUASA (EhB)	Local partners research/coordinator	providing expertise
Centre of Expertise Stem UAB	Research Organization	KC of University Association of Brussels (UAB)	Local partners research/coordinator	providing expertise



3.3 – Mid-term Report on local action plans, participants and interventions



Ella Vzw	Non-Governmental Organization	works on gender, human rights, ...	Social and institutional community actors	providing expertise
Members Advisory Group	Divers organizations	field of education, science, civil society, ...	Advisor/sounding board/disseminator	Providing expertise
Members Expert Group	Divers organizations	Experts in the field of science (education) and arts	advisor	Providing expertise



3.3 – Mid-term Report on local action plans, participants and interventions



Hub Manresa-Vic

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
FUB - UManresa	Higher Secondary Education Establishment	Partner - University	Local partners research/coordinator	leading and coordinating the local Manresa Hub & social actors involved
UVic	Higher Secondary Education Establishment	Partner - University	Local partners research/coordinator	leading and coordinating the local Vic Hub & social actors involved
Escola Valldaura	Public Organisation	Primary School	Implementers	Will be conducting activities with the children and families
Escola Oms i de Prat	Public Organisation	Primary School	Implementers	Will be conducting activities with the children and families
Nana Espai Familiar	Small or Medium Enterprise	Space for children & families	Implementers	Will be conducting activities with the children and families
Museu Comarcal de Manresa	Public Organisation	Public Museum	Implementers	The museum will be the nodal point of 4 neighbourhoods with high degree of migration and communities in vulnerable risk situation and will be conducting



3.3 – Mid-term Report on local action plans, participants and interventions



				activities to engage them in the city & museum life and to make visible the children and families participating as important city actors
Ajuntament de Manresa	Public Organisation	City Hall	Other supporters	will give support to actions at a local level
STEAMCat - Departament d'Educació - Generalitat de Catalunya	Public Organisation	Regional Government - specific STEAM program (Education Ministry)	Other supporters	STEAM project from the Catalan Government that collaborates in the co-design of actions at a national level with schools
CESIRE - Departament d'Educació - Generalitat de Catalunya	Public Organisation	Regional Government - Education Research and Innovation Center	Other supporters	Will collaborate in the co-design of activities at a national level with schools
UNESCO Melilla (Universidad de Granada)	Higher Secondary Education Establishment or	UNICEF Center linked to University	Other supporters	acts as a bridge with other initiatives at a national level and provides assessment on issues related to intercultural cooperation
Individual collaborator 1	Other	Expert in Science education	Social and institutional community actors	Provides advise and expertise on science education & STEAM activities
Individual collaborator 2	Other	Expert assessing on inclusion	Social and institutional community actors	Provides advices on issues relating inclusion of persons with disability and activities from the HUB



3.3 – Mid-term Report on local action plans, participants and interventions



Dones Al-Noor	Other	Association	Social and institutional community actors	Provides advice on issues relating inclusion migrant of persons and gives support to activities from the HUB
Projecte Vulneras - UAB (getp-GRAFO Research Group)	Public Organisation	National funded project	Social and institutional community actors	Provides advice on issues relating persons in vulnerable risk situation
Institut escola Xandri (St Pere Torelló)	Public Organisation	Public School (preschool, primary and secondary school, 3 to 16 yrs old)	Implementers	Will be conducting activities with the children/teachers/families
Escola Doctor Joaquim Salarich (Vic)	Public Organisation	Public School (preschool & primary school, 3 to 12 yrs old)	Implementers	Will be conducting activities with the children/teachers/families
Espai familiar municipal el Remei (Vic)	Public Organisation	Space for children & families (municipal provision from 0 to 3 yrs old)	Implementers	Will be conducting activities with the children/teachers/families
Escola Santa Catarina	public Organisation	primary School	Implementers	conducting the activities with children and families
Vic City Council (Education Department)	public Organisation	City council	Other supporters	Supporting actions



3.3 – Mid-term Report on local action plans, participants and interventions



Hub Milano

Name of Hub member	Type of institution/actor	Brief description of the institution/actor	Hub roles	Brief description of the main Hub roles of the institution/actor
University of Milano-Bicocca (UNIMIB)	Higher Education Establishment	Public University	Local C4S partner	Leading partner, scientific responsible, research (WP4) leader and implementer, leading a training course on inclusive teaching for the Schools of Sesto SG
Municipality of Sesto San Giovanni, Educational Area (Sesto SG)	Public Institution	Municipality in the Metropolitan City of Milan	Local C4S partner	Leading partner, research implementer
GiocheriaLaboratori, Service, Sesto SG	Public Educational Service	Educational Service for Infant and Primary Schools	Sesto SG implementer	Living Lab: co-designer and implementer, supervision of Pilot activities, leading of Professional Development Action-Research paths on inclusive science education, with the Infant Schools of Sesto SG
Bambini Bicocca Toddler and Infant School, Milan	Small or Medium Enterprise	Private equivalent pre-school	UNIMIB implementer	Living Lab: co-designer and implementer, Pilot site
“Antonia Vita” Association, Monza - Popular School	Educational and Lower Secondary Education Establishment	Voluntary association to prevent and contrast early school leaving and youth discomfort	UNIMIB implementer	Living Lab: co-designer and implementer, leading of devising a Digital Atelier



3.3 – Mid-term Report on local action plans, participants and interventions



Infant School of Sesto SG - Monte San Michele	State Infant School	Infant School in the Comprehensive Institute “Martiri della Libertà” in Sesto SG	UNIMIB and Sesto SG implementer	Living Lab: co-designer and implementer, Pilot site
Infant School of Concorezzo - Falcone e Borsellino	State Infant School	Infant School in the Comprehensive Institute “Marconi” in Concorezzo (MB)	UNIMIB and Sesto SG implementer	Living Lab: co-designer and implementer, Pilot site
B.Inclusion Service, UNIMIB	Higher Education Service	Disability and DSA Service of UNIMIB	UNIMIB partner	Liaison with undergraduate students with disabilities and/or SEN, research implementer (Student Voice research)
Laboratory of Robotics for the Cognitive and Social Sciences (RobotiCSS Lab), UNIMIB	Higher Education Scientific Laboratory	Multidisciplinary Research Laboratory (Educational Robotics)	UNIMIB implementer	Liaison with research on Educational Robotics and their social applications, research implementer, leading of a Professional Development Action- Research path on dissemination of scientific culture (“Alla scoperta degli animali robotici”, MUR 2020)
AGPD Onlus, Milan headquarters	Non-Governmental Organisation	Onlus Association	Social and institutional community actors	Supporter and co-designer, consultation
LEM, Sesto SG	Non-Governmental Organisation	Social Promotion Association	Social and institutional community actors	Supporter and co-designer, consultation



3.3 – Mid-term Report on local action plans, participants and interventions



L'abilità, Milan	Non-Governmental Organisation	Onlus Association	Social and institutional community actors	Supporter and co-designer, consultation, Advisory Board member
La Nostra Famiglia, Sesto SG headquarters	Non-Governmental Organisation	Onlus Association	Social and institutional community actors	Supporter and co-designer, consultation
La Grande Casa scs, Sesto SG	Non-Governmental Organisation	Social Cooperative	Social and institutional community actors	Supporter and co-designer, consultation