OSHub France

La Casemate

La Casemate, the centre for scientific, technical and industrial culture (CCSTI – Centre de Culture Scientifique, Technique et Industrielle) of Grenoble, was the first structure of this kind created in France, being now part of a network of around forty CCSTIs. Its main mission is to promote scientific, technical and industrial culture to all populations. La Casemate building includes an exhibition space and a fablab/makerspace, where a multi-disciplinary team, from the fields of culture, science, journalism, communication, mediation and project engineering, develops interactive exhibitions, science workshops, digital publications, Science Festivals, public debates and participatory events with stakeholders.

Within the OSHub project, La Casemate has chosen to settle at the heart of the Villeneuve neighbourhood of Grenoble, and to open the OSHub space – Espace de Science Ouverte – within La Machinerie, to work closely with the local inhabitants.

OSHub Team

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Public & Mediator Manager,
OSHub Project Manager

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Mediator La Casemate,
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Value Proposition

OSHub-FR works as a community hub that supports teachers and students developing new practices and projects using digital fabrication tools, to improve science and technology teaching, empower student's agency in their communities and promote connections and collaborations between local partners and schools.

Target public

Teachers and students, particularly from Villeneuve, a low socio-economic background neighbourhood from Grenoble

Management Board

01 Civil Society

- **La Machinerie**[1]
  Third place organisation dedicated to the performing arts and hybrid practices
  Type of relationship/interaction: OSHub-FR is established at La Machinerie; Promotion of the project, participation in the activities
  Contact frequency: Twice a month or once a week depending on the activities

01 Academia

- **Maison pour la Sciences en Alpes-Dauphiné**
  Nathalie Vuillod, *Training engineer*
  Type of relationship/interaction: Promotion of OSHub; organise training workshops for teachers
  Contact frequency: Every two months

1 La Machinerie: *https://machineriedesarts.ca/en/*

01 School

- **Lucie Aubrac Secondary School**
  Hugo Daumas, *Priority Education Networks coordinator*
  Type of relationship/interaction: Organise training workshops for teachers, Relay information for teachers
  Contact frequency: 4 times during the first year of the project
  Christophe Fasquel, *Leader of Lucie Aubrac Secondary school*
  Type of relationship/interaction: Promotion of OSHub; relay information
  Contact frequency: 4 times during the first year of the project

02 Government

- **Direction des services départementaux de l'éducation nationale**
  Sophie Thuillier, *pedagogical advisor in mathematics and science of departmental educational*
  Type of relationship/interaction: Promotion of OSHub; organise training workshops for teachers
  Contact frequency: Every two months

- **Ministry of Education**
  Anne Karine Piot Paquiet, *Education coordinator*
  Type of relationship/interaction: Promotion of OSHub; relay information
  Contact frequency: One meeting at the beginning of the project

Approach

OSHub-FR is a collaboration between La Casemate – CCSTI Grenoble and the third place La Machinerie located at Villeneuve, a low socio-economic background neighbourhood from Grenoble. La Machinerie works as a concierge and meeting place in the heart of the neighbourhood, where it hosts an open space for meeting and learning by doing, promoting the exchange of know-how and local initiatives by residents and actors from the neighbourhood (DIY, repair, homemade, reuse, digital, etc.). In addition, it provides access to several digital fabrication tools, such as 3D printers or laser cutters, allowing to develop and prototype projects and to create all kinds of objects.

As such, the collaboration between La Casemate and La Machinerie works as an effective synergy, where La Machinerie brings the space and mindset for community collaboration, and La Casemate the open science framework, tools and resources, thus creating the conditions to develop projects based on relevant issues together with the local inhabitants (youngsters, families, associations, etc.), by using a multidisciplinary STEAM approach and digital fabrication skills and tools. Furthermore, this participatory space also provides training and resources for educators, and organises workshops, meetings and events, bringing together the different kinds of local actors.

The role of OSHub-FR is to promote teacher's autonomy and skills that allow them to:

- develop and implement a project-based learning approach in a Fab Lab, creating opportunities for their students to explore, invent and transform abstract ideas into tangible objects by using digital technology;
- create new resources and tools that can be easily shared, adapted and used by the teacher community.

For that, OSHub-FR uses a combination of approaches, which comprise intensive training programs for teachers and/or in-class follow-up sessions.

Model

Below we describe the process of supporting teachers integrating a project-based learning approach in a Fab Lab together with their own class. This process includes a set of sessions, where a facilitator from OSHub-FR guides the teacher, in a real setting with their students, throughout each stage of the project, guaranteeing that the teacher gains the necessary competences to develop it autonomously.

Before starting, it is important to make sure that the following points are met:

- The objects that will be created are aligned with the educational objectives of the teacher and are integrated in a class project, that needs to be feasible in terms of skills, equipment and materials;
- The teacher acknowledges that, in addition to producing the objects, a fundamental part of the process is also learning how to design the objects using 2D or 3D design softwares. As such, before starting, it is important to define which parts will be designed and which software is needed;
- The teacher has connections with other teachers in the school and the technology teacher will be involved in the project,
- It is key to establish a calendar that includes the main project steps and the amount of time needed, and possible, to work with the students.

After this, the teacher and the OSHub facilitator make a project plan and define the type and number of workshops that will be implemented with the students.

This is highly dependent of the project that will be developed, but, as a starting point, one can consider the following general reference:

- Presenting and discussing the project with the class and how the OSHub facilitator will be helping
  1 session
- Training students on a design software program
  2 to 3 sessions

It is important to make sure that students have time to learn how to 2D/3D design depending on their age. If needed, alternatively one can search for files that have already been designed by others, or to use pictures or handmade drawings;

- Deciding on the type of machines needed.
  1 session
- Making test prototypes with recycled materials
  1 session

The exact number of sessions needed for the fabrication steps depends on the kind and size of the project, thus being difficult to define a precise number. However, the important point is to have students actively participating in ideation and drawing, so that they understand how to go from an abstract idea to creating the actual object, by experiencing the different stages of prototyping and testing.

Physical Space

OSHub-FR is established at La Machinerie – Fab Lab and third place – in La Villeneuve Grenoble. The Fab Lab is a 100 m^2 space with machines and tables to work with a class. In the Fab Lab, there is a place for the OSHub project, where it's possible to welcome the residents of the neighbourhood.

Figure 1 – 2: Photos of OSHub-FR physical space.

Partner Schools

NAME	LOCATION	SCHOOL YEARS	# STUDENTS	# TEACHERS	# SCHOOL HEADS	# OTHER (E.G. SCHOOL STAFF)	# PARENTS
Lucie Aubrac (collège)	Grenoble	Secondary	325 (13 classes)	6	2	2	25
Munch (collège)	Grenoble	Secondary	44 (2 classes)	2	-	-	-
Village Olympique (collège)	Grenoble	Secondary	22 (2 classes)	1	-	-	-

Implementation

To help build a community of teachers working on open science projects in Fab Labs, OSHub-FR organised teacher training sessions to illustrate the potential of a Fab Lab for them and their students. Teachers worked together to make game kits intended to carry out mathematical activities with their classes. In addition, OSHub-FR also supports teachers integrating a project-based learning approach in a Fab Lab together with their own class and organises maker workshops for children.

Overall, OSHub-FR impacted:

- Directly:
  - 391 students corresponding to 1 582 interactions (engagement rate: 4)
  - 9 teachers corresponding to 81 interactions (engagement rate: 9)
  - 55 community members corresponding to 56 interactions (engagement rate: 1)
- Indirectly:
  - 460 students
  - 325 community members

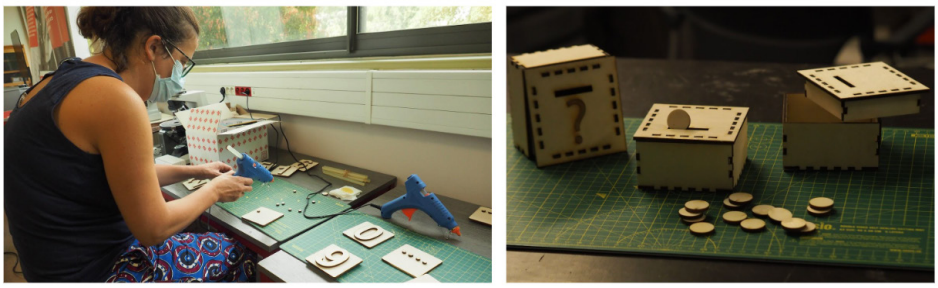

Figure 3 – 4: Photos from sessions at Fab Lab for teachers and students.

Partnerships

03 Academia

- **Pôle pédagogique Maths and Science**
  Type of relationship/interaction: Co-development of the contents of the workshop
  Contact frequency: 3 to 4 times a year

- **Maison pour la science**
  Type of relationship/interaction: Network for the professional development of teachers
  Contact frequency: 3 to 4 times a year

- **Direction de la culture scientifique**
  Type of relationship/interaction: Network of local researchers
  Contact frequency: Once during the first year of the project

01 Civil Society

- **La Machinerie**
  Type of relationship/interaction: Open physical space established in the Villeneuve neighbourhood, where the community (residents, teachers, students…) can come and share knowledge, experiences and local initiatives of the inhabitants and actors of the district.
  Contact frequency: Twice a month or once a week depending on the activities

Activities

02 Teacher Training Sessions

SHORT DESCRIPTION

OSHub-FR held 18 hours of training workshops for primary and secondary school teachers, over two days in September 2020 (10th/11th) and one day in September 2021 (10th). The objective was to support the teachers to use the Fab Lab to prototype the design of tools to teach mathematics to children aged between three and eleven years, and to test out how to use these tools in the classroom. The accompanying resource pack has been published as an Open Educational Resource on the La Casemate website: *https://fablab.lacasemate.fr/#!/projects/kits-pedagogiques-cycles-1-2-et-3-oshub* (see also Resources below).

For the 2021/2022 school year, the 5 kits have been made available to 10 schools in the neighbourhood along with activity sheets to enable teachers to organise work sessions with their students.

This has also been shared with teachers from all over the world at the Science on Stage Festival 2022[2], the largest European educational fair for STEM teachers, that brings together 350 primary and secondary school teachers from 30 countries to exchange best practices (Figure 7).

DURATION

First training session: 2 days, 10 – 11 September 2020
Second training session: 1 day, 10 September 2021

TIMELINE

The general outline of the training sessions was the following:

- learning how to use Fab Lab machines;
- designing with a 2D drawing software;
- choosing an activity and start prototyping it;
- making kits ready for testing and sharing the files;
- testing different maths activities and sharing experiences.

PEOPLE ENGAGED

- Directly engaged:
  - 12 teachers corresponding to 24 interactions (interaction rate: 2)
- Indirectly engaged:
  - 360 students

2 Science on Stage Festival 2022: *https://www.science-on-stage.eu/science-stage-festival-2022*

Figure 5 – 6 : Photos from sessions at Fab Lab for teachers and students.

Figure 7: Poster presented at Science on Stage Festival 2022.

59 Facilitated Sessions

SHORT DESCRIPTION

OSHub-FR supported teachers in a series of projects, both during the engagement and co-creation process with partners, as well as in the classroom, together with their student.

Project 1: Production of a collective fresco

SHORT DESCRIPTION

Production of a collective fresco by 300 students.

This project was communicated in several local/regional/national media outlets:

- Website of Les Cités Éducatives[3]
- Francetv, Auvergne-Rhône-Alpes[4]
- Dauphiné Libéré, Grenoble: article from the edition of 05 April 2021[5]

DURATION

4 months

TIMELINE

The project started being designed by the teachers in December 2020 and the workshops with the 13 classes of students were held from February to April 2021, in a total of 45 sessions.

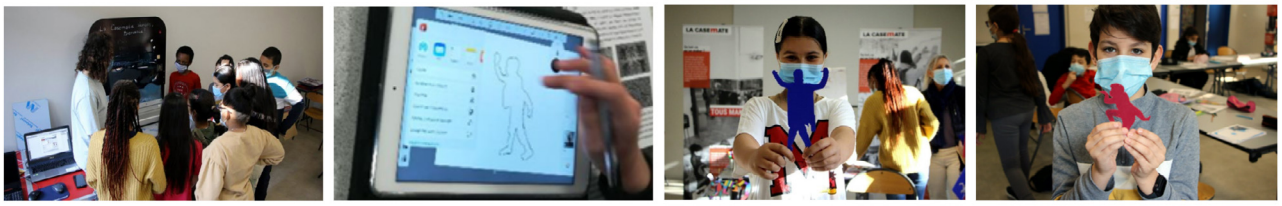

Figure 8 – 11: The different stages of making the silhouettes that will go into the college mural.

3 *https://www.citeseducatives.fr/cite/cite-educative-de-grenoble-echirolles/actions/le-projet-oshub-sinstalle-la-ville-neuve-de-grenoble*

4 *https://france3-regions.francetvinfo.fr/auvergne-rhone-alpes/emissions/jt-1920-alpes*

5 *https://www.ledauphine.com/education/2021/04/05/villeneuve-les-eleves-realisent-une-fresque-pour-s-approprier--leur-college*

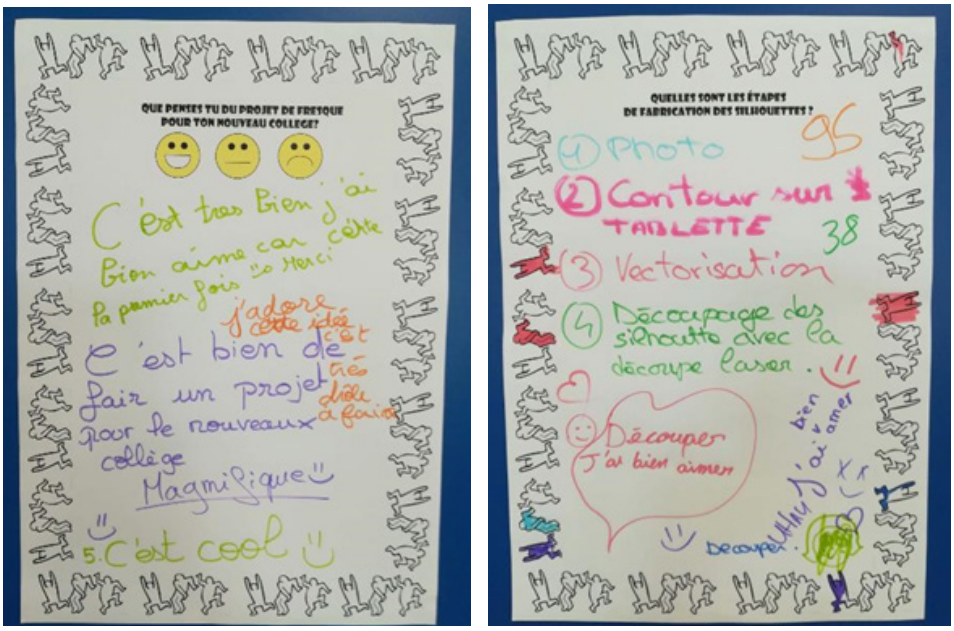

Figure 12: students have given feedback on the project and explain what they have learned.

Project 2: Production of a science exhibition "How to survive on a desert island?"

SHORT DESCRIPTION

Production of a science exhibition "How to Survive on a desert island" with 25 students.

At the end, students presented the exhibition to other students and to their parents.

DURATION

4 months

TIMELINE

- March 2021: 1 meeting with the teachers and partners
- April 2021: 1 meeting with the teacher
- June 2021: 2 sessions with the students

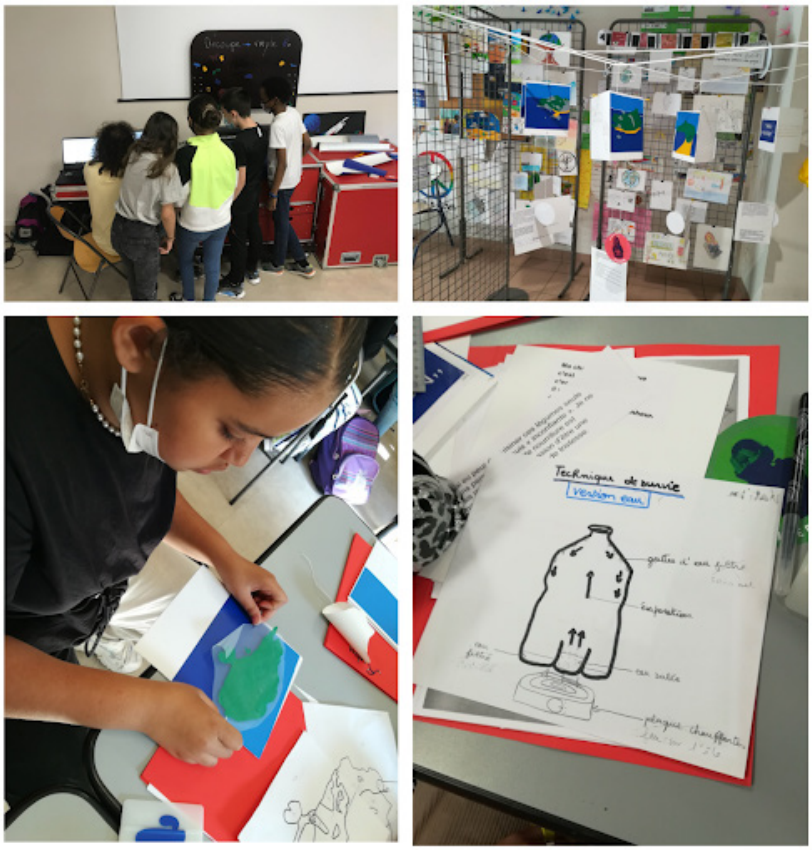

Figure 13 – 16: The different stages of making the exhibition with the vinyl cutter and the laser cutter.

Project 3: Chicken coop automatic door 5 work sessions

SHORT DESCRIPTION

Building an automatic door and producing a video to participate in the „Science Factor" challenge. The video produced by the students can be found in the footnote[6].

DURATION

6 months

TIMELINE

From November 2021 to April 2022, in a total of 5 sessions

6 Chicken coop automatic door video for Science Factor challenge: *https://sciencefactor.fr/concours/projet.php?projet_url=recup-chicken&e=2021/2022*

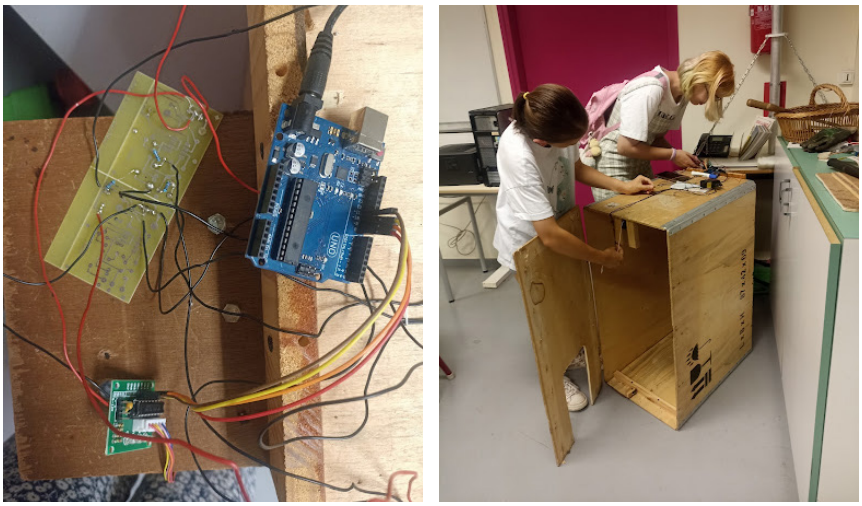

Figure 17 : Students built the prototype and tested the automation of the chicken coop door.

Project 4: A vegetable garden for my school

SHORT DESCRIPTION

This project was developed to integrate school programs about healthy eating, sustainable development and well-being at school.

DURATION

4 months

TIMELINE

- January 2022: 2 sessions with the teacher to design the project
- January – March 2022: 3 workshops sessions to build the project with the students
- April 2022: 1 session for prototyping, at La Machinerie

Figure 18 – 21 : students set up their vegetable garden and make signs explaining the growing conditions.

Project 5: My City, My Planet

SHORT DESCRIPTION

This project was intended to produce a video showcasing the initiatives in their area that contribute to the development of local solutions to reduce CO_2 impact, enhance food quality, reduce waste and develop local gardens, amongst other initiatives.

DURATION

6 months

TIMELINE

The initial discussions with the teacher leading the project started in December 2020 and the project design was concluded by September 2021. After that, OSHub-FR facilitated two workshops with the students, one about video shooting and editing, in January 2022, and the second one at La Machinerie, in March 2022.

Figure 22 – 25 : Students toured La Machinery, made pulp, and recounted their experience with zines.

PEOPLE ENGAGED (FOR ALL FACILITATED SESSIONS)

- Directly engaged:
  - 114 students corresponding to 1349 interactions (interaction rate: 12)
  - 10 teachers corresponding to 47 interactions (interaction rate: 5)
  - 4 school heads corresponding to 7 interactions (interaction rate: 2)
  - 20 parents/guardians corresponding to 20 interactions (interaction rate: 1)
  - 1 professional from NGOs corresponding to 2 interactions (interaction rate: 2)
- Indirectly engaged:
  - 80 students
  - 325 parents/guardians

02 Showcase Events of Open Science Hub

SHORT DESCRIPTION

Open Day to present OSHub to the public, namely to adults and families from the neighbourhood, as well as sharing engaging ways of programming (through Makey Makey or Scratch activities).

DURATION

One afternoon

TIMELINE

Two events that took place in June 2021

PEOPLE ENGAGED

- Directly engaged:
  - 20 parents/guardians corresponding to 20 interactions (interaction rate: 1)
- Indirectly engaged:
  - 20 children

Figure 26: Poster for OSHub-FR showcase event.

Figure 27: Several workshops were proposed : scratch, makey makey, sewing machine.

04 Workshops for students

Project 1: Science Discovery program with youngsters from the neighbourhood

SHORT DESCRIPTION

Weekly program for discovering science and experimentation through different activities, from programming to electronics and DIY Fab Lab opportunities.

DURATION

4 months

TIMELINE

15 weekly sessions from January to April 2022

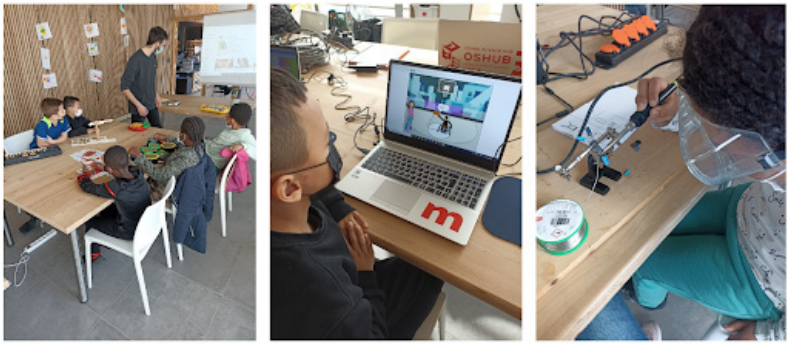

Figure 28 – 30 : Young students learning welding techniques.

Project 2: Making kites workshop

SHORT DESCRIPTION

Discovering air and its properties by learning how to make a kite with recycled materials and tools in a Fab Lab. This activity was communicated at the Cités Éducatives website[7].

DURATION

3 days

TIMELINE

3 workshop sessions

Figure 31 – 33: Young students making their kite.

Project 3: Creative coding in collaboration with the Orange Foundation

SHORT DESCRIPTION

One day of creative coding and robotics organised together with the Orange Foundation. This workshop was communicated in Orange Foundation's twitter account[8].

7 *https://www.citeseducatives.fr/cite/cite-educative-de-grenoble-echirolles/actualites/apprendre-le-cerf-volant-pendant-les-vacances*

8 *https://twitter.com/OrangeAuRA/status/1458017510767398912*

DURATION
One day session

TIMELINE
October 2021

Figure 34 – 35: Students in two classes learning how to program small robots.

Project 4: T-shirt customisation with a flex cutting machine

SHORT DESCRIPTION
Learning how to design and draw in 2D, as well as cutting and customising fabrics by using a laser machine.

DURATION
One day session

TIMELINE

June 2022

Figure 36 – 37: Students learning how to use the vinyl cutter to customize t-shirts.

PEOPLE ENGAGED (FOR ALL WORKSHOPS)

- Directly engaged:
  - 81 students corresponding to 233 interactions (interaction rate: 3)
  - 10 teachers corresponding to 10 interactions (interaction rate: 1)
  - 3 school heads corresponding to 3 interactions (interaction rate: 1)
  - 5 parents/guardians corresponding to 5 interactions (interaction rate: 1)
  - 7 professionals from NGOs corresponding to 7 interactions (interaction rate: 1)
- Indirectly engaged:
  - parents of all students (100 persons aproximately)

Resources

- **Mathematics pedagogical kits**

  Resource pack to support teachers to use the Fab Lab to prototype the design of tools to teach mathematics to children aged between three and eleven years, and to test out how to use these tools in the classroom.

  - Resources available in *La Casemate's website*

- **Make your own kite**

  Discover air and its properties and learn how to make your own kite with recycled materials and tools in a Fab Lab.

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

- **How to engage and support teachers developing pedagogical practices and activities using Fab Lab tools**

  A set of guidelines on how to establish a small Fab Lab / Tinkering Lab, including information about materials, safety and troubleshooting, based on the experience of OSHub-FR.

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

Dissemination and Communication Activities

ACTIVITY TYPE	# ACTIVITIES	INFORMATION ABOUT ACTIVITIES
Organisation of a Workshop	2	OSHub Open Day Detailed information above
Press release/ Articles in media outlets	4	• Website of Les Cités Éducatives[9,10] • Francetv, Auvergne-Rhône-Alpes[11] • Dauphiné Libéré, Grenoble[12] More information above

9 *https://www.citeseducatives.fr/cite/cite-educative-de-grenoble-echirolles/actions/le-projet-oshub-sinstalle-la-ville-neuve-de-grenoble*

10 *https://www.citeseducatives.fr/cite/cite-educative-de-grenoble-echirolles/actualites/apprendre-le-cerf-volant-pendant-les-vacances*

11 *https://france3-regions.francetvinfo.fr/auvergne-rhone-alpes/emissions/jt-1920-alpes*

12 *https://www.ledauphine.com/education/2021/04/05/villeneuve-les-eleves-realisent-une-fresque-pour-s-approprier--leur-college*

Exhibition	2	• Student-made collective fresco • Student-made exhibition: How to survive on a desert island? Detailed information above
Flyer/Poster	2	• Flyer for OSHub Open Day • Poster for Science on Stage Festival 2022 Detailed information above
Training	2	Teacher training sessions to support teachers to use the Fab Lab Detailed information above
Social Media	20	Twitter: • Reach: 10 500
Website	2	Web pages about OSHub in La Casemate's website[13]
Participation to a Conference	1	Science on Stage Festival 2022 Detailed information in the document in the footnote[14]

13 Web pages about OSHub in La Casemate's website: *https://lacasemate.fr/qui-sommes-nous/reseaux/europe/; https://lacasemate.fr/fab-lab-et-co/open-science-hub/*

14 *Conferences & Events*

Video/Film	2	• "What is Open Schooling?" (made by the consortium)[15] • "Why would you encourage a peer to take part?", featuring a local partner[16] • "What do I need to know to get started?", conversation between an "experienced partner" and a newcomer[16]

Legacy

The OSHub project, and the collaboration with La Machinerie, allowed to establish a science-driven community hub, based on digital manufacturing and project prototyping, in the Villeneuve neighbourhood, where, in general, students, teachers and families are not familiar with STEAM and with these kinds of techniques.

This program will continue in the future, and some teachers from the local schools are already planning the development of this year's projects at the hub.

15 *https://opensciencehub.net/index.html*
16 *https://opensciencehub.net/local_OSHub_FR.html*