

OSHUB SWITZERLAND



OPEN SCIENCE HUB
CITÉ
DE SCIENCE
OUVERTE
SWITZERLAND



Onl'Fait

Onl'fait is the first educational Fab Lab in Geneva, a space open to everyone around digital craftsmanship, which provides its community with technical, technological and human resources. The goal is to offer a diverse community of enthusiasts and professionals the tools to repair, create, share, develop, design a prototype or a product, while facilitating an intergenerational and multicultural meeting place to reflect on an ecological, citizen-led and sustainable approach to science, technology and consumption.

Onl'Fait offers a portfolio of events and activities, namely on science and technology education, that promote the spirit and mindset shared by scientists and makers: analyse, research, create, modify, solve; encourage inclusion, from children to scientists, by contributing to the democratisation of science and sharing of scientific and technological knowledge; facilitate science learning by offering hands & minds-on programmes with a special attention to children and disadvantaged communities; and support the open hardware and software movement to share, take ownership of, and contribute to science and technology knowledge and culture.

OSHub Team

Cristina Olivotto

*Fab Lab
manager*

Patrick Condevaux

*Onl'fait
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Shannon Sykes

*Fab Lab project
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*Fab Lab project
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Value Proposition

OSHub-CH offers a methodology and practical tools to place schools at the centre of community projects about sustainability, science and technology by providing support to teachers and students.

Target public

Secondary school students from pre and vocational schools (>15 years-old), teachers, Department of Public Education.

Management Board

01 Non-formal education-related entity

- **Maison de la Rivière**

Damien Robert-Charrue, *Deputy director*

Type of relationship/interaction: Support to set-up pedagogical and scientific relevant programmes about water

Contact frequency: Once per month

01 Academia

- **HEPIA**

Kenzo Paul-Julien, *Teaching Assistant*

Type of relationship/interaction: Support to set-up objectives for scientific projects linked to technology and environment

Contact frequency: 3-4 times during the duration of the project

01 Government

- **Département de l'Instruction Publique**

Andreas Fink and colleagues, *Member of the department of Secondary Public Education*

Type of relationship/interaction: Support to identify needs of the local government for Geneva secondary schools

Contact frequency: 1-2 times per year

01 Industry

- **Après**

Antonin Calderon, *Head of Development Department for the sustainable and social economy*

Type of relationship/interaction: Connection with private stakeholders engaged in community and sustainable programmes

Contact frequency: Once per year

Approach

The scope of OSHub-CH | Cité de Science Ouverte programs are two-fold:

- on one hand, to demonstrate to young people the multidisciplinary of societal challenges, offering the possibility to meet and work together with experts from many different areas (e.g. natural sciences, electronics, communication, european relations, stakeholder facilitation);
- and on the other hand, how to develop technological solutions for these societal challenges, namely in relation to sustainability, through research-based practices grounded on community relevant issues. Throughout this process, students and teachers are acquainted with the knowledge to better understand the problem and with the technical tools to design and make a technical device.

These projects are developed at Onl'fait, which due to its Fab Lab nature is equipped with the necessary technical skills and resources, and connected to several different networks and people from science, technology and innovation.

More specifically, throughout this process, the role of OSHub-CH is the following:

- to organise co-creation sessions with experts and/or students and/or local stakeholders to identify the community issues to tackle;
- to connect schools to experts to understand the importance of science and technology for sustainability, define the "research questions" related to the identified issue and discuss the role of scientific research in society;
- to connect schools to local stakeholders to gain relevant and real-world insight about the identified issue, namely by investigating its complexity and how public and private institutions are dealing with it;
- to offer a workspace, materials, tools and machines to develop the chosen technical solutions;
- to support teachers during the development of the project at school and to identify tasks that suit the different profiles of students;
- to promote the work of students in collaboration with the local community and different stakeholders.

Additionally, OSHub-CH also plays an advocacy role targeted at policy-makers, namely the Department of Public Education, by demonstrating the strengths of maker education, open schooling and transdisciplinarity.

Model

This programme consists of weekly sessions that bring the students through the process of formulating an idea to actualising it as a solution in a real world context.

These sessions include:

- **Co-creation workshops:**

Students and/or teachers and/or relevant stakeholders are guided into a co-creation process to identify the issue to tackle and understand the role of each stakeholder to implement the programme. The topics that have been identified and developed are related with freshwater in the Geneva region, COVID-19, climate change, food waste and healthy soils.

- **Research sessions:**

Experts working on the identified topics are invited to provide a scientific contextualization of the theme, talk about recent developments and perspectives, set the research questions, as well as discussing technical constraints. After this, students start by doing their own research about the topic, guided by their teachers, before focusing on the technical solution to the problem.

- **Maker sessions:**

Over several sessions (5-10), students prototype and implement a technical solution using the tools, machines and materials available at Fab Lab Onl'fait.

- **Sharing session:**

Students are asked to share their work using different communication formats (e.g. social media, presentations, exhibition) and by presenting it in different contexts (e.g. at a students' symposium, the Natural History Museum of Geneva or at their school).

- **Evaluation sessions:**

Students and teachers are asked to self-reflect and evaluate the programme and the activities, providing OSHub with relevant information to improve the implementation of Open Schooling programmes.

Importantly, in addition to the steps above, OSHub-CH also invests several hours in one-to-one meetings with teachers, thus creating trust and empathy relationships that are pivotal for the legacy of these programs.

Finally, the programme described is flexible and can range from a month-long activity to two years of continuous work. The number of students, their personal profile, the school curriculum, and the time available are key elements to consider while co-designing the programme with teachers.

Physical Space

OSHub-CH set up a 20 m² space at the MACO – where Onl'fait is now based – that has been operational from the beginning 2022. The space has been furnished with reused material upcycled by a local association (Materium). Prototypes were done in collaboration with Glitter (Precious plastic Geneva) for additional pieces of furniture that will be produced at the end of 2022 (in particular hang-coaters and boxes to tidy up materials).



Figure 1 – 2: Photos of OSHub-CH physical space and furniture detail.

Partner Schools

NAME	LOCATION	SCHOOL YEARS	# STUDENTS	# TEACHERS	# SCHOOL HEADS	# OTHER (E.G. SCHOOL STAFF)	# PARENTS
CFPP (pre-professional school)	Geneva	15 – 18 yo	30 (1 class)	2	1	0	0
CFPT (school of electronics)	Geneva	15 – 16 yo	10 (from different school years)	2	1	0	1
Collège et école de commerce A. Chavanne	Geneva	>15 yo	50 (2 classes)	2	0	1	0

Implementation

OSHub-CH worked with 3 secondary schools in Geneva to develop sensors to measure the quality of water of the lake of Geneva and the CO₂ level in closed environments like classrooms, as well as creating biomaterials from waste. The topics for the investigation and prototyping were chosen during co-creation sessions where teachers and several types of stakeholders (policymakers, students, entrepreneurs, science communicators, researchers) were invited to exchange and discuss. Students were introduced to the topics by the Onl'fait team and by relevant scientific partners from HEPIA and the University of Geneva, who explained to students the importance of studying these issues and their actual research about the environment and climate. During the manual work at the Fab Lab, students worked in groups to make and prototype. Participants were also invited to work on documentation to disseminate the results of the project to their classmates (posters), to Fab Lab members (documentation on wiki), to the general public (expo at the Science museum and social networks) and to make research about local institutions working on the thematics of water and air quality.

Overall, OSHub-CH impacted:

- Directly:
 - 90 students corresponding to 1 705 interactions (engagement rate: 19)
 - 6 teachers corresponding to 200 interactions (engagement rate: 33)
 - 60 community members corresponding to 119 interactions (engagement rate: 2)
- Indirectly:
 - 1 210 students
 - 112 teachers
 - 205 community member

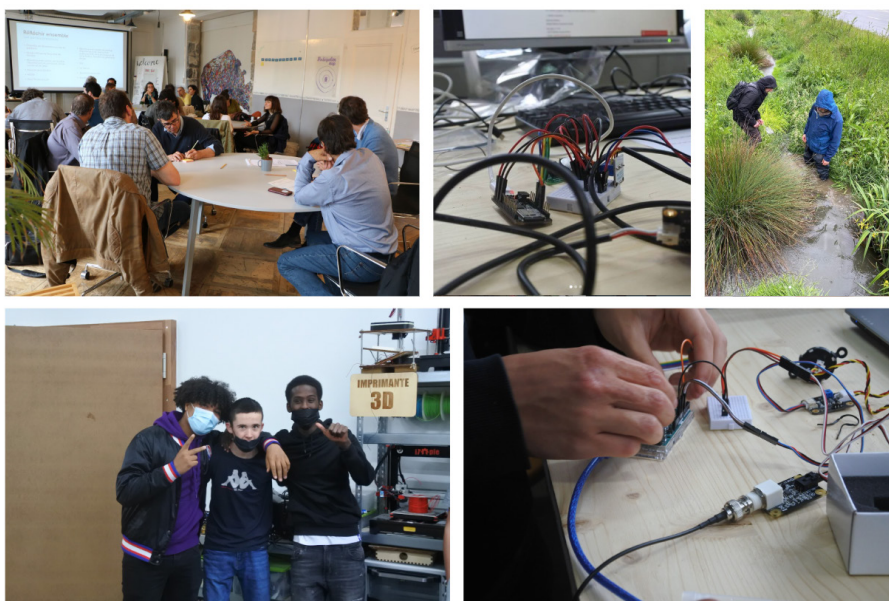


Figure 3 – 7: Photos from OSHUB-CH | La Cité de Science Ouverte activities.

Partnerships

03 Non-formal education-related entity

- **Maison de la Rivière**
Type of relationship/interaction: Regular exchanges with the deputy director to: set the scientific objectives of the programme; co-develop activities
Contact frequency: Once per month
- **Musée d'Histoire Naturelle**
Type of relationship/interaction: To show the results of OSHub-CH in the new space of the museum called dAg!r dedicate to sustainability
Contact frequency: 4-5 times in 2022
- **Cluster eau**
Type of relationship/interaction: Regular exchanges with the director to discuss how to develop an interregional programme based on the OSHub experience in Geneva
Contact frequency: 5-6 times in 2022

02 Academia

- **HEPIA**
Type of relationship/interaction: Exchanges with academic staff to set up the scientific objectives of the programme
Contact frequency: 3-4 times during the duration of the project
- **Université de Genève**
Type of relationship/interaction: Exchanges with academic staff to better understand the importance of measuring carbon dioxide for climate change
Contact frequency: 3 times during the duration of the project

02 Government

- **Département de l' Instruction Publique**
Type of relationship/interaction: Exchanges with different departments to: identify pedagogical challenges in science and technology; identify target schools; understand the objectives about sustainability for secondary schools
Contact frequency: 1-2 times per year
- **Office Cantonal de l'eau**
Type of relationship/interaction: To align with the awareness objectives about fresh water of the regional government
Contact frequency: 3 times during the duration of the project

Activities

41 Facilitated Sessions

SHORT DESCRIPTION

These facilitated sessions consisted both of:

- workshops for students, and were part of three programs developed by OSHub-CH related with freshwater quality, CO₂ monitoring and biomaterials.
- several types of interventions, such as guiding reflections about science and society, facilitating the contact with researchers or supporting the evaluation process.

Below we provide a detailed description of these different situations.

WORKSHOPS FOR STUDENTS – 35 sessions

Freshwater quality – 4h sessions about electronics, 20 sessions

SHORT DESCRIPTION

A small group of students (about 10) from different years of the school of electronics (CFPT) spent one afternoon per week at Onl'fait to prototype a sensor based on Adafruit Feather M0 AdaLogger to measure pH, temperature, oxygen and conductivity in freshwater.

At the end, students made posters for their school (Figure 10-11) and made publications on social media.

DURATION

4 hours x 15 weeks + 5 weeks

TIMELINE

February – June 2021

April – June 2022



Figure 8 – 9: Activities from the 'Freshwater Quality' Sessions.



Figure 10 – 11: Posters made by students about the freshwater quality workshops.

CO₂ monitoring – 3h sessions about electronics, 6 sessions

SHORT DESCRIPTION

Two classes of young adults (+18 on average) from the School of Commerce spent one afternoon per month at Onl’fait to build from scratch a CO₂ sensor to be installed in each class of the school.

Interestingly, two participants of a programme dedicated to unemployed people run by Onl’fait participated in these training sessions to teach students how to solder.

At the end, students developed posters to be exhibited at their school (Figure 14-16).

DURATION

3 hours x 6 weeks

TIMELINE

September 2021 – January 2022

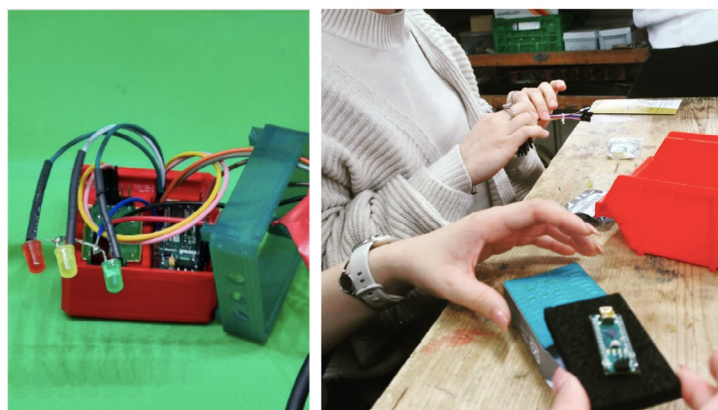


Figure 12 – 13: Building of the CO₂ sensors.



Figure 14 – 16: Posters made by students about the CO₂ monitoring workshops.

Biomaterials – 3h sessions about biomaterials and biofabrics, 4 sessions

SHORT DESCRIPTION

A small class of preprofessional school (for secondary school students who failed all academic standard paths) decided with their teacher to work on organic waste and biomaterials. They collected eggshells, coffee grounds and orange peels and created sheets and samples of biomaterials at Onl'fait.

DURATION

3 hours x 4 weeks

TIMELINE

May – June 2022

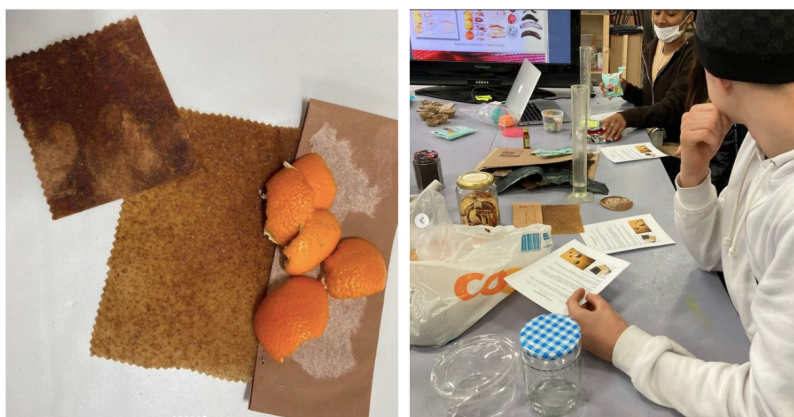


Figure 17 – 18: Images from the biomaterials workshop sessions.

Biomaterials – 3h sessions about biomaterials, 5 sessions

SHORT DESCRIPTION

The objective of the activity is to build a maquette of the schoolyard where the worm composting bin (II year OSHub project) will be installed. The maquette will be shown to other schools, policymakers and parents. It was chosen to link the fabrication of the maquette to a circular economy and use biomaterials.

The first exchanges with the teacher and the first visit of the school to Onl'fait were done during the OSHub programme funded by the EC but the manufacturing activities will continue in 2023 funded by the school itself.

DURATION

3 hours x 5 weeks at Onl'fait

3 hours x 5 weeks at school

TIMELINE

School year 2022/2023

PEOPLE ENGAGED

- Directly engaged:
 - 60 students corresponding to 470 interactions (interaction rate: 8)
 - 6 teachers corresponding to 63 interactions (interaction rate: 10.5)
 - 1 school head corresponding to 5 interactions (interaction rate: 5)
 - 1 parent/guardian corresponding to 1 interaction (interaction rate: 1)
 - 3 researchers corresponding to 10 interactions (interaction rate: 3)
 - 1 professional from NGOs corresponding to 8 interactions (interaction rate: 8)
 - 3 professionals from the private sector corresponding to 3 interactions (interaction rate: 1)
- Indirectly engaged:
 - 950 students
 - 32 teachers
 - 1 school head
 - 30 parents/guardians
 - 1 researcher

OTHER KINDS OF INTERVENTIONS – 6 sessions

SHORT DESCRIPTION

OSHub-CH organised 4 different types of interventions at school

- To introduce the programme to the partner classes and guide a reflection about community issues, technology and sustainability
- To facilitate the evaluation of the programme (zine)
- To present scientific researchers talking about their work and field of expertise
- To present the programme to the partner school and invite students to apply

DURATION

About 2 hours each

TIMELINE

2021 and 2022

PEOPLE ENGAGED

- Directly engaged:
 - 160 students

- 3 teachers
- 2 researchers
- Indirectly engaged:
 - 200 students
 - 10 teachers
 - 1 school head
 - 1 researcher



Figure 19: Zines made by participating students.

03 Science & Society Field Trips

SHORT DESCRIPTION

The school outings were an interesting part of the overall programme because students were fully engaged in the activities and had the opportunity to explore the chosen topic from a different perspective. In particular we organised 2 outings at MACO (la Manufacture Collaborative) to discover circular economy and alternative ways of consuming and producing. Students talked to different associations and assembled an object with re-used material. In May 2021 we organised a school outing with la Maison de la Rivière to make measurements of the quality of fresh water.

DURATION

3 hours

TIMELINE

2 sessions in May 2021

1 session in September 2022

PEOPLE ENGAGED

- Directly engaged:
 - 55 students corresponding to 55 interactions (interaction rate: 1)
 - 2 teachers corresponding to 2 interactions (interaction rate: 1)
 - 1 researchers corresponding to 2 interactions (interaction rate: 2)
 - 3 professional from NGOs corresponding to 6 interactions (interaction rate: 2)
- Indirectly engaged:
 - 3 professionals from NGOs



Figure 20 – 21: Students participating in science & society field trips.

02 Showcase of Open Schooling Projects

SHORT DESCRIPTION

At the end of 2020-2021 school year, Onl'fait invited the 3 participating schools to spend an afternoon together and conclude the programme. Students presented their work orally and with posters, participated in

an evaluation with their teachers and shared pictures in a convivial atmosphere. This event was an occasion for teachers to meet and exchange about the challenges and opportunities of Open Schooling.

A second showcase of the activities of OSHub-CH by teachers and students was organised at the space Aglr, a new space dedicated to sustainability at Science History Museum of Geneva with the collaboration of Museum staff. The miniexpo was organised on a Wednesday afternoon with the objective of presenting the methodology and concrete examples of Open Schooling in Geneva to other schools and teachers and the general public.

In addition to the communication made by Onl'fait with posters and on social media, the Science History Museum of Geneva also promoted the event on its website¹

<http://institutions.ville-geneve.ch/fr/mhn/archives/agr-technologie-et-durabilite-a-lecole/>

DURATION

Showcase 2021: 2 hours

Showcase 2022: 4 hours

TIMELINE

June 2021

June 2022

PEOPLE ENGAGED

- Directly engaged:
 - 80 students corresponding to 80 interactions (interaction rate: 1)
 - 8 teachers corresponding to 8 interactions (interaction rate: 1)
 - 2 school heads corresponding to 2 interactions (interaction rate: 1)
 - 5 parents/guardians corresponding to 5 interactions (interaction rate: 1)
 - 3 researchers corresponding to 10 interactions (interaction rate: 3)
 - 1 professional from NGOs corresponding to 8 interactions (interaction rate: 8)
 - 3 professionals from the private sector corresponding to 3 interactions (interaction rate: 1)
- Indirectly engaged:
 - 50 students
 - 15 teachers
 - 15 parents/guardians
 - 40 citizens (museum visitors)

¹ Communication of the showcase event in the website of the Science History Museum of Geneva <http://institutions.ville-geneve.ch/fr/mhn/archives/agr-technologie-et-durabilite-a-lecole/>



Figure 22: Poster to advertise the showcase event.



Figure 23 – 25: Images of the Open Schooling Showcase.

30 Teacher Support Sessions

SHORT DESCRIPTION

Onl'fait worked in close collaboration with the teachers during all the phases of development of the programme:

- To recruit and engage teachers and their classes
- To choose together the topics and the format of the programme
- To discuss the objectives and the organisation of sessions
- To evaluate the programme

We also exchanged regularly with the teachers who led autonomously sessions at school to support them with the needed expertise, mainly technical but sometimes related to tools and contacts. Onl'fait established good relationships with the teachers and their schools that will continue after the funding of OSHub-CH.

DURATION

30 – 60 minutes

TIMELINE

Throughout the whole programme

PEOPLE ENGAGED

- Directly engaged:
 - 4 teachers corresponding to 30 interactions (interaction rate: 7.5)
 - 1 school head corresponding to 10 interactions (interaction rate: 10)



Figure 26: Filming of the video „What do I need to know to get started?“ between an experienced OSHub teacher and a newcomer teacher.

02 Co-creation Sessions

SHORT DESCRIPTION

We organised 2 co-creation sessions in preparation of the following school year to choose the local challenges together with relevant stakeholders: students, teachers, science communicators, scientists, civil society, etc. The sessions included an introduction of Open Schooling and OSHub-CH and made use of some co-creation tools developed by OSHub-IE to engage stakeholders in the programme. Both sessions concluded with an apéro to facilitate informal exchange.

These co-creation sessions were key occasions to network and establish relationships that went beyond OSHub-CH.

The Reports of the co-creation sessions can be found in the footnote³.

DURATION

3 hours

TIMELINE

June 2020

June 2021

PEOPLE ENGAGED

- Directly engaged:
 - 2 students corresponding to 10 interactions (interaction rate: 2)
 - 15 teachers corresponding to 30 interactions (interaction rate: 2)
 - 1 school head corresponding to 2 interactions (interaction rate: 2)
 - 15 researchers corresponding to 30 interactions (interaction rate: 2)
 - 15 professionals from NGOs corresponding to 30 interactions (interaction rate: 2)
 - 7 professionals from the private sector corresponding to 14 interactions (interaction rate: 2)
 - 4 policy-makers corresponding to 8 interactions (interaction rate: 2)
- Indirectly engaged:
 - 10 students
 - 40 teachers
 - 1 school head
 - 15 researchers
 - 30 professionals from NGOs
 - 15 professionals from the private sector
 - 15 policy-makers



Figure 27: Stakeholders participating in a co-creation session to develop project ideas for the following school year.

34 Autonomous Sessions by teachers

SHORT DESCRIPTION

All teachers led several sessions which were part of the OSHUB-CH programme in collaboration with Onl'fait. Teachers used their weekly time in class to 1) talk about the science of the freshwater and/or carbon dioxide, 2) develop a full programme (making a worm composting bin) based on the Open Schooling principles, 3) lead a co-creation session, 4) prepare posters and other supports for dissemination and 5) evaluate their students.

DURATION

3 hours

TIMELINE

2021 – 2022

PEOPLE ENGAGED

- Directly engaged:
 - 90 students corresponding to 930 interactions (interaction rate: 10)
 - 4 teachers

01 Introducing OSHub presentation

SHORT DESCRIPTION

In the first months of the project, a presentation about Open Schooling in Geneva was made by the coordinator of OSHub-CH during a plenary meeting at the CFPP (pre vocational schools) to about 60 teachers and their school-head.

DURATION

30 minutes

TIMELINE

Beginning of 2020

PEOPLE ENGAGED

- Directly engaged:
 - 60 teachers corresponding to 1 interaction (interaction rate: 1)
 - 1 school head corresponding to 1 interaction (interaction rate: 1)
- Indirectly engaged:
 - 15 teachers

Resources

The activities of OSHub-CH, including hardware and processes, were documented and made openly available according to the Fab Lab chart regarding open source and open access. These resources can be found in the website of Onl'fait⁴ and, in particular, in the links below:

- **Freshwater monitoring**
 - *Github*
 - *Wiki*
- **CO₂ monitoring**
 - *Wiki*
 - The guidelines for this activity can be found in the *OSHub website*.

- **Biomaterials**

Food waste and biomaterials: Give a second life to food waste and fabricate biomaterials that can be used to produce small objects and accessories.

- The guidelines for this activity can be found in the *OSHub website*.
- Materiom project *website*

- **Open Science Hub Board**

A co-creation tool to get familiar with the Open Schooling methodology and to identify themes, resources and stakeholders involved in implementing a programme in the local community. The tool has been adapted from the Full Stack Tool Board, developed by IAAC, Barcelona.

- The guidelines for this activity can be found in the *OSHub website*.

- **Onl’fait – Educational Fab Lab | Equipment, management plan and safety**

Set of guidelines for establishing and running a Fab Lab, including materials, tools and equipment, as well as safety recommendations.

- These guidelines can be found in the *OSHub website*.

Dissemination and Communication Activities

ACTIVITY TYPE	# ACTIVITIES	INFORMATION ABOUT ACTIVITIES
Organisation of a Conference	1	Ars Electronica Festival 2021 – panel discussion Detailed information in the document in the footnote ⁵
Organisation of a Workshop	1	Ars Electronica Festival 2021 – workshop Detailed information in the document in the footnote ⁵
Press release	1	The focus of this press release was on partners and stakeholder engagement (no link)

Exhibition	1	<p>Mini expo Technologie et durabilité à l'école</p> <p>End of programme showcase for all students involved in OSHub-CH . The students displayed the outputs of their Open Schooling projects at the Natural History Museum of Geneva.</p> <p>Detailed information above</p>
Flyer/Posters	10	<p>Several flyers/posters were developed throughout the project: 1) to advertise events; and 2) to communicate the process and outcomes of workshops – these posters were developed by students that participated in the project.</p> <p>Examples above</p>
Social Media	36	Facebook and Instagram
Website	1	Webpage about OSHub in Onl'fait's website ⁶
Participation to a Conference	2	<ul style="list-style-type: none"> • ECSITE 2022 Pre-conference, organised jointly with the Open Schooling Together group⁷ • Science Comm 21 <p>Detailed information in the document in the footnote⁸</p>
Participation to an Event other than a Conference or a Workshop	2	<ul style="list-style-type: none"> • OStogether Inspiration Session #3 • OSHub Inspiration Session #6 <p>Detailed information in the document in the footnote⁸</p>

6 OSHub in Onl'fait's website: <https://www.onlfait.ch/portfolio/44/la-cite-de-science-ouverte/>

7 ECSITE 2022 Pre-Conference Session: <https://www.ecsite.eu/activities-and-services/ecsite-events/conferences/sessions/we-love-and-believe-open-schooling>

8 Conferences & Events: *Conferences & Events*

Video/Film	3	<ul style="list-style-type: none"> • “What is Open Schooling?” (made by the consortium)⁹ • “Why would you encourage a peer to take part?”, featuring a local partner¹⁰ • “What do I need to know to get started?”, conversation between an “experienced partner” and a newcomer¹⁰
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Participation in activities organised jointly with other EU project(s)	2	<ul style="list-style-type: none"> • ECSITE 2022 Pre-conference, organised jointly with the Open Schooling Together group • OStogether Inspiration Session #3 <p>Detailed information in the document in the footnote¹¹</p>
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Legacy

The fruitful collaboration established with la Maison de la Rivière, the Regional Government (canton) and the DIP (Department of Public Instruction) set the ground for the legacy of the activity after the end of the OSHub EU-funded years. We are currently writing a dossier to 1) transform the prototypes into educational kits; 2) refine the scientific objectives with the canton; and 3) work with the French partner (Interreg Programme) to introduce Open Schooling.

9 <https://opensciencehub.net/index.html>

10 https://opensciencehub.net/local_OSHub_CH.html

11 Conferences & Events: *Conferences & Events*