



**OPEN
SCIENCE
HUB**

**EMPOWERING CITIZENS
THROUGH STEAM
EDUCATION WITH
OPEN SCHOOLING**

DELIVERABLE 4.5

Handbook of OSHub.Net Workshops & Activities



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Abstract	This document provides an overview of a number of activities developed by local Open Science Hubs (OSHub) throughout the timeline of the project, so that they may be adapted and implemented by educators.
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LIST OF ACRONYMS

ACRONYM	DEFINITION
AE	Ars Electronica
CCSTI	Centre de Culture Scientifique Technique et Industrielle de Grenoble
EC	European Commission
FAB	Onl’Fait
MFCR	Município de Figueira de Castelo Rodrigo
SCICO	Epistimi Epikoinonia
IH	Impact Hub Siracusa
KPI	Key Performance Indicators
OSHub	Open Science Hub
OSHub-AU	Open Science Hub – Austria
OSHub-CH	Open Science Hub – Switzerland
OSHub-CZ	Open Science Hub – Czech Republic
OSHub-FR	Open Science Hub – France
OSHub-GR	Open Science Hub – Greece
OSHub-IE	Open Science Hub – Ireland
OSHubMB	Open Science Hub Management Board
OSHub.Network	Open Science Hub Network
OSHub-NL	Open Science Hub – The Netherlands
OSHub-PT	Open Science Hub – Portugal
PT	Portugal / Portuguese
SCIN	SCIENCE IN
STEAM	Science, Technology, Engineering, Art, and Mathematics
TCD	Trinity College Dublin
ULEI	Leiden University
WP	Work Package

EXECUTIVE SUMMARY

This document has been produced by the Open Science Hub Network as Deliverable 4.5: Activity Handbook, and contains a variety of workshops and activities that teachers and educational facilitators may adapt and use to implement open schooling practices within their own contexts.

The Open Science Hub Network is an EU project which works towards promoting school-led community development through research and innovation. It has been operational since October 2019, and was funded by the European Union's Horizon 2020 Framework Programme for Research and Innovation.

Open Science Hubs (OS Hubs) have been created in eight countries as part of the project. These operate as mediators in each local community, where they support schools to become active agents for collaboration between families, universities, industry, local governments and civil society. The activities position schools as drivers for societal innovation and community well-being, by engaging in real-life projects where school and community needs are at the core of the collaborative projects undertaken.

As such, a local OS Hub is composed by their local team, a local management board – which consists of different stakeholder groups that are involved in all key processes and decisions of the local OS Hubs – and their partner schools, with whom they work closely and in a manner that is aligned with their needs and context. Moreover, each OS Hub is rooted on their local challenges, which can be of different nature, depending on the local reality.

In this deliverable, we provide descriptions of various activities and workshops that were developed by project partners in the OS Hub network, which can be divided into four categories; Inspiration Workshops, Learner Activities, Reflection and Evaluation Tools and Educator Training. These workshops and activities will introduce both learners and teachers to open schooling practices, and demonstrate the benefits of working with local stakeholders towards the development of communities using research and innovation. The activities are transdisciplinary and approach societal challenges through such a lens, incorporating science, technology, art and culture. All educational resources contained in this handbook are open access and allow for adaptation into different contexts.

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1. INTRODUCTION

1.1 Background: about OSHub.Network

The Open Science Hub Network (OSHub.Network), a consortium of nine partners across Europe, engages schools and local stakeholders in research and innovation as a tool for sustainable community development.

More specifically, the OSHub.Network has established a European network of community hubs – OS Hubs, in communities that traditionally do not engage with research and innovation due to various barriers, geographical location, socio-economic status, or ethnic minority group background. OS Hubs inspire, empower and engage citizens – from school children to senior citizens – in STEAM (Science, Technology, Engineering, Arts and Mathematics) learning and research opportunities, grounded on collaboration with societal agents.

As such, local OS Hubs work as mediators in their local communities, positioning schools as active agents for collaboration between civil society, enterprises, research institutes, and families. This is performed by promoting an open schooling approach grounded in community-based participatory practices: throughout this process, schools and communities identify local relevant challenges, which are then transformed into relevant research and innovation – based education projects, led by learners and teachers, in collaboration with local stakeholders.

With the objective of ensuring joint principles and processes, the OSHub.Network has developed a common methodological framework based on social innovation processes (by adapting the Social Innovation Business Model to the OSHub project) that entail a set of building blocks: school engagement, stakeholder engagement, community building, local-to-global challenges; open schooling co-creation; value proposition; and technical and financial feasibility plans.

To guarantee diversity, inclusion and sustainability, OS Hubs are composed by their local team, a local management board – which consists of different stakeholder groups that are involved in all key processes and decisions of the local OS Hubs – and their partner schools, with whom they work closely and in a manner that is aligned with their needs and context. Importantly, each OS Hub is rooted on their local challenges, which can be of different nature, depending on the local reality.

By supporting local schools and communities with the tools and network to tackle relevant challenges, OS Hubs have allowed the establishment of community infrastructures that create local impact while simultaneously promoting an active global citizenship attitude, thus contributing to community development, innovation and well-being.

To encourage usage and maximise impact in Europe and beyond, all resources, products and solutions developed by OSHub.Network are fully based on Open Standards, such as open education, open technology, open science, open hardware, open design and open architecture. Also, OSHub.Network has created an online platform to share OSHub expertise, resources, and best practices with all OS Hubs, their partners and the communities they

serve. To ensure the legacy and reach of the project, all OSHub.Network resources are also being shared on existing large online educational repositories, and relevant national networks and repositories.

Finally, OSHubs have developed legacy and sustainability plans, and some are working with local governments and the private sector, to ensure that local OSHub has the tools and resources to continue beyond the lifetime of the project, and that the Open Schooling approach is incorporated in the school vision and organisational structure.

In the long-run, OSHubs are envisioned as education brokers in their local communities, supporting local school networks to incorporate Open Schooling in their vision and organisational structure, leading to sustainable quality of education. Most particularly, OSHubs will facilitate the bridge between the needs and realities of schools and their local context and resources, as well as brokering for implementing national/regional policies, passing along signals from schools when policies are failing and advocating for context-sensitive policies.

1.2 What is Open Schooling?

As the world moves forward within innovation and research, complex societal challenges also arise. These challenges are often deep rooted in science and technology, and require an understanding of these topics, not just from experts in these disciplines, but across society in general. A change of perspective in science education may serve to assist citizens to develop positive attitudes towards science, and to empower them to apply scientific knowledge and ways of thinking to address societal challenges such as climate change, health crises, and the rise of misinformation.

One proposed method is Open Schooling. Open Schooling is a broad term describing ,open' learning in terms of timing, location, teaching roles, teaching methods, access modes and any other factors related to learning processes. It aims to connect schools, communities, researchers, policy makers, innovators and other external stakeholders, fostering partnerships which work towards addressing local challenges and aiding sustainable community development. It promotes the sharing of ideas, knowledge, skills and resources across disciplines¹.

Open Schooling is governed by the principles of openness, so resources developed may be shared with those who also wish to implement such practices within their own learning contexts. These resources are free and adaptable by any learners who may benefit from such activities.

1 Hazelkorn, E., Ryan, C., Beernaert, Y., Constantinou, C., Deca, L., Grangeat, M., Karikorpi, M., Lazoudis, A., Pintó, R., & Welzel-Breuer, M. (2015). Science Education for Responsible Citizenship. <https://doi.org/10.2777/12626>

1.3 How to use this handbook

This handbook contains a list of activities and workshops that were developed and implemented by members of the OSHub Network as part of the OSHub project, that have now been compiled so that teachers, facilitators and other community members may implement open schooling practices and activities within their own context.

The activities and workshops are separated into various categories:

1. Inspiration Workshops

Inspiration workshops were developed and implemented by Trinity College Dublin, OSHub Ireland. The overall aim of these workshops is to spark curiosity in topics across science and citizenship with a large focus on discussion and students bringing their own lived experiences to the table.

For the educators leading these sessions, it is very important to note that they are primarily in the role of 'facilitator' – working with the students as opposed to for them. Although there is some knowledge dissemination and context setting in each workshop, the majority of time is dedicated to activities and discussions.

These workshops can be carried out as a once-off activity, or can be used to open students up to different perspectives and topics which can be used in the last of these workshops, the Ideation sessions. This is a series of up to three co-creation sessions designed to collaboratively select a challenge, topic or initial project idea for an Open Schooling project.

For more context and information surrounding these Inspiration Workshops, you can visit the *Open Science Hub Ireland Teacher Handbook 2022/23*.

2. Learner Activities

A number of activities showcased here allow learners to explore scientific and technological topics from multidisciplinary perspectives, such as understanding biodiversity through sound, learning electronics to help the local community, or considering the ethics of research. They focus on skill building and the applicability of science to everyday life, and are easy to implement (with the right equipment).

Two activities can be done in any learning location, while the other three require equipment found in a workshop, makerspace or Fab Lab (see 1.4 Useful Definitions). As these activities were developed in the context of local OS Hubs, some instructional material may need translating from the original language.

3. Reflection and Evaluation Tools

Reflecting on an educational journey is important, not just for the learner but also for the educator. It allows the learner to look further than just the topic they learned about, but to consider the entire process, and how they felt during this process, allowing for an emotional response to be explored. Reflecting allows the educator to consider what they felt went well, and what they too learned in the process from the learners that they can utilise the next time they facilitate the same or similar experience.

Reflections by learners can also be utilised by educators as a form of evaluation, which is crucial in Open Schooling due to the new dynamical partnerships being formed and investigations of unexplored societal topics. It is beneficial to evaluate how things went in a project to ensure even better success the next time round.

In this section, we present four activities that can be utilised for reflection and evaluation of lessons, workshops and activities, but can also be adapted to being activities of their own for exploration of a brand new topic.

4. Educator Trainings

The final two activities/workshops are aimed to empower educators to foster open-schooling practices within their community. They introduce educators to the concept of Open Schooling, demonstrate how to facilitate co-creation and innovation sessions, and provide them with the skills and knowledge to foster collaborations between their school, their learners and local community.

One is a board game, which can be used as an easy introduction to all stakeholders, not just educators. The other is a 10-lesson module, focused more towards teachers and informal learning educators. Educators may use the skills gained from these activities to then successfully implement the activities outlined in this handbook.

Adaptation

In the spirit of Open Science, links to resources are found within the handbook and are open-access. However many of these resources were developed within a specific context, due to the nature of the OSHub project. Therefore activities should be used as inspiration but can also be adapted to fit any context. Language translations may also be necessary as these were developed in the local language of multiple different EU countries.

1.4 Useful definitions

Throughout the handbook you will see references that may not be familiar to you. To help with this, we have compiled a list of definitions to improve your user experience.

PHRASE	DEFINITION	RESOURCES
Co-creation	The act of creating together. An approach to design, attempting to actively involve all participants in the process to ensure the result meets their needs and is usable.	<i>SISCODE</i>
Fab Lab	A Fab Lab (sometimes written FabLab/Fablab) is a workspace where visitors have access to skills, materials and technology to explore, learn and invent in the realm of digital.	<i>Fablabs.io</i>
Maker Movement	The Maker Movement is a movement towards artisan culture, fostering creative and collaborative communities where people build, make, tinker and share skills and ideas to solve problems. Facilities have been developed with this culture in mind, such as Makerspaces. These are open laboratories or workshops that provide the equipment, technology and open space required for innovation.	<i>Make: Community</i>
Miro Board / Jamboard	Virtual whiteboard tools that can be used for brainstorming, collaborative activities and presenting of ideas.	<i>Miro.com Jamboard</i>
Sustainable Development Goals (SDGs)	The United Nations' Sustainable Development Goals are a call to action for all nations of Earth to work towards creating a better, sustainable future for our planet and for society. The 17 goals cover different challenge areas such as poverty, climate change and inequality, and recognise that strategies to combat such issues are not discreet, but overlap and are often multidisciplinary.	<i>THE 17 GOALS Sustainable Development</i>
Stakeholder	A party that has an interest in or connection to a particular project or programme, and can be affected by the outcomes of such.	
Tinkering	Tinkering can be thought of as a way of 'thinking with your hands', where learners explore topics and challenges through the process of design, creation and collaboration.	<i>Tinkering EU: Building Science Capital for ALL</i>
Third Place	An open space where individuals can meet to work, appropriate knowledge and/or skills, to meet or simply exchange informally.	

2. INSPIRATION WORKSHOPS

2.1 Session Title: Diversity and Astronomy

ACTIVITY IN A SENTENCE:

An exploration of how diversity affects decision making and the selective sharing of knowledge based on dominant cultural identities, all through the lens of astronomy.

DISCIPLINES INVOLVED IN ACTIVITIES:

Diversity, Astronomy, Science Communication, Art, Cultural Studies, Activism

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Classroom, informal learning environment

LEARNING OUTCOMES:

- Able to reflect on one's own identity in relation to others
- Understanding of the impact diversity has on decision making
- Understanding the influence of storytelling on science communication
- Able to express one's own cultural identity through storytelling

Cultural diversity forms and shapes trust, bias and activism in society. When activating a project it is vital to understand the culture you are working with and know what cultural shift you may create, intentionally or otherwise.

RECOMMENDED EXPERTISE:

Experience with facilitation is recommended.

SDG LINKS:

- *Goal 5: Achieve gender equality and empower all women and girls*

- Goal 10: Reduce inequality within and among countries

TIME IT TAKES TO COMPLETE:

45 – 60 mins

MATERIALS / RESOURCES NEEDED:

- Presentation Slides
- 3x A4 paper, pencil and ruler per learner
- Cardboard box per learner and tape (OPTIONAL – if choosing Part 3, Option 2)
- Web-enabled device, preferably laptop/computer per learner (OPTIONAL)

CONTENT FOR LEARNERS:

- Presentation – *ActivityHandbook – Diversity and Astronomy.pptx*
Note: Copy the presentation into your own folder before editing.

Activity

INTRODUCTION:

Part 1: Empathy Map

To lay the foundation for this workshop, start by asking learners to divide a page in four with a pencil and write 'learner' in the middle and in each corner write: SEE (top left), DO (top right), THINK (bottom left), FEEL (bottom right). See Figure 1 for an example. A version of this can also be found in the slides linked above.

This is an empathy map for a typical learner where the person 'steps into' the shoes of another to build a picture of their likes, dislikes, wants and needs – a persona.

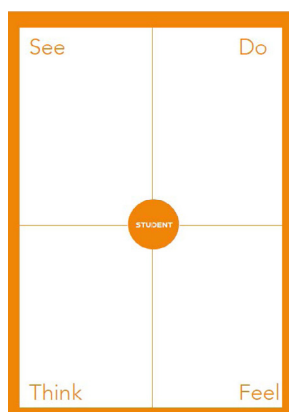


Figure 1: Empathy Map. Credit: Open Science Hub Ireland Teacher Handbook 2022/23.

Explain that the persona is a 'learner' and ask them to write as many things as come to mind for each of the four categories. As they are learners themselves they should have plenty of experience to draw from, but it may be useful for them to think of another person other than themselves. If it helps, the learner can be in primary school, secondary school or University.

Next, ask learners to make the same layout again on a new page, but pick one of the professions seen on the relevant presentation slide (Empathy Map For Another). They should put this persona (e.g. 'astronomer') in the middle and write as many things that come to mind for each of the see/ do/ think/ feel categories. Learners do not need to have been introduced to the professions on the slide – just what they think a person in that profession might typically see, do, think and feel.

Ask the following prompts to open discussion about perceptions of careers and people in those careers:

- Do you associate a particular gender with the profession you chose for the second empathy map? Why or why not?
- Do you associate a particular age with that profession? Why or why not?
- Do you associate a particular country or culture with that profession? Why or why not?

Optionally, you can ask learners to use the other side of their A4 page to sketch a cartoon of what a person typical of the profession looks like (clothes, gender, accessories all come into play). This can be done before the prompts above or instead of them, both with the goal of opening up conversations around perceptions of what a scientist/ artist/ civil servant etc 'should' look like.

Show learners the gender breakdown pie chart and explain that this is representative of all the professional astronomers operating worldwide. This is an approximate 80/20 male / female split with 0.1 percent of astronomers under the category 'other'.

- Is this gender breakdown what you would expect for this profession? Why or why not?
- If we were measuring how 'diverse' the global population of astronomers is, what other demographics could you report on?
- Is the way gender is reported here good enough? (Think about someone forced to choose 'other' as their gender identity).

Part 2: Decisions and Diversity

2.1 Background information

Since people around the world could look up at the stars and talk about them, they have named them and drawn imaginary lines between them to make stories to tell around campfires. The names and stories varied from country to country, but dominant countries and empires spread their stories far and wide. Astronomers call these star patterns constellations.

Fast forward to the early 20th century and astronomers are working together across the world from many different countries and cultures. In 1919 an organisation called the International Astronomical Union was formed to decide on standard naming conventions for professional astronomers to use consistently worldwide. This meant one starmap for all to use with commonly recognised star patterns and names for stars, planets, moons, asteroids, and more.

All professions involve a level of decision making and some decision makers are doing so on behalf of a diverse population – locally, nationally or even internationally. The decision makers often don't reflect the diversity of the population their decisions are affecting. Today astronomers use constellations that don't necessarily reflect their own cultural identity and yet open any popular astronomy app today and you'll be presented with depictions of Greek stories of animals, people and objects.

2.2 Activity instructions

If learners have access to the Internet, direct them to *Stellarium Web* on their devices, otherwise you can display this on a screen in the classroom. Along the bottom, the first two icons can be clicked to reveal constellations and their associated artwork.

- Ask learners if they recognise any of the characters/stories.
- Ask learners to find a star name beginning with 'Al' (they will need to zoom in).
- When everyone has found an example they can share what one they've found and then you can explain that those star names are latinised versions of arabic star names (Al – being the arabic for 'the').

Although there are alternative names for all these stars these are the primary names used across the world and show the influence of the work and writings of Arabic astronomer Al-Sufi who produced a famous star catalogue called 'The Book of Fixed Stars' in 964 CE.

The stories represented by these star names and constellations are of their time and place and are like a 'hall of fame' in the sky. Ask learners which person, animal or object would they want represented in the night sky so that they are honoured for centuries to come.

Part 3: Decisions and Diversity

3.1 Background information

Explain to learners that the digital planetarium they (or you) used was created in part thanks to data from a space telescope built by the European Space Agency (ESA) called GAIA.

GAIA measures the positions and motions of more than one billion stars in our galaxy, the Milky Way. All the stars in our galaxy (including the Sun) are moving through space – very fast – but space is very big and seeing any change in their position takes a long time. We call this movement the 'proper motion' of stars.

Playback the video in the presentation ideas in *Stellarium Web* explaining that they are seeing where stars will move over the course of the next two million years. As can be seen, the constellations lose their shape and the stories they had assigned to them become meaningless.

3.2 Activity Instructions

For this concluding activity learners can construct their own constellation in two ways. The concept is that learners are creating a time capsule of new constellations that could be presented to the IAU for use in the distant future to replace the constellations as they warp and make their original star stories redundant.

What are learners' star stories for the year 2 million?

Option 1: Simple drawing

- Ask learners to take a sheet of paper or card and randomly dot it with 10-15 points using a pencil.
- Ask learners to try to come up with a pattern that represents something they would want represented in a constellation to replace the old Greek legend – something that speaks to their cultural identity, something they would want others to celebrate.
- Ask around for learners to share back to the group.

Option 2: Crafting a light box

- Ask learners to take their cereal boxes and carefully separate the seams so it can be turned inside out and taped on the side and at just one end.
- Ask learners to dot one face of the box with 10-15 points using a pencil.
- Ask learners to try to come up with a pattern that represents something they would want represented in a constellation to replace the old Greek legend – something that speaks to their cultural identity, something they wish others would celebrate.
- When they are satisfied with their pattern, ask them to draw pictures around their patterns and write any notes nearby like the name of this new constellation and any story notes.
- Ask around for learners to share back to the group.
- Finish by asking learners to use their pencil to carefully punch holes where their dots are. Learners can then use a light source such as their phone torch and place it in the box so that the light passes through the holes to represent the stars.
- The lights can be turned off and blinds closed to see the constellation light boxes at their best. If possible all the light boxes can be combined to form a 'class star chart' representing the mixed cultural identities of the group.

USEFUL LINKS:

- [IAU Springboard to Action: Recommendations for improving equity, inclusion and diversity in Astronomy](#)

Credits: This activity session was developed by Trinity College Dublin, OS Hub Ireland.

2.2 Session Title: Sustainability and Future Cities

ACTIVITY IN A SENTENCE:

An exploration into sustainable living and current and potential future challenges our world faces, how we can come together to tackle these challenges as local communities and a global society.

DISCIPLINES INVOLVED IN ACTIVITIES:

Climate change, Sustainability, Citizenship, Technology, Science, Equity

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Classroom, informal learning environment

LEARNING OUTCOMES:

Learners will:

- Explore the current and future global challenges our world faces.
- Gain an understanding of the 3 pillars of sustainability.
- Creatively design for a future society that tackles some of the challenges our world faces.

Sustainability is a theme that intersects with almost every UN Sustainable Development Goal. In the face of a climate crisis, sustainable living is a crucial goal for societies around the globe. This activity supports learners to think critically about what it means, and what we can do, to live sustainably.

RECOMMENDED EXPERTISE:

Facilitation experience is recommended.

SDG LINKS:

- *Goal 1:* End poverty in all its forms everywhere
- *Goal 17:* Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development

TIME IT TAKES TO COMPLETE:

45 – 60 mins

MATERIALS / RESOURCES NEEDED:

- Presentation Slides

Options for Design Section (Part 3)

- Option 1: Large paper (A2) / Pens, pencils or markers to draw or colour
- Option 2: Large paper (A2) Magazines and glue for collage
- Option 3: A computer with internet connection for each group

CONTENT FOR LEARNERS:

- Presentation – *Activity Handbook: Sustainability and Future Cities*
Note: Copy the presentation into your own folder before editing.

Activity

INTRODUCTION:

Part 1: The Challenges We Face

1.1 Challenges we see in media

Note: This is the hook for the lesson so give plenty of time for learners to talk and become invested in each other's thoughts.

Ask the group the question presented on the slide "What is your current favourite movie/book/tv show or piece of media?" Allow each member of the group time to say their answer.

- Ask the group if they see any pattern in the answers provided, do they have anything in common. In most of the shows you will see that the main character(s) have faced some type of challenges and throughout the show they try to make it right.
- Discuss what happens in one of their shows, or choose your own favourite show to speak about. If this is uncomfortable for you an example is provided below

In show writing, the protagonist(s) usually gets agency from some sort of problem, issue or tragedy. The world of the protagonist(s) has fallen into chaos and has been disrupted from the normal balance of things. We live in a world that is in constant need of re-balancing. We need to make smart decisions to keep things from falling into chaos as we move forward. This can be referred to as sustainability.

Most of a protagonist's journey is them searching for a sustainable, less chaotic life. It also shows that love for drama is founded upon an innate curiosity for overcoming challenges. We will investigate some of the challenges in today's class.

Example Provided — Attack On Titan

- The protagonists within this story live within three large ringed sets of walls the smallest of which is 3 feet high. The poorest folk live within the first wall (Maria), the upper class live within the second wall (Rose) and the highest most noble class live within the 3rd (Sinah).

- These walls are constructed to protect from the dangers beyond the wall known as titans. These are giant sized humanoid like creatures whose only goal is to eat people. The protagonists have no choice but to live inside the walls to protect themselves from the titans.
- With a growing population and crumbling walls, tragedy could strike at any minute. This is not a sustainable way to live, so they must find a more sustainable way.

1.2 Challenges of the future

Through open discussion or a whiteboard tool, ask learners to come up with the biggest challenges we face for our future.

- Allow them to examine the answers and see if there are any overlaps or patterns in them? Is there a way that we could group them?
- Optional activity: Pick one of the challenges given (it might be the most frequent) and list the things (sub-topics, sub-challenges) that contribute to this?
- E.g. Challenge given: Climate Change. Subtopics: Land Use, Education, Paris Agreement, Clean Energy, The Ocean, Fossil Fuels, Biodiversity Loss, Justice and Laws.

1.3 Global risks

There is a group, whose job is to look at what could be the biggest challenges of the future, and to plan strategically for them. They are called The World Economic Forum.

- This is what they think are the highest risks the world faces (show slide 5)
- 'By likelihood' means how likely these things are to happen, therefore it's most likely that the biggest challenge the world will face in the future is extreme weather (eg. extreme flooding and record high temperatures).
- By impact means how much devastation they could cause. Therefore although infectious disease might not be as likely as extreme weather, if it does happen it will be the most devastating and difficult to deal with.
- Discuss how similar or different they are to previously given answers. Now change the slide to the connection map.
- As you may have already figured out, these issues/challenges don't just exist by themselves, they are all linked and influenced by one another in some way. You can explore all this on *WEF: Strategic Intelligence Maps*.

Part 2: Living for the future

2.1 The 3 Pillars of Sustainability

Ask the question "Does anybody know what sustainability means?" Allow the class 5 minutes to Think/Pair/Share. Gauge the learners previous knowledge of sustainability. This will inform how fast or slow to move on the next couple of slides.

2.2 What does sustainability mean?

Discuss the following with your learners.

- When we think about sustainability, we need to think of these 3 things.
 - Environmental Preservation: Keeping our environment safe and strong
 - Social Equity: Keeping our society fair for all
 - Economic Viability: Keeping our economies functioning.
- In 1983 sustainability was defined in the Rutland Report “Sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs” – Rutland Report 1983
- A simple way of thinking about this is, do what you need to do without harming anyone else.

2.3 Living Sustainably

Here are some videos to watch. They show different approaches to being sustainable.

- *Living Waste Free*
- *The Great Pacific Garbage Patch*
- *Lobster Plastic*

Once you watch two or three of the videos you can ask the following questions to prompt a class discussion.

- Do you think any of these methods are sustainable? Why/Why not?
- Is there anything that they can do to improve?
- Do you think this is available for everyone?
- What else can we do to live sustainably?

Part 3: Design a Sustainable City for the Future

“The year is 2321, the earth is a very different place. You and your team must design a sustainable city where future generations can live peacefully. Now you are in charge! You all get to make the decisions, and we want you to design a city for the future”

- Use pens and paper, crafts, or presentations with pictures or lego or arkit.
- Your design must balance the 3 pillars of sustainability. Therefore think of the elements that keep your city environmentally friendly (its nature is protected), social (there are things for people to do and enjoy), and economical (brings in money).
- Be creative, think outside the box, don't be afraid to get wild and wacky with your ideas.

- The class will be split into 5 groups.
 - Depending on the number of learners, you can increase or decrease the group number.
 - Each group will be provided with a scenario/brief below that will inform their build.
 - It is each group's job to read their brief and design their city. They must decide where the city is located, and create amenities, work, travel, resources etc.
 - They must have a city name, flag and a motto. Think about what the goals are for your society?
 - Optional: After the build, assign each group a pillar (environment, social, economic), they can grade the other groups out of 5.

Sustainable City: Scenarios

1. Environmental Breakdown — Trash Earth

In this reality, the world has done very little to combat the waste crisis which we once faced. The world over produced waste for hundreds of years and now there is trash everywhere. Our major waterways have been contaminated, there are numerous giant landfills around the planet. The earth has gotten warmer and a blue sky is rare due to the pollutants and we have seen a dramatic loss in biodiversity.

How do we live on a planet so contaminated with trash and lacking biodiversity? Can we somehow use this to our advantage or is there a way to start building again? Think about the world you want to see in the future. How will you provide people with housing, energy, resources and amenities?

2. Geopolitical Collapse

In this reality the world has just finished a devastating world war, which resulted in a nuclear fallout. Billions of people still survived, however the earth itself is tarnished. The pollution and radiation is too dangerous for society to live on the surface of the earth anymore. The only safe havens are underground, the deep open ocean or somewhere off earth.

With no governments in power the people are divided, you must lead them to their new home. How will you bring your societies together and provide them with new resources, entertainment, jobs and housing.

3. Technological Uprising

In this future Artificial Intelligence has grown dramatically. Nobody expected it to have the power it has today. Many people are uncomfortable with its control and do not want to live close to any major cities. To build such a powerful A.I was environmentally and socially damaging to many areas.

Technology has advanced so quickly that cities are all powered off the one computer. The lights,

the transport, the operating systems, the shops, the law, the schools, living quarters etc. are all automated near the big cities.

There is a citizen ranking system in place to “assist” people in being the best citizens they can, this is monitored by the A.I – Big Bird.

Technology has an infinite potential, but people want to move away from the big cities and take control back themselves. With your team, build a new city, use as much or as little technology as you wish, the people will be sceptical.

Credits: This activity session was developed by Trinity College Dublin, OS Hub Ireland.

2.3 Session Title: Innovation and Ethics

ACTIVITY IN A SENTENCE:

This workshop expands learners’ perception of what is considered ethically appropriate when engaging the public through art practices and scientific research, and how to innovate responsibly.

DISCIPLINES INVOLVED IN ACTIVITIES:

Ethics, Biology, Chemistry, Astronomy, Technology, Society, Research

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Classroom, informal learning environment

LEARNING OUTCOMES:

- Able to reflect on ethics in decision making
- Understanding the difference between inspiration and plagiarism
- Recognising unethical research practices
- Able to participate in ethical debates and discussions

When creating solutions for global challenges it is important to understand that innovation goes hand in hand with good ethics. To responsibly innovate we need to be aware of the fact that a lack of integrity can harm others even if there are some positive outcomes (e.g. something novel or something fast).

RECOMMENDED EXPERTISE:

Facilitation experience is recommended.

SDG LINKS:

- *Goal 9*: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- *Goal 11*: Make cities and human settlements inclusive, safe, resilient and sustainable.
- *Goal 16*: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

TIME IT TAKES TO COMPLETE:

45 – 60 mins

MATERIALS / RESOURCES NEEDED:

- Presentation Slides
- Paper and writing materials

CONTENT FOR LEARNERS:

- Presentation – *Activity Handbook – Innovation and Ethics.pptx*
Note: Copy the presentation into your own folder before editing.

Activity

INTRODUCTION:

Most of the following activities and concepts are adapted from the EU Horizon 2020 project *INTEGRITY*². As part of this project, resources were developed to empower learners at second and third level with an evidence-based understanding of responsible conduct in research.

Part 1: Innovation Game

1.1 Playing the game

Ask learners in pairs to choose one of the four activities below:

2 INTEGRITY received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 824586.

- Browsing the internet
- Shopping on the highstreet
- Travelling to work on a bus
- Being interviewed for a job

Tell learners that they will be given a pair of obligations depending on their choice. Assign the relevant pair of obligations as seen below:

- Browsing the internet = Privacy and Security
- Shopping on the high street = Happiness and Efficiency
- Travelling to work on a bus = Safety and Sustainability
- Being interviewed for a job = Efficiency and Confidentiality

Give learners 5 minutes to come up with a bad idea where they focus all their attention on just one of the obligations and completely sacrifice the other. For example with browsing the internet learners could neglect privacy and focus entirely on security, which would potentially lead to a large invasion of privacy. Ask them to share their ideas.

Then give the same learners 10 minutes to come up with a redesign that gives equal priority to both obligations. Ask them afterwards if anyone can share back and whether or not they felt that this second task was more difficult and why.

Discussion

The obligations learners were assigned are real world examples of ethical or moral values that when upheld are great case studies in responsible innovation. In the past, many organisations disregarded some of these values for prosperity or sacrificed a value of equal importance which resulted in harm to society.

Many organisations are now in the process of reshaping their practices and by upholding values that might seem at odds with each other, it actually forces innovation to meet the needs of society.

This may also lead to a discussion on who makes these decisions and who gets to be involved in developing ethical and moral codes, and who should be present in making these decisions now in our society.

Part 2: Walking Debate

To bring learners further into the complexity of research ethics, this activity will present them with research situations for them to judge. Ask learners to form a single file line in the classroom, preferably with backs to one wall. The leftmost end of the line will represent a position of strongly disagree, while the rightmost end of the line will represent a position of strongly agree.

For the following statements learners can reposition themselves depending on how they agree or disagree with them. Also if someone is unsure or does not feel strongly either way they can put themselves in the middle.

Warm up statements – these should be used to demonstrate how the activity works before diving into content: 'Pineapple should never go on pizza' Or 'Cats are better than dogs'

Moving on from this warm up, present learners with three or four of the following statements:

Space Ethics:

- Space tourism should be banned
- Mining asteroids for rare Earth metals like platinum should remain legal
- It is ethically acceptable to create artworks in space
- Humans should have a 'leave no trace' policy for planetary exploration ☐ If we find life on another planet it is ethically acceptable to take it back to Earth for research
- Human colonisation on other planets is unethical
- It is unethical to allow using sacred land to build telescopes on

Animal Experimentation:

- Animal experimentation is acceptable for producing cosmetics
- Animal experimentation is acceptable to produce drugs that treat human illnesses
- Animal experimentation is acceptable when it's carried out in space e.g. sending animals to space
- It is more acceptable when the animal is perceived to be
- Less 'intelligent' or very small (e.g. a fruit fly instead of a mouse)

Each time learners have chosen their positions on an issue, ask for shareback from different parts of the agreement spectrum. As a final reflection for this part, ask if any measures could be taken to change their opinion on any of the statements.

For example: for animal experimentation in space would it make a difference if one of the crew was an independent monitor for animal welfare? For animal experimentation on Earth, would it make a difference if the animal was old and only had a certain short time to live?

Note: On page 48, more questions on different topics for the Walking Debate activity can be found.

Part 3: AI Popstar

In the previous section learners were introduced to lines of research and innovation that are either taking place right now or have been considered. For this last activity learners will be introduced via the slides to something that blurs the line between science fact and science fiction in the arts and culture space.

3.1 Miquela the AI popstar

By giving learners as little introduction as possible, show them the video clip found in the slides (02:28-02:42) of Miquela performing in her music video. Ask if there was anything unusual about the Performance?

Hopefully most learners will recognise that the performer is completely animated. This is not unheard of as performers sometimes have animated avatars such as the band Gorillaz.

Again with little introduction say that they are going to see an interview with the performer. Play the interview video clip (01:45 to 02:31).

Ask learners what they thought of what they just saw and heard. In the video the interviewer appears to be interviewing Miquela live. It is revealed in that interview that she is an Artificial Intelligence programmed to believe that she is a real person.

Depending on how lively the conversation with learners is, you may want to pose the following questions:

- Is Miquela's AI music as 'real' as a humans?
- If Miquela was programmed by someone, who should be credited with her performances?
- Is this interview a performance in itself? Do you think she was really there? Do you think she as an AI really believes she is a person – is that level of technology (self-awareness) possible yet?
- If Miquela was all CGI, the dialogue scripted and recorded by a voice artist, the songs written by a human and sung by a human artist – what is Miquela? Why pretend that all of this is real and share it with people?

There are not necessarily right or wrong answers here, the media at large are still trying to confirm details around the nature of the performance/ performer and the company behind them. It seems that there is little if any direct evidence that Miquela is anything beyond a digital character with no mind of their own and fully scripted/ animated.

Background information

The company pulling the strings (Brud – <https://www.brud.fyi/>) has received significant investment as Miquela is a popular online celebrity with lucrative sponsorship deals and more. Many have vo-

iced concern over a company using a fabricated character with a false narrative to create a money spinner that takes advantage of race, gender and age representation. Others see this as a way of coming to terms with moral dilemmas around AI, citizenship and copyright before they really do become issues.

How do we live on a planet so contaminated with trash and lacking biodiversity? Can we somehow use this to our advantage or is there a way to start building again? Think about the world you want to see in the future. How will you provide people with housing, energy, resources and amenities?

3.2 Design your own AI popstar

To conclude, ask learners to design their own AI popstar. This can be done on paper or using an online platform such as Google *Jamboard*.

They should include the name of their AI popstar, their music genre, background information (gender/ethnicity/etc).

As well as this learners will need to write a short explanation of one of the two speculative headlines (distributed as you choose): *Scandal for AI popstar* or *Triumph for AI popstar*

Ask learners to write a few ideas down explaining a story behind the headline. learners should work in small groups or pairs and have 10 minutes maximum for creating their AI popstar and explaining the headline they are given. The session can end with a final shareback of learners' creations and final thoughts from the group.

Conclusion

Through teasing out positive and negative storylines associated with this new technology we can further understand ethical and moral issues, what learners perceive as 'good' or 'bad' and what influences these decisions, imagining how these

questions and dilemmas might evolve in an imaginative technological future that we aim to shape and predict.

FURTHER READING:

- Ethical Innovation Means Giving Society a Say, WIRED, 2017 article

2.4 Session Title: Ideation Session

ACTIVITY IN A SENTENCE:

This is a series of up to three co-creation sessions designed to collaboratively select a challenge, topic or initial project idea for an Open Schooling project.

DISCIPLINES INVOLVED IN ACTIVITIES:

Design Thinking, Citizenship

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Classroom, informal learning setting, university

LEARNING OUTCOMES:

Learners will:

- Select a challenge topic related to an area of the sustainable development goals
- Decide on a specific challenge to be addressed (who/what/why/where?)
- Develop initial ideas and solutions (sketches for later development)

Active citizenship within the local community will be encouraged, and learners will see the importance of working with different stakeholders, including multiple experts from different disciplines, when working to solve challenges. This feeds directly into the goal of open schooling.

RECOMMENDED EXPERTISE:

There is no specific expertise needed for this session. Participation in design thinking, collaborative work may be of some help.

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

TIME IT TAKES TO COMPLETE:

Approximately 2 hours 30 minutes.

MATERIALS / RESOURCES NEEDED:

- Presentation Slides
- Google Jamboard templates or printable templates
- Pencils/markers and 1 sheet of A4 paper per learner

- Some A1 or A2 paper and sticky notes (if not using the Google Jamboard option)

CONTENT FOR LEARNERS:

- Presentation – *Activity Handbook: Ideation Sessions.pptx*
Note: Copy the presentation into your own folder before editing.

Activity

INTRODUCTION:

The Ideation Sessions are made up of these three elements:

- ASKING QUESTIONS TO DRIVE THE PROCESS FORWARD (e.g., Who are the people most affected by this issue in the local area?)
- IDEATING & REACHING CONSENSUS THROUGH DESIGN THINKING TOOLS (e.g., posting sticky notes of ideas to a graph of positive impact vs feasibility)
- ENSURING THAT DECISIONS ARE LEADING TO USEFUL NEXT STEPS (e.g., a consensus of Chelsea fans being a problem to be dealt with is a co-creation dead-end, but a theme of soccer/sport/competition can be carried forward)

Most importantly – the learners are the decision makers. Although there will necessarily be some synthesising of ideas with others (you, the open science hub, external societal actors), it should be possible to trace back the leaves (project outputs) to the branch (final concept or challenge) to the trunk (mix of ideas that turns into the final concept) to the roots (learner ideas and input that are the main part of the mix).

Finally, it is important to note that learners are not expected to reach a fully formed project idea by the end of these sessions. The rough sketches of ideas they come up with towards the end of these sessions will feed into the OSHub Accelerator Session and subsequent research phase. More information on these sessions can be found in the *Open Science Hub Ireland Interactive Handbook*.

Part 1: Co-creation Introduction

1.1 A manifesto for co-creation

Co-creation is the act of creating together. It's an approach to design that attempts to actively involve all participants in the process to ensure the result meets their needs and is usable.

Ask learners what they think is important in order to create a good, happy space for collaboration. Learners should write these up using post-it notes, an online whiteboard or on a poster space in the classroom under the title "OUR MANIFESTO FOR COLLABORATION".



Figure 2: Example of 'Our Manifesto for Collaboration' Board. Credit: TCD.

1.2 Choosing a goal (Sustainable Development Goals)

To start the challenge decision making process, we have grouped the SDGs into three broad areas: Climate Action, Reduced Inequality and Sustainability. These groupings can also be found in the complimentary presentation (Slide 10). The following three questions begin the ideation journey. Responses can be noted physically with sticky notes or digitally on the provided Google Jamboard.

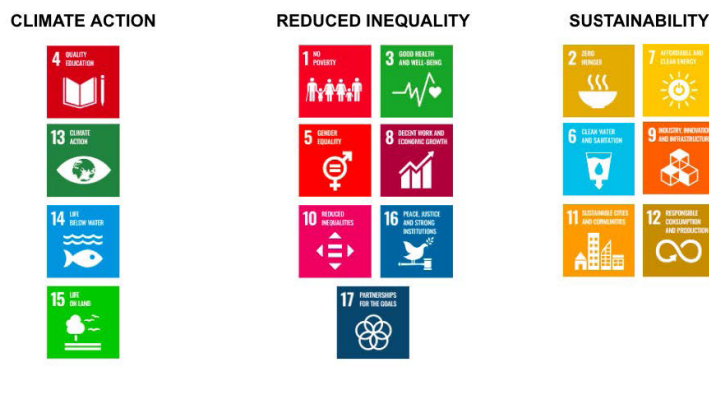


Figure 3: Categorisation of SDGs. Credit: TCD.

- If you had to choose only one of those broad areas (climate action / reduced inequalities / sustainability) to tackle, which would it be?
- Is there an issue in your local area linked to what you chose?
- Who is worst affected by this issue?

Now take time to open discussion around what learners have contributed including questioning any choices that you feel may not have been made in all seriousness or need more clarification.

Part 2: Decision-making

Learners will now rank these topics generated in Part 1 in terms of positive impact on the community (is there high or low benefit to the community by tackling this problem?) and relevance (is this an urgent or timely issue?). See Figure 4 for an example of such a graph. As the facilitator, feel free to edit this sorting graph with different axis labels if they are more relevant.

Ask learners to individually copy the map on paper and use it to choose their top preferred topics from the previous step. This ensures that the learners don't follow a herd mentality. Once they've marked their own choices on their own paper, they can fill in a Jamboard or large sheet of paper with their choices so that everyone's opinions are visualised together.

If there is more than one dissimilar topic in the top right section of the graph (high impact and high relevance) open up a brief discussion so that learners can speak about why they chose a particular topic. Finish with a vote to decide the top challenge area to take forward to the next stages.

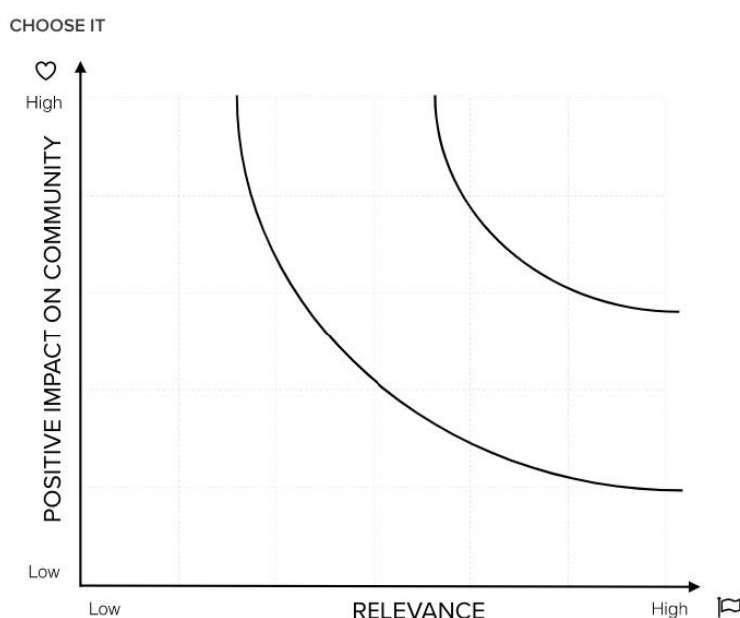


Figure 4: Example of sorting graph outlined in Part 2. Axes of the graph can be edited for relevance. Credit: TCD.

2.1 Understanding stakeholders

Now that one topic has been decided use the provided Google Jamboard Venn diagram titled 'THINK OF EVERYONE' to ask for learners to fill in who they think is affected by the issue and who can affect the issue (e.g. who has influence to make a difference – positive or negative). These may be individuals, communities, organisations, government departments etc. As a facilitator you may want to provide some suggestions to get the ball rolling. When thinking of those affected, think of particular demographics (gender, age, ethnicity etc).

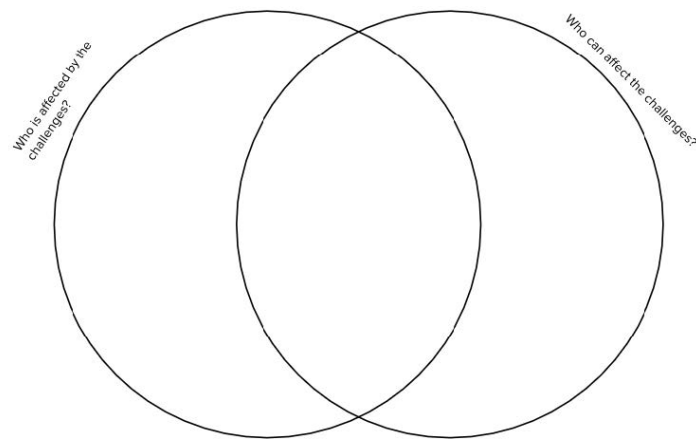


Figure 5: 'Think of Everyone' Venn Diagram. Credit: TCD.

2.2 Idea generation

In the presentation slides use the 'scribbly mess' slide to illustrate that making a prototype is not a straight A to B line. There is a lot of discussion and debating, and new information could change the course of the project later. To this point we only know what challenge we want to tackle, but now we will discuss ways of actually tackling the challenge.

Explain to learners that these next activities could get a bit wild and wonderful. Welcome exploration and creative ideas at this stage.

2.3 Rapid Ideation

Another way we can do this is through a pick and mix of ISSUE + USER + FORMAT.

- Select some of the issues that have already been discussed either in inspiration sessions or the topics voted on previously
- Ask learners to think of various types of users (ability, gender, age) ☑ Ask learners to provide various formats of art, design, or technology (poster, AR, app etc)
- After randomly grouping an issue with a user and a format, ask learners to take ten minutes to come up with a concept that uses their given combination – a concept in the format provided aimed at the user provided that deals with the issue provided (e.g., water pollution + old-aged pensioners + virtual reality).

Make sure there is enough time to do another round of rapid ideation with a combination given to all groups of: the chosen challenge + a user identified as being affected by the challenge + a format.

This time choose formats from: survey, poster, advertisement, coding, community initiative, prototype, monitoring device, website, artwork, robotics, video. These ideas will be carried forward to the last ideation session for discussion and refinement.

Part 3: Choosing a project

Sort ideas by using the grids (impact v creativity and impact v feasibility) provided. Learners should individually copy the graph before adding it to a communal version. This time only the lowest priority ideas (bottom left) should be discarded, if the class is unanimous in agreement. The top ideas (top right) can be banked and brought forward.

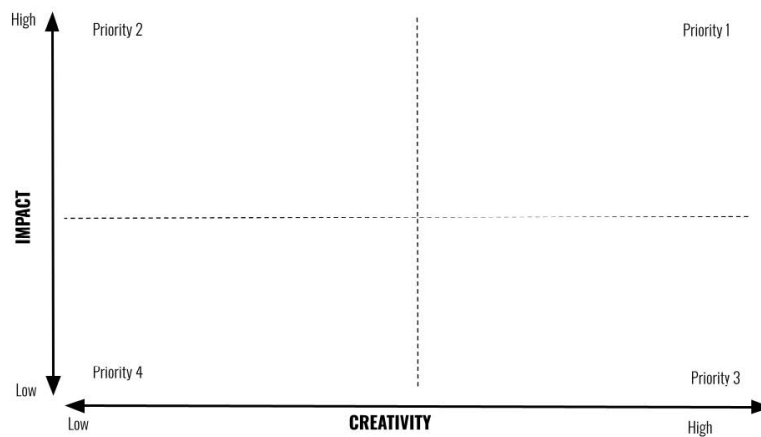


Figure 6: Impact vs Creativity grid. Credit: TCD.

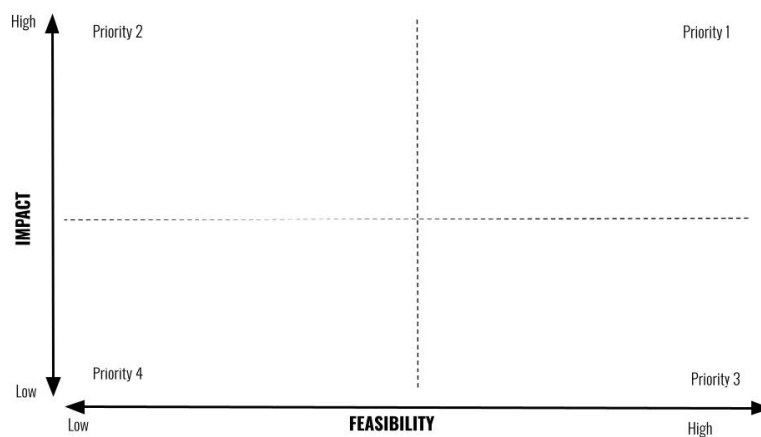


Figure 7: Impact vs Feasibility grid. Credit: TCD .

3.1 Problem definition

Using the provided problem definition canvas, go through each of the panels as a group. Talk and walk through each panel, filling in as much information as is possible at this time. Depending on the complexity and existing knowledge of the chosen challenge, this process may take a short time or

longer. This will be a living document which can be added to as more research is carried out. Part of the session could be used for learners to do some web research on laptops to gather information for the problem definition canvas.

Credits: This activity session was developed by Trinity College Dublin, OS Hub Ireland.

3. LEARNER ACTIVITIES

3.1 Any context

3.1.1 Session title: Sound of Insects

ACTIVITY IN A SENTENCE:

Through the process of creating a film with sound, learners understand the value of insects within our ecosystem by sharpening their senses for their auditive and visual appearance.

DISCIPLINES INVOLVED IN ACTIVITIES:

Biology, Ecology, Sound, Music, Fine Arts, Film

RECOMMENDED AGES:

7 – 11

LEARNING ENVIRONMENT (CONTEXT SETTING):

Classroom, outdoor area around school, children's homes

LEARNING OUTCOMES:

- Encourages listening to the surrounding sounds
- Learn to abstract sounds and get into a creative process
- Get to know many insects and their anatomy
- Know about the importance of insects for our ecosystem

“Sound of Insects” provides an interdisciplinary approach to this topic by combining biology, music and visual arts. This creative approach makes this important topic accessible and tangible to children on an emotional level. They get a very personal connection through the way they explore it. The concept makes an important contribution to species conservation according to the motto “You can only protect what you love”. In order to be able to love something, the knowledge about it and the intensive perception of it are the most important prerequisites.

RECOMMENDED EXPERTISE:

No special expertise is necessary.

SDG LINKS:

- *Goal 15*: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss

TIME IT TAKES TO COMPLETE:

150 – 180 minutes

MATERIALS / RESOURCES NEEDED:

- Everyday objects for sound samples, A3 paper and drawing utensils, smart phone, projector

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- The aim of the workshop is to perceive and investigate objects from a certain angle. With a different focus, the workshop could be adapted for older learners. It could, for example, serve as preparation for a product design exercise which has a sound aspect.

Activity

INTRODUCTION:

The workshop is targeted at children of ages 7-11 who are still very playful and have a creative approach towards learning. The learners are encouraged to learn more about the role of insects in our ecosystem. In the first part of the workshop, the children get to know several insects by observing and listening to them. In the second part, they draw several insects in order to create a film. In the third part, they try to find sounds of daily objects that are similar to the sound of the drawn insects. Finally, the children compose an audio track with the collected sounds and perform their composition simultaneously with the film.

Part 1: Co-creation Introduction

1.1 The World of insects

The learners are introduced to the world of insects. They are encouraged to talk about their knowledge of insects. Give some guidance and suggestions (see Material 1-2).

MATERIAL:

- Listening to insects
 - Download Free Insect Sound Effects | Mixkit
 - Listening to insects
- Watching insects:
 - What's that chirping?

1.2 Talking about insects

- Which insects do you know?
 - How many insects were mentioned in total?
- Why are insects so important for our ecosystem?
 - Insects help to keep the balance in our ecosystem. They loosen the soil so that plants can survive. They pollinate a wide variety of fruits and vegetables, allowing them to grow.
 - Insects help to create the perfect balance in forest ecosystems by eating fallen leaves and shredding old tree barks. This material becomes soil after a while.
 - Ask the learners to think of more reasons to protect insects.
- What can we do to protect insects?
 - There are several ways to protect insects:
 - Leave areas and margins in the garden where the grass is not cut. Insects can thrive in these areas.
 - Create an insect hotel where insects have a protected area to survive and procreate.
 - Grow wild plants that are not cultured. Insects will more likely visit these plants than cultured plants.
 - Reduce use of insecticides in the garden and for agriculture. Ask the learners for more suggestions.
- Do insects have ears?
 - Yes, they have 'ears' with which they can feel vibrations.
 - For example, the cicada has ears on the abdomen, the cricket on the fore-legs, the praying mantis on the belly. Insects feel high and low vibrations like we feel the vibrations of a musical instrument.

Part 2

2.1 Creating an insect film

In the next step each child draws an insect they like. They can use one of the insects mentioned in the workshop already or they could find inspiration and pictures in biology books or on the internet. The pictures can be drawn with ink, coloured pencils or crayon.

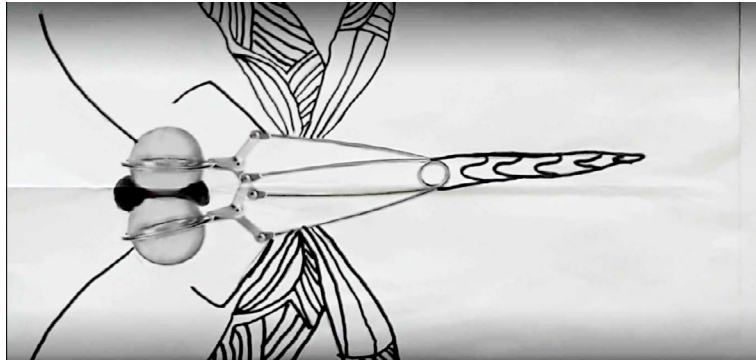


Figure 7: Example of an insect drawing, assisted by the use of household objects. Credit: VS Abtenau.

Afterwards the children stick the drawings together on the back with tape so that all the pictures become a film strip.



Figure 8: Children stick their insect drawings together. Credit: VS Abtenau/Maria Stampfer.

With your help, the children now produce the film: one person points the smartphone steadily at the floor where the film strip is located. When the recording team gives a sign, two children pull the film strip under the camera so that the pictures are slowly moved – 3-4 seconds for every picture; total length 2-3 minutes.

Part 3

3.1 Discovering insect sounds

The learners are encouraged to find and collect daily objects that make the following sounds: buzzing, rattling, chattering, humming, scratching, cracking.

They can also imitate sounds from nature: wind, water, rustling of leaves etc.

Give advice on how to find these objects. A kitchen or a garage can be a wonderful place of inspiration to discover sounds. Tools from the classroom such as a ruler or pencil are possible instruments. Tools from the arts and crafts room can be especially suitable. Possible objects could be a kitchen grater, sandpaper, ripped paper, a measuring tape, a file, a plastic bag, water etc. Materials from nature like leaves, branches or stones can also be used.

Maybe the learners can also make insect sounds with their voice. Children often have great ideas themselves to find suitable sounds.

The workshop can be linked to other subjects like arts, crafts and biology.

3.2 Composing an insect piece

First, the learners sit in a circle and present their sound ideas in turn. Next, they compose an insect piece out of the collected sounds (around 2-3 minutes, depending on the length of the film). Encourage them to differentiate between long and short sounds.

With your help, the learners now find out how to structure the sounds. Some “instruments” which make long sounds can be used as a permanent sound layer during a long part of the piece (like wind or water) while others can produce short sounds like insects do in a certain rhythmical structure. Short sounds can be repeated in a pattern. The class may decide that one pattern will be repeated four times during the piece, the other pattern maybe five times (see Figure 9 below).

Now decide which sounds fit together well. It is important to discuss when to play soft sounds so that they are not “overrun” by very strong sounds.

The learners can draw a draft of the composition if necessary (see Figure 9 below). After some rehearsals the composition can be recorded. The learners listen to the recording and discuss if they want to change anything.

Part 4

4.1 Presenting the film with live sound

The film will now be presented on a screen while the children are playing the composition as a live performance.

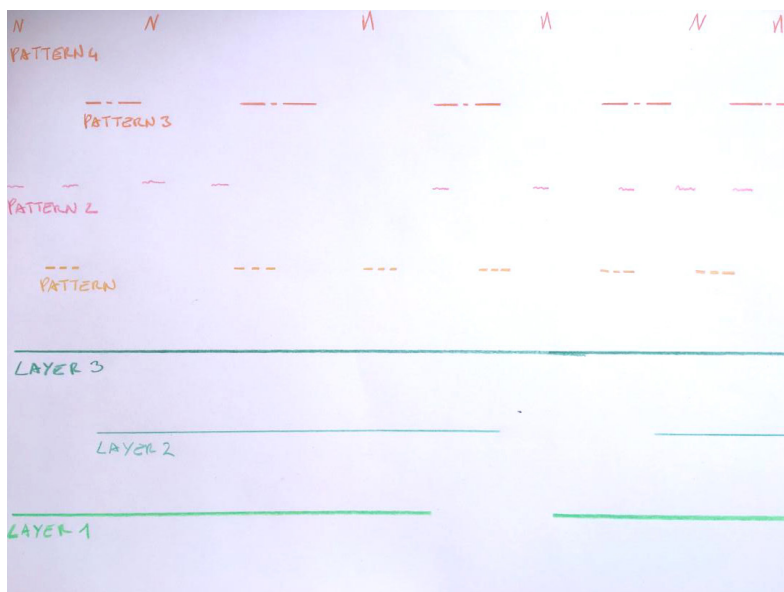


Figure 9: A composition of sound patterns. Credit: Veronika Groissberger Credit: This workshop was provided by Ars Electronica, OSHub Austria.

3.1.2 Session title: Ethics Walking Debate Workshop

ACTIVITY IN A SENTENCE:

The goal of this workshop is to provide an open and supportive space in which learners can voice their opinions and insights on societal topics that often pose challenging ethical questions.

DISCIPLINES INVOLVED IN ACTIVITIES:

Science, Art, Culture, Religion, Diversity, Equity

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Open space (if classroom, then move tables and chairs to the side)

LEARNING OUTCOMES:

- Able to reflect on ethics in decision making
- Understanding the difference between inspiration and plagiarism
- Recognising unethical research practices
- Able to participate in ethical debates and discussions

RECOMMENDED EXPERTISE:

Preferably learners would have worked with facilitators prior to carrying out this workshop. Facilitators should also be sensitive to cultural, social and religious differences amongst the group.

SDG LINKS:

- *Goal 11*: Make cities and human settlements inclusive, safe, resilient and sustainable
- *Goal 16*: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

TIME IT TAKES TO COMPLETE:

60 – 90 mins

MATERIALS / RESOURCES NEEDED:

- Open space
- List of questions (provided)

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- Questions may be modified to suit other age groups, however please consider questions that are age appropriate.

Activity

INTRODUCTION:

The goal of this workshop is to provide an open and supportive space in which learners can voice their opinions and insights. This workshop is usually held at the end of a week with facilitators when the learners are most comfortable with each other and the facilitators. The facilitators should use their discretion as to what questions should be posed, below is a list of questions that have worked well in the past but every group is different. When a question is posed learners are invited to move to either side of the room. One side is “Strongly agree” the other side is “Strongly disagree”. learners can stand anywhere on the spectrum.

Part 1: Delivery

1.1 Room setup

Move all tables and chairs to the side of the room. This workshop works best when learners can move across the length of the room.

1.2 Introduce workshops

Ask learners what they know about ethics.

Explain to learners that they are going to be asked questions and are welcome to give their opinions. The questions don't necessarily have a right answer and every perspective is welcome and valued. The questions cover ethics across both science and art.

1.3 Room setup

Before any questions are posed to the learners, facilitators should reiterate that learners are expected to be kind, respectful and listen when others are talking. Facilitators need to be especially sensitive to cultural, social and religious differences amongst the group.

Part 2: Questions

Here is a list of questions we have asked. Not all of these questions have to be asked, omit or add questions depending on your group. Some learners might not be familiar with all of the concepts so be sure to explain the question.

Intro Questions:

- Pineapple or pizza?
- Cats or dogs?
- Coke or Pepsi?

Science Questions:

Should vaccines be mandatory?

- Herd immunity is a form of indirect protection from infectious disease that occurs when a large percentage of a population has become immune
- Should it be mandatory for some vaccines, but not all vaccines?
- What should happen if someone refuses to get a vaccine? Should it be a criminal offence?
- Is bodily autonomy a priority?

- A nanny state is when the government or its policies are overprotective or interfering unduly with personal choice.
- Do you think people would feel social pressure to get the vaccine anyway?
- Should unvaccinated children be allowed into schools, etc.

Should parents be allowed to pierce their baby's ears?

- Should parents always be able to make decisions about their baby's body?
- Are we sexualising young girls by adorning them in jewellery?
- A child can just take it out when they get older?
- Is it important to follow traditions and culture?

Should parents have the right to circumcise their children for non-medical reasons?

- If it is part of religion or culture does that always make it ok?
- Should parents be able to make permanent changes to the body?
- Should it be more regulated?
- Should spiritual leaders need medical training?
- No procedure is guaranteed safe, so should we take the risk?

What about for female circumcision/Female genital mutilation?

- If it is part of religion or culture does that always make it ok?
- If it is hard to give birth, it is dangerous for the woman?
- It is still wrong if it is not dangerous but affects you sexually?

Are zoos unethical?

- Are Zoos important for conservation or are there alternatives?
- Is it safer?
- Is it ok to profit monetarily from animals?
- Is it ok to keep non-native species in Ireland?
- How do we regulate zoos to keep them accountable?

Is it ethical to use animals for research and testing?

- Is it ok to research and test for cosmetics?
- When we research and test for medical reasons is it ok?

- Is human life more important than animal life?
- Is it problematic that animals can't consent?
- Can humans really consent when there is a monetary incentive? Eg. does this encourages people in low economic positions to participate in a potentially dangerous situation

Should we be genetically testing or altering embryos?

- If we can alter an embryo to not have a chronic or painful illness should we?
- Is it ok to make changes to achieve preferable qualities? Eg. Eye color, beauty, strength, intelligence.
- What characteristics should be allowed to be altered?
- Could this cause population issues? Eg. sustaining longer lifespans.
- If wealthy people can afford genetic modification, would there be drastic genetic differences between the wealthy and the rest of the population?

Should we allow euthanasia/ assisted suicide?

- Should people have the right to end their life because of their physical health?
- Should people have the right to end their life because of their mental health?
- Should it be criminalised?
- How could we regulate it so it won't be abused?

Art Questions:

Note that most bullet points below contain background information on the piece under discussion, not further questions such as in the previous section.

Is Santiago Sierra's piece, 160 cm Line Tattooed on 4 People, ethical?

- 160 cm Line Tattooed on 4 People (2000).
- 'Four prostitutes addicted to heroin were hired for the price of a shot of heroin to give their consent to be tattooed. Normally they charge 2,000 or 3,000 pesetas, between 15 and 17 dollars, for fellatio, while the price of a shot of heroin is around 12,000 pesetas, about 67 dollars.' – Santiago Sierra.
- His works highlight the exploitation of human labour taking place in systems of economic exchange.
- Sierra focuses on those sections of the community who are most exploited and yet who remain least 'visible' in official terms: illegal immigrants, asylum seekers, prostitutes, drug addicts and the urban poor, unemployed and homeless.

Does Marina Abramovic's piece, Rhythm 0, raise any ethical concerns?

- Rhythm 0 (1974).
- Her instructions were placed on the table:
- There are 72 objects on the table that one can use on me as desired. Performance. I am the object. During this period I take full responsibility. Duration: 6 hours (8 pm – 2 am).
- These included a rose, feather, perfume, honey, bread, grapes, wine, scissors, a scalpel, nails, a metal bar, and a gun loaded with one bullet.

Was the United Colours of Benetton advertising campaign, La pieta, ethical?

- La pieta (1991).
- The photo of AIDS activist David Kirby was taken in his room in the Ohio State University Hospital in May 1990.
- Benetton approached the photographer and Kirby family, gaining consent for the use of the photograph and contributing to an acquired immunodeficiency syndrome (AIDS) foundation.
- In 2003 the photo was included in the Life magazine collection '100 Photos that changed the world'.
- A number of AIDS activists believed that the photograph and its use in advertising actually painted AIDS victims in a negative light, spreading fear rather than acceptance. Others perceived the campaign as a vindication of homosexuality.
- The visual similarity between David Kirby and Jesus.

Was it unethical to photograph the girl in "the vulture and the little girl"?

- The vulture and the little girl (1993).
- The photo was taken during the Sudanese famine, it was published in the New York Times in 1993. Some people said that Kevin Carter, the photojournalist who took this photo, was inhumane and profiting from the child's suffering.
- The child was reported to be attempting to reach a United Nations feeding centre about a half mile away.
- Would it be unethical for him not to photograph this? Then how would we have a record of this to help us stop it happening again?
- Carter won the Pulitzer Prize for the photo.
- Carter took his own life in 1994.

Should ORLAN be able to physically manipulate her body for art?

- ORLAN is a contemporary French artist known for the radical act of changing her appearance with plastic surgery in the name of art, she is the first artist to use plastic surgery as part of her arts practice.

- “I have been the first artist to use aesthetic surgery in another context—not to appear younger or better according to the designated pattern. I wanted to disrupt the standards of beauty”
- Should doctors perform procedures like this?
- Is cosmetic surgery generally ethical?
- <https://www.irishtimes.com/life-and-style/bones-of-contention-1.736882>
– Seamos Nolan dog art

Credits: This activity session was developed by Trinity College Dublin, OS Hub Ireland.

3.2 Context specific (Fab Lab / Makerspace / Workshop)

3.2.1 Session title: Make your own kite

ACTIVITY IN A SENTENCE:

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

DISCIPLINES INVOLVED IN ACTIVITIES:

Physics, Technology, Tinkering

RECOMMENDED AGES:

9+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Fab Lab / Third place

LEARNING OUTCOMES:

- Understand how a kite can fly
- Understand the role of air in human life
- Arouse wonder and curiosity to discover the world of kites

- Learn to stay focused on an activity
- Acquire tinkering skills in a Fab Lab and learn to use tools
- Develop creativity

RECOMMENDED EXPERTISE:

Facilitators will have experience in Fab Lab tinkering activities and will need to know how to use a sewing machine and a 3D printer.

SDG LINKS:

- *Goal 12:* Ensure sustainable consumption and production patterns

TIME IT TAKES TO COMPLETE:

Two sessions of 3 hours

MATERIALS / RESOURCES NEEDED:

- Wood sticks, scraps of fabric (polyester or nylon fabric is best), material for decorating like sticker, 5mm strips of wood, kite string, scissors, markers, connectors (may be printed using 3D Printer, see Content for Learners), sewing machine and if possible a vinyl cutter
- Handles for the kite string can be cut in advance or during the workshop using a laser cutter or a saw.

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- Resources may be found *here*, including instruction for the prototype connector to be created with a 3D printer [French].

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- The workshops targets children of 9 years and older because of the need to handle tools. Therefore scaling down to reach a younger age group is not advised.

Activity

INTRODUCTION:

First session (180 min)

Part 1: Welcome (20 min)

Welcome the children to the workshop room and talk to them about what a Fab Lab is. Give a quick tour of the Fab Lab space and show how the 3D printer, vinyl cutter and laser cutter work (cut a handle and print a connector).

1.1 Establishing the children's pre-existing knowledge (10min)

Arouse the children's curiosity about air through questioning. This will help to identify their level of knowledge.

Some questions to ask:

- What is wind?
- Are wind and air the same thing?
- Can we touch the wind?
- Can we see the wind?
- Can we make wind?
- What objects can fly? How does technology mimic nature eg. planes vs birds?
- What everyday experiences allow us to perceive the existence of wind? What experiments can be done? What objects can be made?
- Air is everywhere around us. How can we notice it? How can we make it obvious?
- When the wind blows: Is it windy? How do you know?
- Is air important for human beings? Why is it important?

Part 2: Building a paper plane (10 min)

Carry out small experiments to introduce the subject and ask the children about it.

Make a paper plane fly. Ask questions: Why can the paper plane fly? What is the difference between air and wind? Let the pupils participate actively.

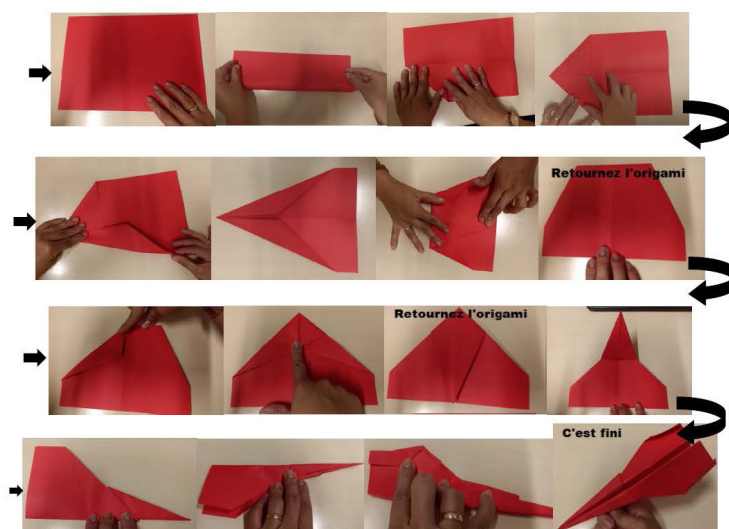


Figure 10: Step-by-step guide on how to build a paper aeroplane. Credit: CCSTI.

It is also possible to carry out other experiments with air:

- Inflate and deflate a balloon
- Make a small parachute out of a plastic bag

Part 3: Making a diamond kite (140 min)

Each child should have a kit with the following materials:

- A connector (3D printing instructions provided)
- A piece of fabric to make the canopy (preferably nylon or polyester)
- Two sticks or rods, preferably 105cm in length
- Kite handle
- String

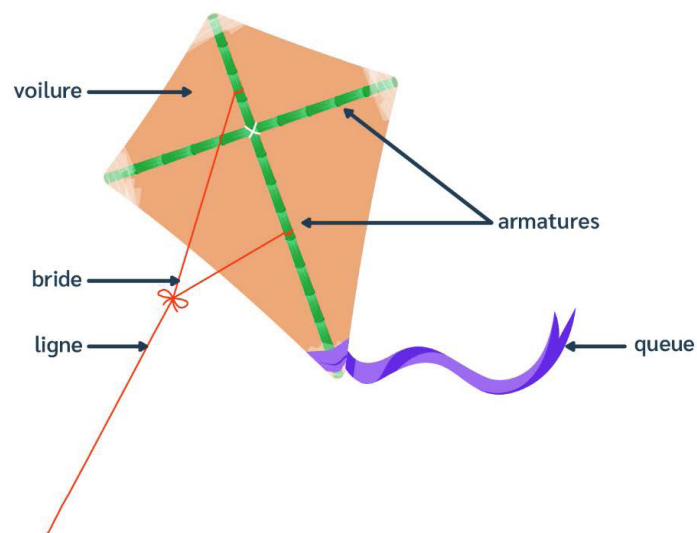


Figure 11: Components of a kite [French]. Credit: CCSTI.

3.1 Crossing the two rods perpendicularly

Each rod is 105cm long. The crossing should be done as shown in the diagram: 1/5th of the vertical rod from the top (25cm) and 1/2 of the horizontal rod (52,5cm).

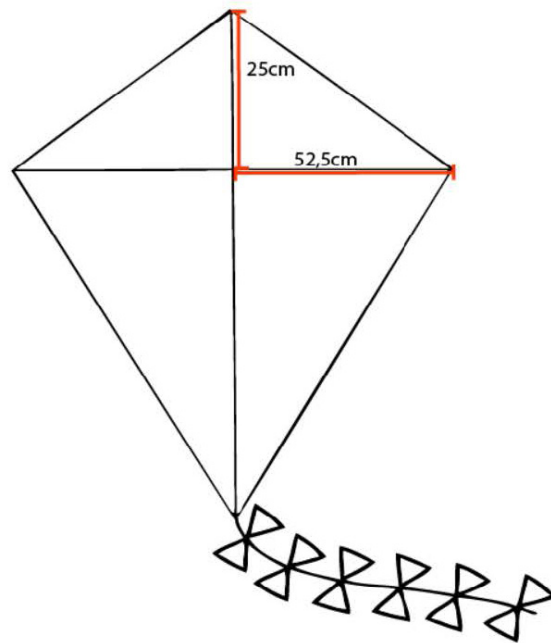


Figure 12: Location of rod crossings. Credit: CCSTI.

3.2 Creating the sail

The fabric for the sail should be cut to the size of the sticks and in the shape of a diamond. To help the children cut the sail to the correct size, you can prepare a cardboard model in advance.



Figure 13: Creating the sail. Credit: CCSTI.

3.3 Sewing the canopy and making the decoration

Divide the group in two. The first group will use the sewing machine to hem the canopy while the second group will make the decoration for the kite. It may be possible to make decorations with predefined images and the vinyl cutter.

Second session (180 min)

Part 1: Feedback (20 min)

Welcome the children and ask for feedback on what was covered in the first session. Recall scientific knowledge if necessary.

Part 2: Completing a diamond kite (160 min)

2.1 Making the tail and the handle (80 min)

Divide the children into three teams.

First team: Cut four pieces of fabric (6cm X 3cm) and make a braid in each corner of the canopy using the sewing machine.



Figure 14: Creating the braids. Credit: CCSTI.

Second team: Build the tail of the kite from plastic bags or fabric scraps. The tail should be long and light enough to provide a stabilising swing, about 150cm.

Third team: Wrap the string around the handle to create a coil.



Figure 15: A handle with coiled string. Credit: CCSTI.

When each team has finished its work, swap groups.

2.2 Making the bridle and tying the tail (80min)

The children will now make the bridle for the kite. The bridle is an arrangement of strings that hold the kite at a specific angle while it is flying. Following the diagram below, the strings are attached to the kite at points A and B. The strings are then brought together and attached to the handle at C.

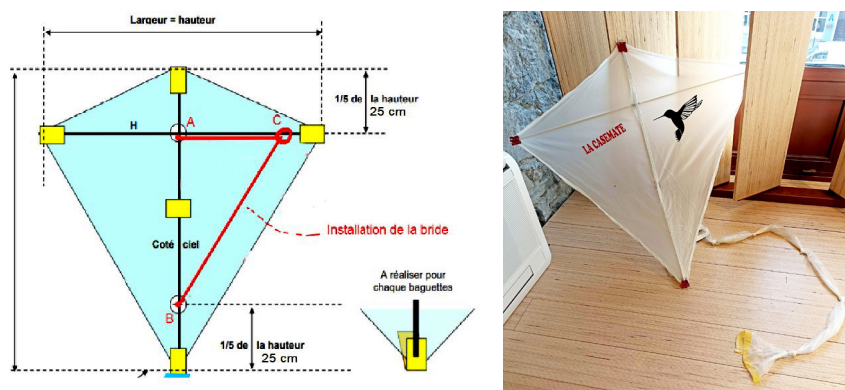


Figure 16: (Left) Schematics of the kite [French] and (Right) a finished kite. Credit: CCSTI.

Finally, go out to test the kite!



Figure 17: A child flying a kite. Credit: CCSTI.

Conclusion

This workshop will provide young people with an introduction to air and its properties, allowing them to learn how to make an object using DIY tools and to discover the machines in the Fab Lab: laser cutter, vinyl cutter, 3D printer, sewing machine.

Link to all files can be found on the website *FabManager*

Credits: This activity was developed by Fab Lab at Centre de Culture Scientifique Technique et Industrielle de Grenoble, La Casemate (OS-Hub France).

3.2.2 Session title: Building a CO₂ sensor

ACTIVITY IN A SENTENCE:

Assemble a CO₂ sensor and understand why the measure of CO₂ is important on a local and global scale.

DISCIPLINES INVOLVED IN ACTIVITIES:

Physics, Biology, Environmental Science

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Makerspace, class, outdoor, university

LEARNING OUTCOMES:

- Learn about basic electronic circuits
- Collect and interpret data (understand variables, draw graphs)
- Understand the role CO₂ plays in human physiology and climate change

The topic was chosen by teachers and learners during a session about the most concerning issues on both local and global scales. Climate change and the pandemic scored the highest among the learners of our group. It was then decided to build CO₂ sensors to be distributed in the classrooms to know when to aerate, and to measure the emission of CO₂ in different contexts. In parallel, university researchers were invited to present their research related to CO₂ in climate change. A local company awarded the learners water bottles that were produced during an awareness campaign about climate change. Finally, the project and results were presented to the general public at the Natural History Museum of Geneva.

RECOMMENDED EXPERTISE:

Basic electronics and soldering

SDG LINKS:

- *Goal 3:* Ensure healthy lives and promote well-being for all at all ages
- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- *Goal 13:* Take urgent action to combat climate change and its impacts

TIME IT TAKES TO COMPLETE:

- Co-creation session: 1.5 – 2 hours
- Assembling: 1.5 – 7.5 hours based on the level of explanation of different components and use of machines for the sensor case (plastic and wood)
- Installing the sensors and measuring: 2 – 4 hours
- Interpretation of the data: 2 hours
- Session with the experts: 1.5 – 2 hours x 2
- Preparation of the mini-expo: 2-6 hours
- Mini-expo: 6 hours
- Evaluation: 2-4 hours

MATERIALS / RESOURCES NEEDED:

- CO₂ sensor MH-Z19B
- Microcontroller Arduino Nano (with USB cable)
- Light Emitting Diode (LED) display 7 segments TM1637
- 12 jumper cables female-female
- Heat shrink tubes

- 40g PLA for 3D printing
- 3 LED (red, green, yellow)
- 50x50x3mm plywood
- 3D printer
- Laser cutter
- Computer
- Soldering irons

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- Wiki converts the instructions into a printable pdf: <https://wikifab.org/wiki/DetecteurCO2> [French]

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- The activity can be adapted to younger audiences by not explaining the function of each component and avoiding the analysis of the data.
- The activity can be adapted to learners of electronics or informatics by programming the Arduino to show messages on the display based on the “live” measurements.

Activity

INTRODUCTION: Co-creation:

- Start the activity with a presentation about Open Schooling. Use examples of local issues that are tackled with smart solutions developed by the youth and citizens. Show examples of technology for sustainability.
- Divide the class in smaller groups and distribute cards with a list of issues (traffic, climate change, etc). Ask the group to rank them from the most concerning to the least and to add one more issue specific to their community. Let the learners justify their choice and find a consensus to select the topic to work on.
- Once the topic has been chosen, you can decide to propose an idea (more or less defined) or facilitate a second session to come up with a technological solution.
- (In our case the chosen topics were Covid-19 and climate change and we proposed to build CO₂ sensors)

Part 1: Assembling

Below is a step-by-step guide on how to assemble the CO₂ sensors. More photos and detailed instructions are available in the link below, however instructions are in French. (Drawing files and instructions (in French))

1. **Make the box.** To mount the sensor, you will need to download and then print the 3 elements of the box. One face has to be laser cut and the box 3D printed. See ‘Step 2’ in the linked instruction manual for 3D printing files [French].

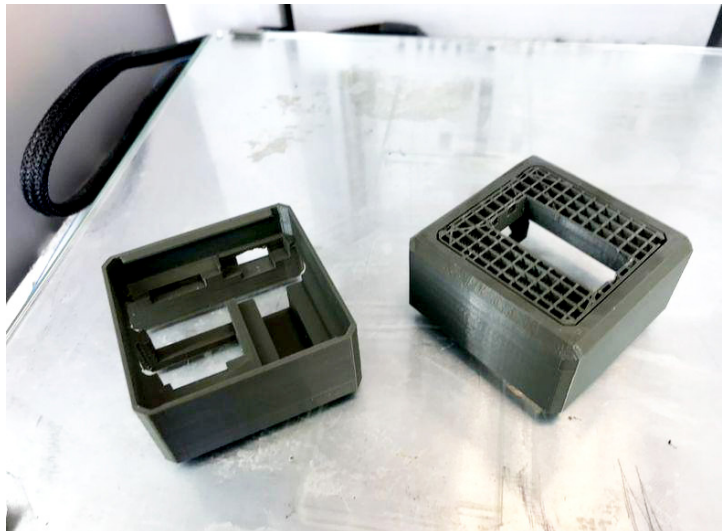


Figure 18: 3D printed sensor box (Credit: FAB).

2. **Place the electronics in the box.**
3. **Wiring.** Since the Arduino has a 5V output, you will need to prepare Y wires, with female-female jumper cables wire to power both components. Solder the wires and protect them with heat shrink tubes.

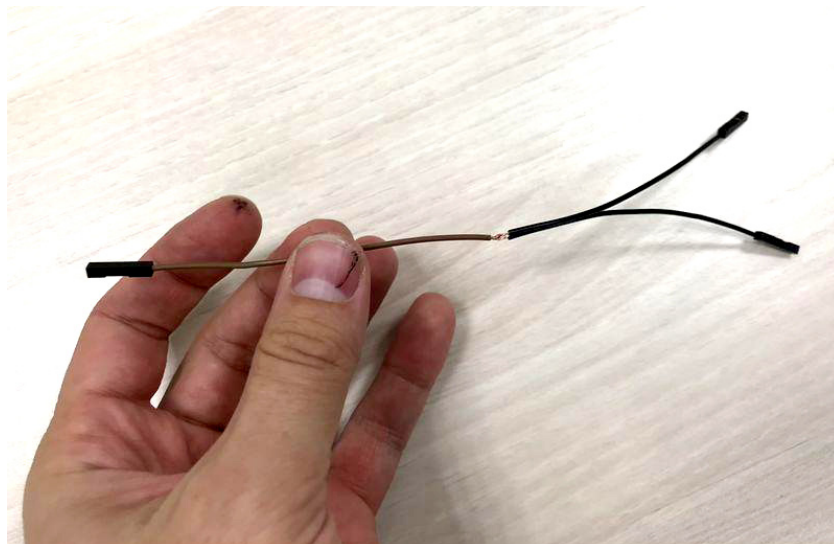


Figure 19: Prepared Y wires (Credit: FAB).

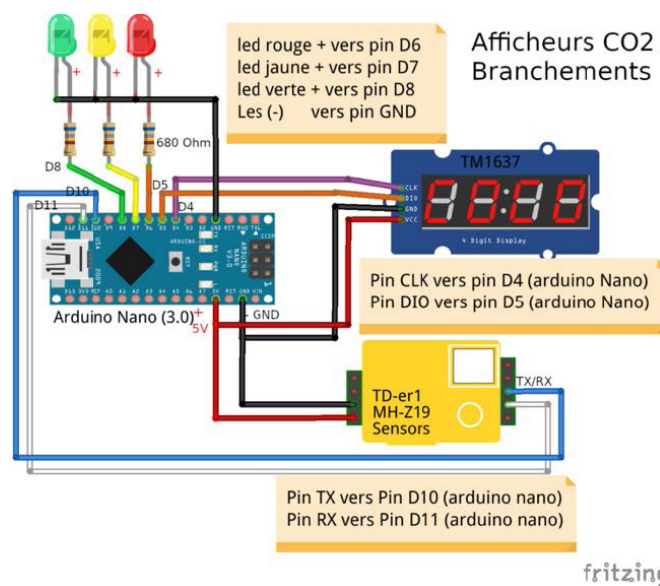
4. **Mounting the LED.** Solder the 3 cathodes of the LEDs and solder a 680 Ohm resistor to the anode.



Figure 20: Soldered LEDs and Ohm resistors. Credit: FAB.

5. **Make the connections.** Follow the plan to connect Pins:

- Pin D11 (Arduino) > Pin RX (CO2 sensor)
- Pin D10 (Arduino) > Pin TX (CO2 sensor)
- Pin D4 (Arduino) > Pin CLK (7 sec display)
- Pin D5 (Arduino) > Pin DIO (7 sec display)
- Pin D6 (Arduino) > + side of the red LED
- Pin D7 (Arduino) > + side of the yellow LED
- Pin D8 (Arduino) > + side of green LED
- Pin 5v (Arduino) > Pin V+ (CO2 sensor), Pin Vcc (7 sec display)
- Pin GND (Arduino) > Pin V – (CO2 sensor), Pin Gnd (7 sec display)



fritzing

Figure 21: Overview of connections [French]. Credit: FAB.

6. Close the box.

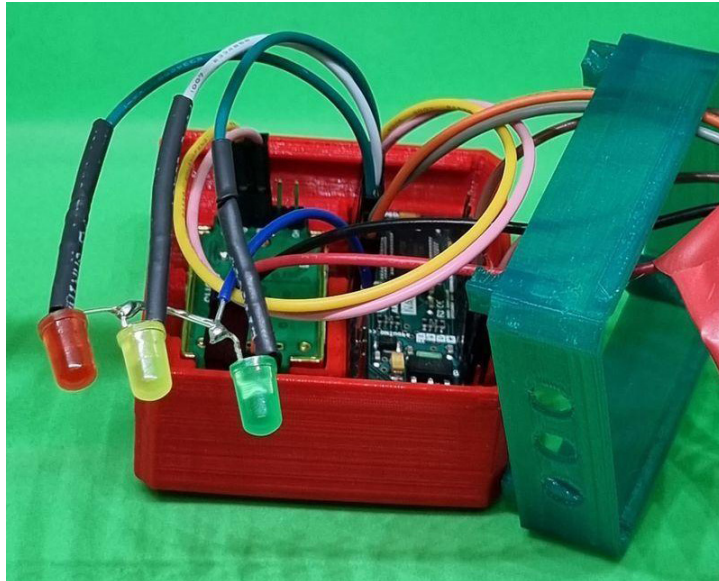


Figure 22: Inside the box before closure. Credit: FAB.

7. **Download the Arduino code.** Connect the sensor to your computer with a USB cable.
8. Copy the code made available in the documentation then, with the Arduino software, upload it to the Arduino Nano. Once uploaded, the sensor should work properly and display the live CO₂ level on the display.



Figure 22: Finalised sensor showing CO₂ level. Credit: FAB.

9. **Save measurements to a csv file.** When the box is connected to a PC, the python script datalogger.py allows you to save the readings in a log_CO2.csv file which will contain the time and the CO₂ level in PPM. You can then open it in a spreadsheet to view and analyse the results. Remember to modify the script to adapt it to the serial port to read the data (for example `./dev/ttyUSB0` for Linux and `./COM0` for Windows).

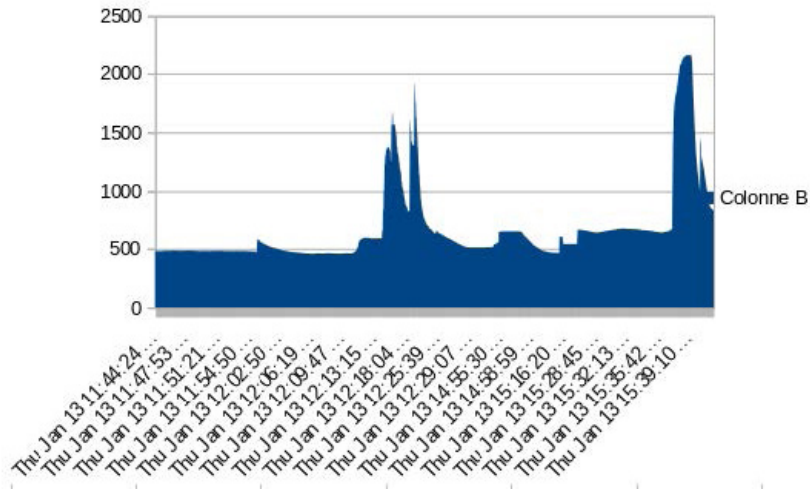


Figure 23: CO₂ level measurements taken from sensor. Credit: FAB.

Part 2: Measuring

Install the sensors and take measurements in different conditions to compare results. Examples: indoor, outdoor, before and after opening a window, next to a flame, close to the mouth, etc.

Part 3: Researchers

Invite researchers and experts to present the scientific research related to the chosen topic (such as a researcher in climate change, or a doctor, nurse or expert in health issues. They can be invited at the beginning of the project (to help set the scientific objectives), in the middle (to advise and exchange) or at the end (to allow learners to first master the topic so they can ask meaningful questions).

Part 4: Presentation

Prepare posters and an interactive stand to present the project to the other school learners or to the general public. It's important to show the whole process, not only the sensor.

Part 5: Evaluation

Use the zines at the beginning and during the project to help learners reflect on the bigger picture related to the measurement of CO₂.

Credit: The sensor was designed by Tony Vanpoucke l'Edulab – Université Rennes 2, and modified for this activity by Onl'Fait Makerspace, OS Hub Switzerland.

3.2.3 Session title: Raspberry Pi Gaming Console

ACTIVITY IN A SENTENCE:

Creating a gaming console with retro games by using open source technologies

DISCIPLINES INVOLVED IN ACTIVITIES:

ICT, Coding, Engineering

RECOMMENDED AGES:

12 – 18

LEARNING ENVIRONMENT (CONTEXT SETTING):

Ideally the activity is run in a Makers lab – IT lab. However, it can also be carried out in an ordinary classroom with just the essentials needed (see Resources Needed).

LEARNING OUTCOMES:

- Internet researching
- Setting up and use of raspberry pi
- Introduction to coding
- Trial and error method.

RECOMMENDED EXPERTISE:

IT teacher with Open Schooling knowledge

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- *Goal 17:* Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development

TIME IT TAKES TO COMPLETE:

4 hours

MATERIALS / RESOURCES NEEDED:

- Raspberry pi, SD card, Computer, MicroSD card reader (a method to connect your SD card to your computer or laptop), internet connection, screen (to connect the raspberry pi), game controller of your choice (keyboard also works)

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- Detailed instructions can be found *here*.

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- For younger learners, the necessary files could be already loaded into the SD card.

Activity

INTRODUCTION: Create a gaming console by using open technologies with the use of Raspberry pi.

- This activity is an easy, introductory activity that learners can work on with the correct technologies. The raspberry – pi platform (<https://www.raspberrypi.org/>) includes many ideas and teaching material for open source community projects and can be combined with the arduino space (<https://www.arduino.cc/>) for more complex and automated issues.
- Within Open Schooling, students need to be introduced to the basics of these tools, a process which can take from a few hours to many weeks and can then implement their knowledge and creativity in a vast range of different projects, using science and technology to solve local issues.

Part 1:

- Download the necessary files (OS) on your computer from *RetroPie*, depending on your raspberry pi version.
- Then, you have to download a program to import the files to the raspberry pi through the SD card. For Windows you can use: *Raspberry Pi Imager* or *Etcher*. Once the program's image/OS and SD card have been chosen, write it to the SD card and wait until the operation completes.
- Insert the SD card onto the raspberry pi so you can start using it.

Part 2:

- Turn on the raspberry pi. A menu should pop up. On this menu, configure the

connected controllers and an unused button or key as your Hotkey Enable button. When you get to "OK" at the end, press the button you have configured as "A" (East) to complete this step.

- Then you have to enter Game ROMs into your system. ROM stands for *Read Only Memory*, and in this context are digital copies of a game. You have plenty of ROMs to choose from. More on transferring ROMs to your system can be found [here](#).

Part 3:

- After you've transferred your ROMs, you need to restart EmulationStation in order for them to show up. You can restart EmulationStation by pressing Start > Quit > Restart EmulationStation, or with SSH access by rebooting your pi with `sudo reboot`. Once rebooted, you should see the game systems appear on the system list.
- An emulator is a software that acts like an old gaming device console.
- Helpful links:
 - [More on transferring ROMS](#)
 - [The whole procedure on youtube](#)



Figure 24: Students playing with their Raspberry Pi Retro Gaming Console. Credit: Vocational School of Myrina.

Credit: This activity was developed by the Vocational School of Myrina (EPAL Myrinas) using raspberry pi configurations from RetroPie.org and was run in collaboration with SciCo, OS-Hub Greece.

3.2.4 Session title: Food waste and biomaterials

ACTIVITY IN A SENTENCE:

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

DISCIPLINES INVOLVED IN ACTIVITIES:

Chemistry

RECOMMENDED AGES:

12+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Makerspace, class, restaurants and bars

LEARNING OUTCOMES:

Learners will:

- Learn about organic waste
- Discover how much it is produced in restaurants and bars
- Understand how it is treated in their municipality after disposal
- Measure quantities
- Follow procedures
- Be introduced to the chemistry of biomaterials.

The topic was chosen by students during a session facilitated by the teacher at school. Students were interested to learn more about food waste and how it could be turned into a resource. They visited a bar and a restaurant in their neighbourhood to collect food waste (eggshells, coffee grounds and orange peels) and talk to the owners about disposal of organic waste. After having produced biomaterials at Onl'fait, the students continued to explore the topic in class and another group worked on a compost bin fed by the school cafeteria to grow aromatic plants.

RECOMMENDED EXPERTISE:

Chemist, Cook, Bar owner, Food expert

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- *Goal 11:* Make cities and human settlements inclusive, safe, resilient and sustainable
- *Goal 12:* Ensure sustainable consumption and production patterns

TIME IT TAKES TO COMPLETE:

- Co-creation session: 1.5-2 hours
- Waste collection: 1-3 hours
- Introduction about biomaterials and their advantages: 1 hour
- Producing biomaterials: 3 x 2 hours
- Fabricating objects: 3 hours
- Preparation of the miniexpo: 2-6 hours
- Mini-expo: 6 hours
- Evaluation: 2-4 hours

MATERIALS / RESOURCES NEEDED:

- Eggshell
 - 15 ml water
 - 24 g eggshell
 - 7 g gelatin
 - a saucepan
 - heating plate
 - grinder
 - spoon
 - Moulds (eg. ice tray)
 - high precision balance
- Coffee
 - 35 ml water
 - 5 g glycerin
 - 5 g coffee ground
 - 5 g sodium alginate
 - 5 g olive oil
 - 100 ml water
 - 10 g of calcium chloride
 - high precision balance
 - bowl to mix
 - frame
 - spoon
 - spray bottle
 - heating plate
 - saucepan
- Orange
 - 5 litres water

- 420 g glycerin
- 120 g orange peels
- 125 g sodium alginate
- 55 g olive oil
- 20 g wool fibre
- 100 ml water
- 10 g calcium chloride
- high precision balance
- bowl to mix
- frame
- spoon
- spray bottle
- heating plate
- grinder or mixer
- heating plate
- saucepan

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- External resources can be found later on within the activity description

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- The activity can be adapted to primary school students by simplifying the object to create.

Activity

INTRODUCTION: Co-creation

- Start the activity with a presentation about Open Schooling (check out 5. Educator Training to learn more about Open Schooling). Use examples of local issues that are tackled with smart solutions developed by the youth and citizens. Show examples of technology for sustainability.
- Divide the class in smaller groups and distribute A3 cards with a list of issues (traffic, climate change, etc...) and ask the group to rank them from the most concerning to the least and to add one more issue specific to their community. Let the students motivate their choice and find a consensus to select the topic to work on.
- Once the topic has been chosen, you can decide to propose an idea (more or less defined) or facilitate a second session to come up with a technological solution.

Part 1: Waste collection

Contact restaurants, bars or a supermarket in your neighbourhood to organise a visit to collect food waste, explain the project (motivation and objectives) and interview the food professionals regarding food waste.

Part 2: Introduction to biomaterials

Prepare a presentation to explain the sustainability issues related to the overproduction of fabrics for textile and the fabrication of synthetic composites for furniture and buildings. Explain the potential of biomaterials for manufacturing and the fashion industry and the limits that researchers are trying to overcome. Inspiration may be taken from [here](#).

Part 3: Producing biomaterials: eggshell composite

- Boil eggshells to kill bacteria and work safely
- Dry the eggshells (either naturally or in the oven for 10 mins)
- Grind the eggshells with a grinder to obtain a fine powder
- Pour the gelatin powder in hot water in a saucepan.
- Add the eggshell powder and mix until you have a slightly viscous and granulous paste. Note: gelatin molecules break more easily when the water is hot, so be sure to pour in the eggshell powder before the mixture is too runny.
- Pour the eggshell mixture into a mould and let it dry and voila!

Part 4: Producing biomaterials: coffee grounds bioplastic

- Weigh all the ingredients with a precision scale.
- Mix the ground coffee and the sodium alginate with the glycerin and olive oil.
- Add the warm water and mix well to obtain a homogeneous solution.
- Cast the liquid in a frame (you can make your own using any waterproof textile for the base and wood for the frame – see External Resources for assistance)
- Mix calcium chloride with water in a spray bottle. Then spray the material surface with the calcium chloride solution.
- Let the calcium chloride act for 5 minutes and rinse with clear water.
- Let the composite sample dry in a dry, warm place for one week. Depending on the thickness and size of the sample, this may take longer. It will also vary due to local temperature and humidity.
- When the product is dry, you can remove it from the frame.

Part 5: Producing biomaterials: orange peel bioplastic

- Dry the orange peels .
- Grind the orange peel with a shredder or blender then sift it into a powder.
- Mix the warm water, gelatin, sodium alginate, oil and orange peel powder in a saucepan.
- Let the mixture rest in a cool environment to avoid bubbles for 24 hours.
- Add the wool fibre to the mixture and mix .
- Pour the mixture into a frame (you can make your own using any waterproof textile for the base and wood for the base – see External Resources for assistance).
- Mix calcium chloride with water in a spray bottle and spray the surface of the material.
- Let the bioplastic dry for 3-7 days in a dry environment to avoid mould and when the product is dry you can remove it from the frame.

Part 6: Fabricating objects

- Use silicon moulds to make small objects (i.e. small pots) with the eggshell composite
- You can use the coffee fabric to make objects like a keyholder, a foldable bag or a notebook cover
- You can use the orange peel fabric to make objects like a keyholder, a bag or a notebook cover and you can use a sewing machine to assemble the object

EXTERNAL RESOURCES

These resources will assist with the biomaterial fabrication process

- *Biomaterial Design Casting*
- *Bioplastic Cook Book by anastasia pistofidou – Issuu*
- *Bioplastics – materiability*

Part 7: Conclusion

Show the artefacts in the school or in a local science museum. Contact the bar, supermarket or restaurants to explain what you did and explore further collaboration.

Credits: This activity was developed by Fab Textile – IAAC Barcelona, Fabricademy and Materiom, and was submitted by Onl’Fait Makerspace, OSHub Switzerland.

4. EVALUATION TOOLS

4.1 Session title: An introduction to zines

ACTIVITY IN A SENTENCE:

Overview of how to make and implement zines as a creative and personal way for learners to reflect on their learning experience of any activity/workshop undertaken.

DISCIPLINES INVOLVED IN ACTIVITIES:

Art, Mindfulness and disciplines related to activity/workshop under

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Formal and informal learning environment, can be adapted to online

LEARNING OUTCOMES:

- Familiarity with zine culture and construction
- Warm up and blind drawing skills
- Practice reflection
- Explore emotional response to scientific topics
- Creative confidence
- Learning Journal

Zines allow learners to reflect on a learning experience in a creative and personal way. For topics explored in Open Schooling, such reflection is vital as it allows learners the opportunity to connect with and form an emotional response to a topic, and provides facilitators with a form of evaluation.

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

TIME IT TAKES TO COMPLETE:

45 – 60 mins

MATERIALS / RESOURCES NEEDED:

- Required:
 - Paper + Pen/pencil
- Optional:
 - Markers
 - Newspapers, magazines and/or photos
 - Scrap materials
 - Scissors and glue
 - Needle and thread
 - Post-its

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- Presentation: *Activity Handbook: Zine Makeshop.pptx*

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- Provide assistance with making the zines and prompts for younger participants.

Activity

INTRODUCTION: What is a zine?

A zine is a small, short handmade pamphlet/magazine which contains multiple pages, often filled with text, drawings, and collages. They can be made by a single person or a small group, and are a unique way to communicate topics, thoughts and ideas.

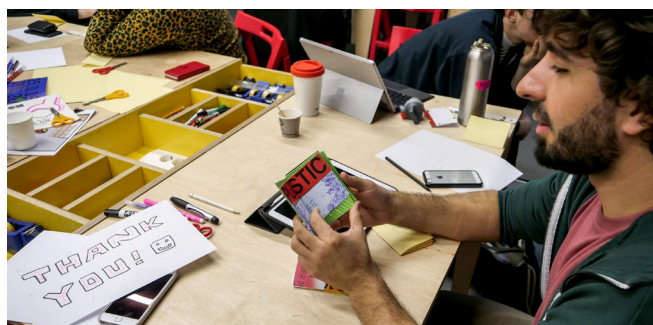


Figure 26: Creator looking through their own zine.



Figure 27: Example of a zine. Credit: SySTEM 2020³.

This activity will focus on how to build and utilise a zine as a means of evaluation, as well as a way for learners to document and reflect on their learning. This reflection should include their emotional response to the topic eg. how they felt, what inspired them.

Part 1: Building the zine

There are multiple ways to build a zine, but the simplest involves folding and cutting a single sheet of paper. Follow the steps in the image below to create a zine. The zine can also be made by binding multiple pieces of paper using staples, or a needle and thread.

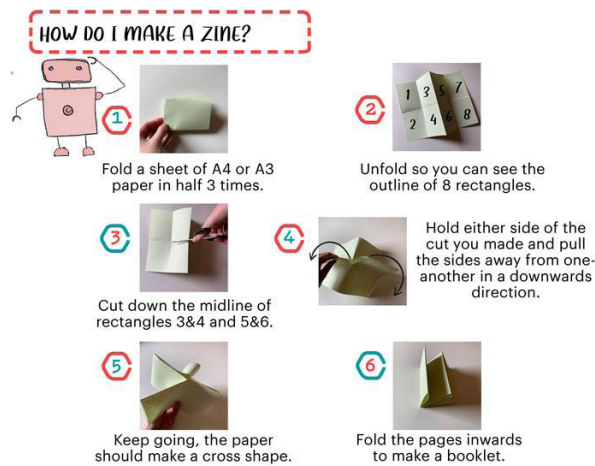


Figure 28: Step by step guide of 'How to make a zine'. Credit: Brown et al., 2021⁴.

3 SySTEM 2020 received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement no. 788317

4 Brown, A., Hurley, M., Perry, S., & Roche, J. (2021). Zines as Reflective Evaluation Within Interdisciplinary Learning Programmes. *Frontiers in Education*, 6

Part 2: Adding content to the zine

To guide the participants through creating their own zine, it is best to first assign a theme or topic that will be explored. For this activity, we will focus on zines used for evaluation of a project or as a learning journal for a topic. However zines can be adapted for many different contexts, including introducing a lesson or brainstorming.

Content ideas should come from the participant, but they can be guided by the facilitator using prompts as a form of scaffolding. These prompts can vary in detail depending on the participants and the aim of the zines.

The prompts should ask the participants to reflect on their learning journey, both exploring what they have learned and how they have learned it, but also how they felt. Did they enjoy the process? Was anything difficult? Did a particular part inspire new perspectives?

An example of a topic and prompts can be found in the *attached slides*. These slides focus on documenting the learning journey as participants explore the theme of plastic. Encourage participants to get creative with their zines, to use the materials provided and think outside of the box. The zine is a personal reflection of their learning experience, and we are asking them to express this creatively.

Part 3: Showcase (Optional)

Zines are a form of self-published work and are mainly created to communicate topics or ideas with others. Therefore it is a nice addition to ask participants to share their zines with each other. This could be done through a simple presentation, but could also be done with a showcase for both the participants and the public. Zines can also be shared with the local community (and wider) using online platforms, selling them or submitting them to local libraries and art festivals.

After this activity, participants should be aware of zine culture and feel empowered to explore topics using a creative process.

USEFUL LINKS:

- SySTEM 2020 Learning portfolios – Zines
- Brown, A., Hurley, M., Perry, S., & Roche, J. (2021). Zines as Reflective Evaluation Within Interdisciplinary Learning Programmes. *Frontiers in Education*, 6

Credits: This activity was developed by Science Gallery Dublin and Trinity College Dublin, OS-Hub Ireland, and inspired by the SySTEM 2020 project (2018 – 2021).

4.2 Session title: Art-based mapping

ACTIVITY IN A SENTENCE:

Art-based mapping is a participatory evaluation method during which learners express their thoughts, opinions and emotions, by making a creative map of their experiences – in a safe environment, led by the learner – , while engaging in a conversation with the educator.

DISCIPLINES INVOLVED IN ACTIVITIES:

It can be integrated into any discipline

RECOMMENDED AGES:

6+

It can also be performed with younger ages, however, the experience will be more meaningful for older learners, in terms of self-awareness and self-expression of their experiences and thoughts, as well as regarding the development of a trust relationship with the educator.

LEARNING ENVIRONMENT (CONTEXT SETTING):

It can be integrated into any learning environment, however it is fundamental to take place in a quiet and familiar environment, where the learner feels safe and comfortable.

LEARNING OUTCOMES:

Learners will:

- gain insight into their perceptions, experiences and emotions, which promotes self awareness, self-confidence and wellbeing. These are crucial for learners' learning processes and overall academic progress.
- become equipped with the tools and mechanisms to express these, in particular, through the development of art-based skills.

Educators will:

- get acquainted with research practices, which allows them to get insight into learners' stories, perceptions and experiences and to strengthen their relationship with them.
- receive insights into how they can tailor and improve the education for the learner.

Importantly, this participatory evaluation method also leads to more equality between the researcher (the educator) and the participant (the learner), by empowering the learner with the tools to express themselves and steering the creation of their own maps. It also fosters equity by creating opportunities for participants with language difficulties.

This an evaluation method where learners take centre stage, by giving them the agency to decide what to share and how to share, while, at the same time, equipping them with the tools to gain access to and give voice to their perceptions, experiences and emotions. In addition, it is a participatory tool that promotes the collaboration between researchers, educators and learners. On one

hand, it allows educators to take the role of the researcher, thus promoting their sense of ownership and sparking their interest in research, while providing them with the tools and skills to become more aware about the thoughts and emotions of their learners and to directly improve their education in a tailored way. On the other hand, it fosters equality between the researcher (in this case, the educator) and the participant (the learner) and strengthens a trust relationship between them.

RECOMMENDED EXPERTISE:

Basic training in creating art-based mappings with learners and analysing them is recommended. In the Content for Learners section we make available a set of guidelines and other relevant documents (e.g. examples of Conversation and Process Reports) created by the researchers from the Centre of Expertise in Global and Inclusive Learning at *The Hague University of Applied Sciences* and by previous tutors, that were created in the context of the project *Studenten voor Educatie* project from the *Open Science Hub – The Netherlands*.

SDG LINKS:

- *Goal 4*: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- *Goal 5*: Achieve gender equality and empower all women and girls
- *Goal 17*: Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development

TIME IT TAKES TO COMPLETE:

30 – 60 min, depending on the age of the learner. This is the estimated time for a group of up to 3 participants.

- for younger learners (5/6 year olds), we recommend a 30 min session
- for older learners (7+), a session can take up to 60 min.

MATERIALS / RESOURCES NEEDED:

- Paper
- Markers / colored pencils / crayons
- Magazines, newspapers, scrap paper (in case participants want to cut out pictures, make collages)
- Scissors
- Glue

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- In the *art-based mapping folder*, learners will find guidelines on how to implement this participatory evaluation method and other relevant documents, such as examples of Conversation and Process Reports developed by previous tutors.

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

- The activity is already written in a way that can be applied to different kinds of audiences.

Activity

INTRODUCTION:

The art-based mapping evaluation method was implemented in the context of the Studenten voor Educatie project from the Open Science Hub – The Netherlands as one of the research instruments of the Monitoring and Evaluation Program developed by the Centre of Expertise in Global and Inclusive Learning at The Hague University of Applied Science.

The learneren voor Educatie project aimed at supporting primary schools in overcoming current and unfolding challenges engendered and/or exacerbated by the COVID-19 pandemic with long-lasting effects, such as: 1) many pupils are increasingly falling behind in their academic, creative and emotional development, and 2) the workload for teachers, concomitantly, increases sharply. For that, learneren voor Educatie consisted of a professional program targeted at university learners, that ran parallel to their studies, where learners (tutors) were matched to primary schools based on their assets and on the school's needs.

Considering this context, the Monitoring and Evaluation Program was aimed at testing the overarching objectives of the project, and simultaneously making sure that it would be implemented in the classroom in an organic, playful, non-disruptive and non-time consuming way. Through this, we also hoped to strengthen the trust relationship between the tutor and the primary learner, amongst primary learners as well as between tutors.

As such, tutors were trained and guided to become co-researchers and to create the art-based mappings with the primary learners as part of their tutoring activities, thus not entailing extra work-time for primary learners, teachers nor tutors. The role of the university learners was vital since they were closer in age than (most) teachers and, through their close guidance, could offer trust and recognition to the primary learners, thus further enhancing the boost in confidence. Each exercise was conducted by two tutors (where possible) with a group of up to three participants. Also, since we wanted to understand the impact of the project throughout time, we performed an initial baseline that was followed by several assessment timepoints throughout the school year.

Below you can see some of the maps created by primary schools in the context of the Studenten voor Educatie project.



Figure 30: Art-based maps created as part of the Studenten voor Educatie project. Credit: ULEI.

Part 1:

The first step is to define the objectives and the research question of your project. What would you like to understand by using the art-based mapping evaluation method? In the case of *Studenten voor Educatie*, we wanted to evaluate the impact of this tailored tutoring program on the educational opportunities of primary learners, namely on skill development and academic progress, self-confidence, well-being and motivation. Then, based on these objectives and on the defined research question, we designed our research plan.

What are the objectives and research questions of your project?

And what will be your research plan?

Part 2: Adding content to the zine

The next step is then the creation of the actual maps by the learners. Please find below some guidelines that will help you prepare the activity.

2.1 Preparation

1. Think of a few open-ended questions related to your project objectives and research questions to kick-off the conversation. In the case of the *lerneren voor Educatie* project, some of these questions were:
 - We have been doing activity X over the last few weeks, what do you think of it?
 - Could you describe activity X to me?
 - Could you describe what you are learning during activity X?
 - What do you think of the place where we do activity X?
 - What do you like to do / find interesting?
 - How do you think activity X is going?
 - What do you think about doing activity X in a group / alone?
 - What would you like to change about activity X?
2. Find a space where participants feel safe and comfortable.
3. Gather all the supplies and make sure they are ready to use.
4. Prepare consent forms. Bear in mind that in the case of minors, you will need to ask for the consent of their guardians prior to the session.

2.2 During the activity

1. Start by asking the participant's consent (this only applies to non-minor children, in the case of minors, you will need the guardian's consent – please see above), and if there are any questions/concerns. Also, ensure that participants are aware that they can stop the exercise at any time.

2. Give participants a piece of paper and a variety of writing tools, e.g. markers, colored pencils, crayons, as well as newspapers, magazines, scrap paper, scissors, in case they want to cut out a picture, make collages, etc.
3. Once you feel that the participants are ready to start, choose your first question and kindly ask them to express themselves (by drawing, using words, cutting out pictures). Throughout the mapping exercise, keep in mind the following golden tips:
 - Your role during this exercise is to listen and to facilitate the mapping but without biasing the participant in any particular way. It is the learner that will lead the conversation about the mapping.
 - Ask open-ended questions and keep your theme in mind, but don't explicitly tell your theme and objectives; don't steer too much;
 - It is important that you also share something, so that it becomes a dialogue and the conversation flows organically. However, never forget that the participant is the one leading the conversation;
 - Map along with the participant, if you want to. This can promote the dialogue between the educator and the learner and, at the same time, it will allow you to take notes during the mapping exercise in an informal way;
 - Make clear that mapping is not just about drawing. Participants can also use words, cut out pictures, etc.
4. Now that the mapping exercise is running, please pay attention to the following elements, which will provide valuable information in order to help you asking follow-up questions and facilitating the mapping process:
 - What is drawn, pasted, written and/or what is left out
 - How: shape / size / colours, composition and interrelationships
 - Symbols
 - Details
 - What has not been recorded / written down
 - Other elements that you find relevant
5. Throughout the mapping, please make a record of the conversation, for example, by:
 - Recording the audio – in this case, do not forget to include this in the consent forms.
 - Or by taking written notes, e.g. specific phrases, comments about something that was drawn. Please try to keep as close as possible from the original sentences. If you decide to map along with the participant, you can use your map to take notes as well.

Part 3

After having finalised the mapping exercise, it's time to analyse the data. At the end of the exercise, you will have two products: a Map and a Conversation Report (produced from the audio record and/or written notes).

Based on these products, you will then write a Process Report, which will include first impressions, responses and answers to your research questions.

Below we provide an example of an art-based map and a brief Process Report (from the report *Studenten voor Educatie – Evaluation Report, 2021*⁵, which can be found in the Art-based mapping folder – please see Content for Learners).



Figure 31: Art-based mapping example drawing. Credit: ULEI.

This drawing made with black felt-tip pen shows how the student experienced the support of the student tutor. The learner chose black to make the drawing look like a manga drawing. The Conversation and Process Report clarify the drawing. We see a full drawing containing bounded planes/circles, figures and letters. The student begins by drawing the letters Kring [‘Kring’ is the circle the class makes in the morning to start the day together and to go through the planning of the day or through a central topic for the class], next to it in a non-bounded space next to it, in an undefined area, a top view of a group of six pupils (her tribal group).

Then, below that, a figure with a tear and ‘10 hours later’ written. This refers to the length of a school day and the emotions of the pupil. School takes a long time and creates sad feelings. The student draws the second circle clockwise, you see the letters L.K.P. [which refers to Learning Opportunities Profile, a programme developed for primary school where large groups of pupils have fewer development opportunities], which is a reference to school. Furthermore, in this plane you see two figures and a ball. The student says that this refers to a moment during gym class when

5 *Studenten voor Educatie – Evaluation Report, 2021:*
<https://drive.google.com/drive/folders/1hJnFQZGqjt3PkwIwxG5tT8UuOIU6i5wO?usp=sharing>

another student had thrown a ball against her head. As she recounted this, the student drew a cross through the scene because it hurt her to remember it. In the other circles drawn, the student shows school subjects such as maths, language, reading, writing, automation. The circles vary in size, which indicates the heaviness of importance to the student, and the individual drawings also depict different emotions. There are also circles that show the relationship with other children. Sometimes sadness or negative feelings dominate. What is striking is that the student draws herself especially happy when she is alone or with her best friend or when she is working 1-on-1 with the student tutor or teacher for a while, even if this is in the classroom.

The student noted during the mapping that the tutor and herself have not read together yet this year. When questioned by the tutor "What do you most enjoy doing together"?, the student answered, "Reading in the hallway.". This is reflected in the drawing, in the middle.

The student ends the conversation by saying she would like the tutor to be there all week.

Credit: This activity was developed by Leiden University for the Studenten voor Educatie Program, OSHub The Netherlands.

4.3 Session title: Free Flow Writing

ACTIVITY IN A SENTENCE:

A creative way of getting started and finding unique approaches.

DISCIPLINES INVOLVED IN ACTIVITIES:

Citizenship and Philosophy (The workshop can be applied as a creative tool in order to deal with any subject area).

RECOMMENDED AGES:

14+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Classroom, informal learning space. This activity/method can be applied for two different purposes:

A) The activity describes a process to find a unique and personal approach to transform a topic, a prompt, an experience or an input into a creative piece of work which deepens the elaboration and serves to start exploring a topic in depth.

Or

B) This activity can be applied as a method for any context in which students are asked to create a project that engages with their environment on their own. It serves to gather a pool of ideas and find a personal approach that is aligned with their personal interest, stance and concern.

LEARNING OUTCOMES:

- Overcoming writer's block or simply getting started with a project
- Attuning to one's personal involvement and interest in a topic
- Finding ideas for a project and editing them afterwards
- Recapitulating after a session of input in order to reflect on the learner's' experience of the class, about its impact and relevance for them, which open questions or further thoughts and/or how to investigate the topic further.
- Demarcation to other brainstorming or ideation methods: The process of free writing does not allow one to stay in a mental mode of full control. Therefore, unexpected and valuable approaches can evolve.

A) Inputs from activities undertaken by school students with stakeholders engaged in open schooling programs can be "digested" and further developed and converted into the personal projects of the students. The activity can either serve to create the connection between what is done in school and the experiences that are made together with others or in extraordinary open schooling events – through developing the starting point for creating a "piece" that builds up on the input/experience. This piece can be realised in different mediums: It can be a theatre play, a graphically designed Zine, a stop motion movie, a scientific text or an essay – to list only a few examples of possible final outcomes.

B) This activity will help students to map the issues that concerns them and their local community and to form the basis for formulating an open schooling project.

RECOMMENDED EXPERTISE:

No specific expertise is mandatory. Experience in writing or free flow writing can be helpful.

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

TIME IT TAKES TO COMPLETE:

30 – 45 min

MATERIALS / RESOURCES NEEDED:

- a few blank sheets of paper (or notebook) per student
- pens
- timer
- three open questions fitting to the subject matter
- a bell (optional)

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- *Free Flow Writing Rules*
- *Topic Layout Template A Topic Layout Template B*

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

This module makes a creative method of project development accessible to many different disciplines. See examples below.

Activity

INTRODUCTION: About Free Flow Writing

The technique of Automatic Writing or Free Flow Writing became popular under the name “Écriture automatique” by the Surrealists – an art movement of the 1920s who tried to get into practice by giving up intentional control and connecting to the subconscious. While it can have many forms, the method described here invites the students to answer three questions posed by the teacher, by writing down whatever comes to their mind after listening to the question for a certain amount of time (approximately 3 – 5 minutes per question). Correct grammar or a good style are not important, and any judgement should be suspended during those few minutes. The exercise can be compared to a so-called brainstorming process, in which all ideas are considered equally valid, so one is also encouraged to write down what could be considered one’s ‘worst ideas’.

The scope of this exercise is to let one’s thoughts evolve during the writing process (not to think about the question first and then write those thoughts down). It is important to keep on writing without pausing or even lifting the pen for too long from the paper, until an acoustic tone (like an alarm bell) signals the end of the writing time. This low-threshold approach not only fills the paper with written text quite quickly and effortlessly, which can help to deal with anxieties around perfectionism or being confronted with a blank page and not knowing how to even get started. It also leads to surprising, unforeseeable outcomes, which helps to connect with one’s own innovative creativity and personal (maybe even private) interests in a topic. The written pages stay with the students who decide what they want to do with them – sharing them or keeping them to themselves. The free flow of writing should be followed by a process of sorting out specific ideas and arranging them for the purpose of the class’s task.

Part 1: Let it flow

There are multiple ways to build a zine, but the simplest involves folding and cutting a single sheet of paper. Follow the steps in the image below to create a zine. The zine can also be made by binding multiple pieces of paper using staples, or a needle and thread.

1.1 Introduction of frame and goal

First the students should be introduced to the general project of the class. Does it refer to an activity

or input from the past? Or is the goal to develop a new project and find the starting point?

Introduce the output-medium

The teacher explains what medium it is that the students are going to use to create their outcome – based on the activity described in this guide. This could be a magazine, a fictional story, a documentary, a speech, a multimedia presentation, etc.

For this activity handbook, we will use the example of creating a Zine to the topic “Self-Care” as the output.

The teacher gives insights to the (historical) background, the purpose and use of the selected medium. Some already existing examples can be presented.

Links related to the example of Zines:

- *What are Zines? Examples of Zines.*
- *What are self-care zines?*

1.2 Explain Free Writing

Every student is asked to get a pen, a few sheets of blank paper and a copy of the Automatic Writing Exercise with its ‘rules’ is explained to them as followed:

- “I am going to ask you three questions all in all and for every question you will get ~4 minutes to answer it in written form.”
- “Immediately after hearing the question, you should start writing. Don’t think about your answer first and then write it down but try to be in a constant writing flow without thinking too much. This might feel as if your hand or the pen has a life of its own and is writing the answers, not you. So afterwards you might even be surprised what ‘you’ have written down. Try to never lift the pen from the paper for too long. If you don’t know what to write about, just try to keep on writing. You can even write ‘I don’t know what to write about’ or ‘blah blah blah’ and trust that full sentences will come as if by themselves soon.”
- “Mistakes are welcome, as well as weirdness and imperfections. Don’t worry about grammar, commas, style, beautiful handwriting or the like. Don’t judge or censor what you are writing down – your supposedly worst as well as your best ideas or conclusions are equally important.”
- “I am not going to collect your texts or ask you to read it. Whatever you are writing down stays with yourself and you decide what you are going to do with it: keeping it or throwing it away or showing it to somebody – as you wish. Since you are writing only for yourself you don’t need to impress anybody or restrict your writing.”
- “Your answers can be serious or silly, realistic or fantastic, true or false, authentic or pretending, small or big, humorous or earnest. Wherever your flow leads you to and whatever you find more interesting.”

1.3 Free Writing

The teacher can then set the timer for 3 – 5 minutes and ask the first question.

How to formulate the three questions in dependency of the topic:

Depending on the topic the three questions for the Free Flow Writing should highlight different perspectives which help the students to dig deeper into the topic by first getting a feeling for its full spectrum, which can also contain contradictions. A typical triple would be to ask about the pro and the contra or the positive and the negative aspects regarding a subject matter and finally about some form of conclusion, synthesis or next steps and actions. One can also ask about easy or pleasurable aspects and then about difficult or problematic ones. The first two questions then serve as some form of overview, while the last question can be about more specific, pragmatic or hands-on aspects in order to collect ideas to get into practice afterwards or in order to see one's personal relevance of the topic.

Example: Self-Care Zine:

In a workshop that aims at creating small handmade magazines about self-care, the writing exercise could help the students to find out what kind of self-care topic is so accessible to them that they could make a whole magazine about it. Here the first question could be about certain problems, worries or difficulties – because the final zine could help to address those problems and investigate how to deal with them. The question (or set of questions which all aim at the same direction that students can choose one from to focus on) could then sound something like:

- First Question: "Ask yourself: 'What has been on your mind lately? What was annoying or worrying? What is a problem that you could need answers or advice for?'"
- The second question would then be about solutions the students have already found for certain difficult situations, e.g.: "Ask yourself: 'What can you do quite well? What could you teach to others? For what problems have you found good solutions? When do other people come to you to ask for advice?'"
- The final question would then get back to the workshop outcome and simply use the answers for the first two questions as inspiration for the third question: "Ask yourself: 'What should your zine be about? For whom would you write this Zine? What title could it have and what would be its content?'"

Application to other topics:

In science or humanities classes, the opening questions could, for example, ask the students about their current knowledge about a certain topic (e.g., global warming), secondly what they find confusing about the topic or what they would like to learn more about, and thirdly, how the topic is connected to or represented in their own lives. Exemplary questions could be:

- "What comes to your mind when you hear the term 'global warming' or 'climate change'? What have you learned about it so far?"

- “What would you be curious about regarding this topic? What questions come to your mind that you would like to ask regarding climate change?”
- “Do you feel the topic has an impact on you beyond learning about it in school? Where do you see how issues around the climate are already embedded in your everyday life? Why could it be interesting or relevant for you to learn more about the topic?”

In order to retrospectively evaluate a class or workshop – be it about philosophy, biology, a sports event, literature club, a visit to the museum or any other form or discipline – the Automatic Writing questions can also help to reflect on the students’ experiences and their take-aways. It can also help them to prepare for possibly upcoming tests, dissertations, projects or next level classes. The questions could either focus more on the taught content or on personal experiences.

Transition between questions

When the alarm of the timer rings after the first few minutes of focused free writing, depending on the size of the group the teacher might amplify the sound with a bell, so everybody hears it. They can also tell the students to finish their last sentence and prepare for the next question, maybe by rotating their wrists in between or shaking their hands since handwriting can be exhausting. The timer can then be set again, and the second question can be posed. All of this is repeated for the third and final round.

1.4 Distil

The students then have time (~5-10 minutes) to read what they’ve written down and are welcome to work with their text by underlining or encircling certain words or sentences they find interesting, by adding comments, symbols, pictures or by crossing out certain words or sentences. They can be reminded that there is no right or wrong in this process, but that they should follow their intuition in order to find their unique approach.

This process of reading and editing helps to intuitively decide on one of all the possible approaches. It usually shows what interests the most, what appears to be most urgent, or where the most subjective potential lies. This part of the process is very crucial. It serves as a bridge from “letting it flow” to making a conscious plan.

Part 2: Harvest

The written texts serve as a pool of ideas and personal reflections that now need to be narrowed down and sorted out to continue a working process.

The texts can then either be a base to decide for the topic and design of their self-care zine, stop-motion-animation or whatever the output medium is. Or it is the source to find a research question that can be investigated further in a dissertation, essay, documentary, symposium, debate club or any other project the students engage in.

2.1 Sorting out and making a plan

To bring some order into the free writing the students take another piece of paper and a pen and divide the paper into five parts by drawing a circle in the middle and then four lines from the circle to every corner of the paper, like this (see Figure 10).

The attached document "Topic Layout Template A" can be used to facilitate this exercise.

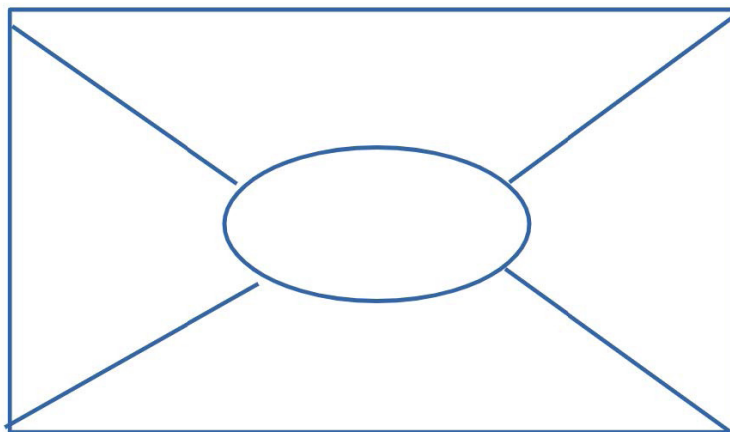


Figure 32: Template for Part 2.1. Credit: Beate Absalon.

- In the middle of the circle they can write down one **topic** – for their self-care zine (e.g., "smartphone addiction", "favourite friendship activities"), for their essay on global warming (e.g., "posters used at Friday for Future demos", "recycling"), or for their wishes or expectations regarding a new class (e.g., "more female authors", "inclusion of introverted students").
- In the upper field they can write down "**Questions**" and take a few minutes to write down any question that their zine, essay, etc, could tackle – regarding their topic (e.g. "What else could I do to distract myself from boredom than being on my phone?"; "What does a slogan on a demonstration need in order to get the message about global warming across?"; "Why do we read so many men in philosophy?")
- In the next field they can write down "**Answers**" and try to collect answers for some of their questions (e.g., "Instead of scrolling through social media I could write a letter or learn to juggle" etc.).
- While the first two gather ideas around the content – the "What?" –, the next two fields are more about the form a further dealing with those questions could take. In one field the students can write down "**How?**". If we take the example of the self-care zines they can then collect ideas about its specific genre (e.g., do they want to write it like a journalistic report, as a letter or a recipe book? Will it contain interviews, comics or lists of recommendations or journaling questions?). The ideas in filling in the "How" section can be greatly enriched by the appropriate input on the different forms and possibilities of the target medium. Similar approaches can be applied for any other artistic outcome as well as research papers (e.g., by asking about its methods, structure, material and resources).

- The last field gives space to collect ideas about the “Style”, “Design” or the “Aesthetics” of the project. Here the students can, for example, write down anything about their Zine’s looks (e.g., if it should be purely in black and white or what other colours and materials they want to use; if they want to make a very small micro-magazine or a huge one; if they want to create a collage, etc.) Same can be applied to any other artistic project and research paper (e.g., by asking about its rhetorical style, length, audience, etc.).

Adaptation:

This process of decision-making, sorting out and specifying one’s project, topic or involvement can be adapted for different needs and aims. If it is less about crafting and more about problem-solving it could be possible to write the problem into the middle. In one field, the student tries to formulate a precise question for the problem. In another field they could collect ideas about certain needs or reasons behind the problem, and in the next one possible solution. In the final corner they will write down ideas for realistic actions and next steps of how to get closer to the solution.

The attached document “Topic Layout Template B” can be used to facilitate this exercise.

Part 3: Transformation into a project

The creative writing process, which serves as a preparation for the students to get into a work-in-progress and start with their project, ends here. They can use their Automatic Writing or Sorting Out-Diagram to orient themselves about what to do next. When creating their self-care Zine, for example, they serve as a blueprint or a plan, reminding them of their ideas and approaches in order to not get lost or doing things arbitrarily. Now they have a direction when starting to gather their needed materials, writing their texts within a certain congruent design they decided for. The students learn to prepare for a task while making their own choices which make most sense for them and their idea, which can raise their motivation to work on the project and feeling attuned to it.

4.4 Session title: Story-Telling and Content Revision

ACTIVITY IN A SENTENCE:

Learners use story-telling methods to structure, revise and engage with learnt content.

DISCIPLINES INVOLVED IN ACTIVITIES:

This activity can be used with all subjects and can be adapted to compile, work with, and revise content as well as to suit teachers' and learners' needs and preferences. The activity is also very suitable for language teaching, especially also in the context of Content and Language Integrated Learning (CLIL).

RECOMMENDED AGES:

Can be adjusted to most ages.

LEARNING ENVIRONMENT (CONTEXT SETTING):

Groups of 3 to 4 students; ideally every group has a somewhat individual space to work in (e.g., a corner in the classroom, a double-desk – the exact amount of space needed also depends on the mode of presentation, as acting out a sketch will require more space than e.g., staging a 'freeze-frame' with action figures or cut outs on a desk). The educator supports the individual groups where necessary.

LEARNING OUTCOMES:

Learners can

- Can structure content in transferable packages
- Practice presentation skills
- Manage project-focused teamwork
- Negotiate meaning and representation

The activity allows to reference and "digest" inputs from experts, topics that were discussed in class, or experiences which were made outside of schools, and to engage with them in an interactive, emotional and socially collaborative way to better aid the retention of the acquired knowledge by translating the content into a creative medium. The activity can serve as a bridge between the world outside and what happens inside of schools, as well as between the different subjects at school, be they science-, humanities – or arts-related.

RECOMMENDED EXPERTISE:

The educator is not required to have any specific expertise. If available, connections can be made with professionals/experts in the relevant areas to help with content or the presentation.

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

- *Goal 14*: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- *Goal 15*: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

TIME IT TAKES TO COMPLETE:

- Minimum: one lesson of 50 minutes
- If the presentation is a focus point in and of its own, additional time will be needed to practise telling the story and to produce any necessary props; this will depend greatly on the age group, available resources, and how elaborate the production can be.
- Time for the presentations depends on the number of groups and how elaborate the presentations should be. Drastically limiting speaking time to one or two minutes can be a fun exercise and forces students to focus on the essentials without getting side-tracked.

MATERIALS / RESOURCES NEEDED:

- printed handouts, one set per group of 3-5 students.
- smartphones or cameras.

Can be adjusted depending on what is available, the subject, and the exact goal of the activity. E.g., pictures of relevant content, numbers, for a science class cards with relevant terms or formulas, eventually Rory's Story Cubes or something similar, action figures, pictures of characters, ...

USEFUL LITERATURE:

- Phillips, Louise. 2000. "Storytelling: The Seeds of Children's Creativity". *Australasian Journal of Early Childhood*, 25(3), 1–5. Doi: 10.1177/183693910002500302.
- Savage, Alice. 2019. *The Drama Book: Lesson Plans, Activities, and Scripts for English – Language Learners*. Branford: Alphabet Publishing.
- Wright, Andrew. 2015. *Creating Stories With Children*. Oxford: Oxford University Press.
- Wright, Andrew. 2008. *Storytelling with Children*. Oxford: Oxford University Press.

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- *Handout 1, 'Mind-Map'*
- *Handout 2, 'Story Design'*
- *Handout 3, 'Storyboard'*

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

Ideally, per teacher there should not be more than four to five groups of three to four, at most five students. Suitability for a class will also depend on the number of students, on a class' motivation, and on how confident students are with working independently. The bigger the class, the more space will be needed, especially once groups proceed to practise presenting their stories.

The complexity of the story itself can be adjusted depending on the age group; the complexity of the task as a whole should be adjusted depending on the age group, group size, available time, and the desired outcome (process-oriented revision, goal-oriented presentation).

Scaling the activity up or down for different audiences also lends itself to individualization and diversification as motivated/gifted/faster students can easily be given more complex tasks or be encouraged to add more content/characters/background information of their choosing, or to work on a more elaborate presentation.

Activity

INTRODUCTION:

Much in the same way as many other memory techniques, packaging content into pre-existing structures makes it easier to remember individual pieces of information as well as to establish links between the individual building blocks. Retention of content is further promoted by engaging with it(inter-)actively, by connecting it to emotions, and by comprehending connections between content items. As such, the activity can be used with all subjects and can be adapted to compile, work with, and revise content as well as to suit teachers' and learners' needs and preferences.

Once the stories have been created, students will enact these stories in several ways of varying degrees of complexity which draw on techniques also used in improv theatre and theatre pedagogy. In addition to class content and when it comes to storytelling, story elements from popular TV-series, films, books, comics (such as protagonists, narrative tropes, specific plot points or plot structure, specific characters, etc.) can be used to engage students further (e.g. The Lord of the Rings can be read in terms of environmental criticism (industrialisation and destruction of nature), Spiderman can be discussed in terms of genetic manipulation and what that means for the world and the individual).

Note: The following instructions are to conduct the activity as a revision exercise, in this example to revise the thematic complex of biodiversity.

Part 1: The Mind Map (10 – 15 mins)

Time is dependent on how fast groups can be formed and the specifics of the class.

- Form groups of three to four people. Each group should have a desk/their own space.
- Distribute the first handout, "Mind-Map".
- Ask students to write the main thematic complex that you will be revising in the central field. In our proposed example, this is 'biodiversity.'
- Give students five minutes to complete the mind-map, first adding topics you have talked about in class and facts that they have learnt, and then adding any further associations, ideas, and knowledge they might have, working steadily outwards until complete. They will need to hurry, but they are working together in a group, and they will also be able to return to the mind-map later.

Example:

Central field: biodiversity

Surrounding fields: fauna, flora, decline – why, effects of decline, why needed, ...

Further associations: buildings – cities – streets – highways – animals isolated – inbreeding or lack of breeding partners – not enough food, not the right food – animals killed when crossing streets – species extinction – solutions? – – > e.g., 'green' animal bridges over streets and highways that connect otherwise isolated habitats

Part 2: The Story

2.1 Designing the story (15 mins)

Experience has shown that this phase tends to take up most of the time. Some groups will require gently nudging/leading questions to identify the 'plot' etc., however, other groups will be very enthusiastic and overflow with ideas. Help them to pick a focus point, an idea they want to communicate, and to add more details once their basic storyline is complete.

- Distribute the second handout, "Story Design".
- Talk about and explain the story elements mentioned on the handout. What elements does a story need?
- Ask students to pick one aspect of their mind-map and think about how they could use that aspect in a story.
- Guide students to pick a protagonist, a problem, and a solution to or consequence of the problem. Naturally, a story also needs a title!

Example:

Aspect chosen: isolated animals, green bridges as a solution

Story elements:

- Protagonist: e.g., a lonely boy fox looking for a girl fox/ a lost baby-deer, looking for its mother
- The problem: There are no girl foxes anywhere in his tiny forest, and he can't leave/ the baby-deer got separated from its mother when they had to cross the street and it got scared and ran back: everybody fears the fast, roaring monsters with huge, glowing eyes.
- Solution: He wanders around for a while and in the end finds a green bridge that connects his forest to another forest where he meets a girl fox, and they live happily ever after. / The baby-deer finds the green bridge and reunites with its mother.

2.2 Staging in the Story (15 mins)

Depending on the students, they may choose/need to stage a single 'frozen frame' or put together a single 'sculpture', or they might work very fast and manage to create a sequence of frames or sculptures to tell their story.

'Freeze Frame'/ 'Sculpture': Students (re-)create a moment of the story themselves, with each student taking on the role of an element in the picture, e.g., a roaring monster, two students building a bridge, a tree, ... In improv theatre each image element can talk about who they are, what they feel like, etc. if encouraged to do so by the director.

- Distribute the third handout, "Storyboard".
- Ask students to decide on one to five key moments of the story: How could they communicate the entire story in a single image? What moments would they pick if they could pick three or five images?
- Students sketch their ideas in the fields in the story boards and write down notes. What do the characters/elements feel in that position? What would they say? They may also already start trying out poses.
- Students may pick any available materials as props.
- One student takes a photo of each of the 'frames'/ 'sculptures'.

Part 3: The Presentation

Students present their stories to the class, either by moving through the frames/sculptures or by showing the photos they have taken.

If moving through the frames/sculptures, the teacher or another student can signal, e.g. by touch, each element in the frame/sculpture individually (monologue) or all together (to create a soundscape) to talk about who they are and what they are feeling, what their purpose is, etc. Sentences should start with "I" in order to focus on the specific character/element.

Other students and the teacher/trainer give feedback. What was the story? What content did the story focus on? Was there anything that was especially cool?

Example:

The teacher moves around the sculpture of a baby-deer cowering under trees and lightly touches the shoulder of the student acting the part of the baby-deer. They talk until the teacher stops touching them: "I am a baby-deer and I have lost my mother. I am lonely and afraid of the loud monsters with the glowing eyes. ..."

Documentation/Outreach:

Given more time and more resources, the frames/sculptures can be made more detailed/elaborate. The best photos for each frame/sculpture may be printed and put together on a poster. In addition to the title and the artists' names, image descriptions can be added (e.g., a description of what is happening or parts of the monologue of the picture elements). The poster can be put up at school etc. so that others may enjoy them and even learn something about an important topic.

5. EDUCATOR TRAINING

5.1 Session title: Integrating Open Schooling in the daily-life of schools: a teacher training program

ACTIVITY IN A SENTENCE:

Training program for teachers on how to develop and implement an Open Schooling project co-creatively with students.

DISCIPLINES INVOLVED IN ACTIVITIES:

This training program promotes a project based methodology settled on equity, inclusion and democracy.

The main characteristics of this methodology are focused on: tackling local challenges/opportunities, collaborating with stakeholders, sharing with the local community and evaluating the impact of the project. As such, it can be adapted to different disciplines and, above all, allows transdisciplinarity.

RECOMMENDED AGES:

18+

LEARNING ENVIRONMENT (CONTEXT SETTING):

This training program can be adapted/integrated into any learning environment, but it is important that both educators and students feel safe and comfortable to share their thoughts and opinions, thus promoting collaboration and co-creation. Even if the training program happens in a face-to-face setting, we recommend the use of digital collaboration tools (e.g. Google documents) in complementary to post-its and other paper-based tools, since it promotes digital literacy and collaboration beyond the training site.

LEARNING OUTCOMES:

At the end of this training program, it is expected that learners will

- Become aware of the importance of fostering active citizenship in their classroom and in their daily-life school practices, namely in regard to inclusion, gender equality, interculturality, human rights, and plural participation, contributing to community development and well-being. In addition, by being based in democratic practices, this training program will position learners as main agents in the decision-making process.
- Be able to develop and plan projects based on tackling real life challenges that are locally relevant. Specifically, they will identify global and local challenges, define the objective of a project, design actions and assess the respective impact, and finally communicate and disseminate its process and outcomes.
- Understand the value of collaborating and co-creating with families and members of their local community, as well as other relevant stakeholders, in order to guarantee a more integrative, meaningful and sustainable development and implementation of the project.

RECOMMENDED EXPERTISE:

It's recommended that the facilitators of the training program have

- The ability of enabling a safe and comfortable environment, so that all participants share their thoughts and opinions freely.
- Rxpperience in design thinking, co-creation and collaborative work.

In the online setting, depending on the amount of participants, it's recommended more than one facilitator, especially when there is co-creation work in breakout rooms. In this case, we recommend at least one facilitator per breakout room.

SDG LINKS:

- *Goal 3:* Ensure healthy lives and promote well-being for all at all ages
- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- *Goal 5:* Achieve gender equality and empower all women and girls
- *Goal 12:* Ensure sustainable consumption and production patterns
- *Goal 17:* Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development

TIME IT TAKES TO COMPLETE:

Overall, the training program has a duration of around 16 hours, and each activity takes from 1 – 2 hours.

MATERIALS / RESOURCES NEEDED:

- In-person setting: whiteboard, A1 paper sheets, post-its, pens and the respective canvas for each activity (in "Content for learners").
- Online setting: computer, webcam, internet, Google Workspace (GDocs, GSli-

des, GSheets, GDrawings⁶), Mentimeter, Padlet (or similar software).

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- *Integrating Open Schooling in the daily-life of schools: a teacher training program – activities 1 to 10* – a pack with editable and non-editable files for each activity of the training program.
- *Open Schooling manual for the Citizenship and Development Discipline* – pack with editable and non-editable files containing the manual and activities from the manual (integrated in the item below “Related Content From Open Schooling Manual for the Citizenship and Development Discipline”).

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

The activities described in this training program can be adapted both to formal and non-formal educational contexts, depending on the educator’s objectives and needs. Also, although the activities of this training program were carried out sequentially, they can be used independently, and with a different order than the one proposed here. Note that some resources are in Portuguese, so translation may be required.

Activity

INTRODUCTION:

The training program for teachers that we present in this handbook results from an empirical experience of a certified teacher training program that took place in Portugal between November 2020 and May 2021, with twenty teachers from four different school clusters (SC) and one science centre (SC Figueira de Castelo Rodrigo, SC Almeida, SC Sé – Guarda, SC Pioneiros de Aviação Portuguesa, SC Pêro da Covilhã, Museu do Côa – Centro de Ciência Viva). This program was co-developed with one teacher from the SC of Figueira de Castelo Rodrigo (FCR) – Ana Cristina Perpétuo – and it was aimed at increasing student’s active citizenship and promoting teacher’s autonomy in Open Schooling practices. The content of this teacher training program was based on a practical manual co-created by the OSHub-PT team together with the teachers of the Citizenship and Development discipline, from the SC of FCR – Open Schooling Manual for Citizenship and Development (see Content for learners) – and systematises the Open Schooling practices that have been developed and implemented in this school cluster since the school year of 2018/2019.

Although this program was originally designed for the discipline of Citizenship and Development (C&D), in order to scale it for different audiences, we adapted it in a way that is transversal to any discipline.

As we describe below, this teacher training program provides guidance from the identification of local relevant challenges/opportunities to the design, implementation, evaluation and communication of projects in collaboration with local partners and the surrounding community.

6 Google Drawings was our platform of choice because we could create several documents for free and it was easily accessible to participants as it was part of Google Workspace. However, there are several user-friendly collaborative work platforms, such as *Miro* or *Mural*, for example.

It is organised in three parts and comprises 10 activities. The first part starts with the creation of the working groups, by bringing together learners with diverse and complementary competences. The second part is dedicated to the identification, with the help of families and the local community, of locally relevant challenges/opportunities while reflecting about their reality from a local to a global context. It finalises with the voting of one challenge that will be tackled in the next part. The third part follows a project-based methodology and guides the planning, development, evaluation and communication of the actions aimed at addressing the challenge identified earlier and contributing to community well-being.

Overview:

- Activity 1: Creating working groups by promoting diversity
- Activity 2: From global to local: identifying challenges, opportunities and solutions
- Activity 3: My school, my community, my country, the world: analysing challenges and opportunities
- Activity 4: Involving families, friends, colleagues, citizens understanding the challenges from our community
- Activity 5: Voting the challenge of the project
- Activity 6: Developing and planning the project: section “Why?”
- Activity 7: Developing and planning the project: section “What for?” and inviting local stakeholders to the school
- Activity 8: Developing and planning the project: debating with stakeholders
- Activity 9: Developing and planning the project: sections “How?” and “Did it work?”
- Activity 10: Developing and planning the project: section “What and how to communicate?”

Part 1

Activity 1: Creating working groups by promoting diversity

HOW?

The first activity of this training program is dedicated to creating working groups that bring together diverse and complementary competences. For that, learners start by answering several questions that make them reflect on their abilities in various skills – creativity, collaboration, communication, critical thinking and problem solving. The working groups are then formed based on these individual abilities by trying to maximise the diversity of skills in each group. At the end, learners reflect about the intrinsic diversity of each group and about the importance of this diversity for collaborative work.

WHY?

- Fostering inclusion, diversity, plural participation and democratic school practices;
- Promoting the reflection about the importance of gender equality, interculturality and the respect for human rights for working collaboratively and living in society.

HOW LONG?

1 hour

MATERIALS:

- Pack with editable and non editable files – “Creating working groups by promoting diversity” (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- “Plural participation and diversity: creation of working groups” [Portuguese]

STEP-BY-STEP:

1. Start by showing the participants the horizontal axis depicted in Image 1 and by explaining that they will be doing a game about creativity, collaboration, communication, critical thinking and problem solving. Let the learners briefly discuss each skill.

The figure displays four self-assessment axes, each with a colored header, a question, and a horizontal axis with three labels: 'A little', 'More or Less', and 'A lot'.

- CREATIVITY** (Yellow header): "Are you someone with a lot of ideas or that enjoys playing with gadgets?"
- COLLABORATION** (Purple header): "Are you a good teammate?"
- COMMUNICATION** (Pink header): "Are you good at explaining/arguing/presenting ideas?"
- CRITICAL THINKING AND PROBLEM SOLVING** (Teal header): "Are you someone who asks a lot of questions and enjoys solving problems?"

Figure 33: Self-assessment axis regarding the skills creativity, collaboration, communication, critical thinking and problem solving. For each skill (creativity, collaboration, communication, critical thinking and problem solving), learners are asked to position themselves along this axis by using as a reference the labels “A little”, “More or less” or “A lot”. Credit: MFCR.

2. Then, start playing the game. To assess learners’ creativity, ask them the following question: “Do you consider yourself as someone with a lot of ideas or that enjoys playing with gadgets?”. After this, ask the learners to position themselves along the horizontal axis in Figure 33, by using as a reference the labels: “A little”, “More or Less”, “A lot”. Ask one of the learners on the “A little” side and another on the “A lot” side to share their choices. Repeat the same procedure but now for the other skills, by asking the following questions:
3. Collaboration: “Do you consider yourself as a good teammate?”.
4. Communication: “Do you consider yourself good at explaining/arguing/presenting ideas?”.
5. Critical thinking and problem solving: “Do you consider yourself as someone who asks a lot of questions and enjoys solving problems?”.

6. After having completed this self-assessment exercise, ask each participant to identify the skill they are best at and to position themselves in the diagram depicted in Figure 34a. Ask learners if they would like to share their answer.
7. Based on the final positioning of the participants, the facilitator makes the workgroups as shown in Figureb.
 - NOTE: Feel free to slightly change the composition of the groups in case there's any obvious unbalance (e.g. in terms of gender representation). Please keep in mind that the objective is to create groups that are heterogeneous as possible regarding their competences.



Figure 34a.

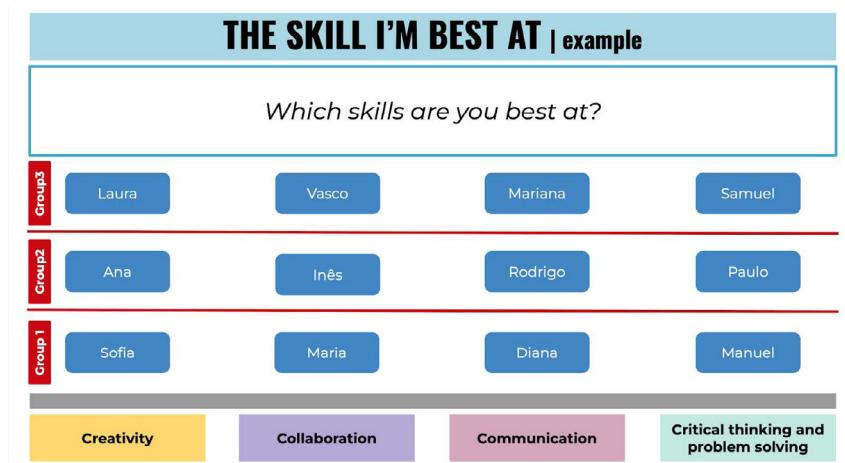


Figure 34: Diagram showing how to form the work groups based on the diversity of competences. (a) Learners are asked to position themselves in the column corresponding to the skill they consider they are best at. (b) Example of how working groups are created by trying to maximise the diversity of skills in each group.

8. Finally, ask the learners in each group to reflect about diversity in their own group, by considering different variables, like the ones depicted in Figure 35.

How to ensure that students reflect and are aware of the diversity in their group?

Questions for group members	How many different answers do we have in the group?
Where do we live (city, village, farm, ...)?	
How is gender represented in our group?	
Do we follow a religion? If yes, which one?	
What is our nationality or that of our parents?	
What is our favorite hobby?	
Do we have any food restrictions?	
How many brothers/sisters do we have?	

Figure 35: Examples of questions to ensure that the class reflects on the diversity of the group created.

Part 2

Activity 2: From global to local: identifying challenges, opportunities and solutions

HOW?

Learners start by individually identifying and reflecting about global and local challenges/opportunities. Then, together with their groups, focus on specific local challenges/opportunities and discuss how the school community (students, teachers, school staff) can contribute to solutions that tackle them.

WHY?

- Promoting the reflection about concrete challenges and opportunities that exist around us from a local to a global perspective;
- Promoting civic attitude by seeking tangible solutions to challenges/opportunities that surround us.

HOW LONG?

1 hour

MATERIALS:

- Pack with editable and non editable files – “From global to local: identifying challenges, opportunities and solutions” (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- “The world around us and the discipline of Citizenship and Development”
- “The challenges and opportunities of our community and the Domains of Education for the citizenship” [Portuguese]

STEP-BY-STEP:

1. Start by explaining to the participants that during this activity they will be looking at challenges and opportunities from a global to a local perspective. Take this moment also to clarify how challenge and opportunity are defined in the context of this training program:
 - A challenge is an obstacle that can be overcome, i.e., something that is not working so well and that can be improved.
 - Examples of challenges: food waste; bad eating habits; lack of physical exercise; few spaces with shades; few green spaces; trash on the floor; no recycling.
 - An opportunity is something that, by itself, is already good, but that can become even better if we explore it and develop it further. An opportunity can also help us solve challenges, like the ones mentioned above.
 - Examples of opportunities: green spaces; outdoor spaces to play; existence of extracurricular activities; natural/historical/archaeological/cultural heritage; proximity between people and entities; spaces for picnics; proximity to lakes, rivers, beaches.
2. Show the participants the example in Image 4 and explain that each of them will receive two images. For each image, they will need to identify (individually) a global and a local challenge/opportunity related to that image. By global challenge/opportunity we mean something that takes place worldwide. By local challenge/opportunity we mean something that is happening in our community.

Example



GLOBAL CHALLENGE:	LOCAL CHALLENGE:
GLOBAL OPPORTUNITY: There are a lot of open educational resources available online that help the development of digital literacy skills.	LOCAL OPPORTUNITY: In our school/locality, there is an educational offer (e.g. digital literacy club and local entities that promote digital competences), that enhances digital literacy skills.

Figure 36: Example of the exercise where learners identify a global and a local challenge/opportunity related to the image on the left.

3. Distribute two images from the file "Images" in the *pack* with files from the activity (see Materials) to each participant and give them some minutes to identify the global and local challenges or opportunities.
4. After this, bring each group together and ask them to share and discuss the identified challenges and opportunities.
5. Distribute the canvas "Challenge – Opportunity – Solution" depicted in Figure 37a to the groups and ask them to write down the identified local challenges and opportunities.
 - NOTE: If there are similar challenges and opportunities, ask the groups to cluster them and find a common denomination.
6. Now, ask the groups to look at the identified local challenges and opportunities and to analyse how the opportunities that were found can help tackle those challenges. The groups are free to include new information to the table in addition to the one identified earlier.
7. For each of the identified local challenges, ask each group to discuss how the school community (students, teachers, school staff) can contribute to tackle them and write down those ideas under the box "Solution", which is defined in the context of this training program as follows:
 - A solution is something that we can do to overcome the challenge or to improve the opportunity.
 - Examples of solutions: use green spaces for physical exercise; organise garbage collection activities and recycling campaigns, in collaboration with different entities, in lakes/rivers/beaches; organise food exchange markets to avoid food waste, in spaces for picnics; to make a peddy-paper of territory exploration, which promotes the practice of physical exercise and the valorization of the heritage.

In Figure 37b, you can find some examples that resulted from the training program with Portuguese teachers.

(a)

CANVAS Challenge - Opportunity - Solution		
CHALLENGE	OPPORTUNITY	SOLUTION
<p>A CHALLENGE is an obstacle that can be overcome, i.e., something that is not working so well and that can be improved</p> <p>Examples of challenges: food waste; bad eating habits; lack of physical exercise; few spaces with shades; few green spaces; trash on the floor; no recycling.</p>	<p>An OPPORTUNITY is something that, by itself, is already good, but that can become even better if we explore it and develop it further. An opportunity can also help us solve challenges, like the ones mentioned (see "CHALLENGES" column).</p> <p>Examples of opportunities: green spaces; outdoor spaces to play; existence of extracurricular activities; natural/historical/archaeological/cultural heritage; proximity between people and entities; spaces for picnics; proximity to lakes, rivers, beaches.</p>	<p>A solution is something that we can do to overcome the challenge (see "CHALLENGES" column) or to improve the opportunity (see "OPPORTUNITIES" column).</p> <p>Examples of solutions: use green spaces for physical exercise; organize garbage collection activities and recycling campaigns, in collaboration with different entities, in lakes/rivers/beaches; organize food exchange markets to avoid food waste, in spaces for picnics; to make a peddy-paper of territory exploration, which promotes the practice of physical exercise and the valorization of the heritage.</p>

(b)

CANVAS Challenge - Opportunity - Solution		
CHALLENGE	OPPORTUNITY	SOLUTION
<p>A CHALLENGE is an obstacle that can be overcome, i.e., something that is not working so well and that can be improved.</p> <p>Examples of challenges: food waste; bad eating habits; lack of physical exercise; few spaces with shades; few green spaces; trash on the floor; no recycling.</p>	<p>An OPPORTUNITY is something that, by itself, is already good, but that can become even better if we explore it and develop it further. An opportunity can also help us solve challenges, like the ones mentioned (see "CHALLENGES" column).</p> <p>Examples of opportunities: green spaces; outdoor spaces to play; existence of extracurricular activities; natural/historical/archaeological/cultural heritage; proximity between people and entities; spaces for picnics; proximity to lakes, rivers, beaches.</p>	<p>A solution is something that we can do to overcome the challenge (see "CHALLENGES" column) or to improve the opportunity (see "OPPORTUNITIES" column).</p> <p>Examples of solutions: use green spaces for physical exercise; organize garbage collection activities and recycling campaigns, in collaboration with different entities, in lakes/rivers/beaches; organize food exchange markets to avoid food waste, in spaces for picnics; to make a paddy-paper of territory exploration, which promotes the practice of physical exercise and the valorization of the heritage.</p>
Many stray animals	Existence of entities that promote animal adoption campaigns (e.g. municipalities - Porto , Setúbal ; ONG - "Adopta-me")	Developing an animal adoption campaign
Lack of trash bins outside the school	<ul style="list-style-type: none"> - It's easy to make appealing garbage containers from waste materials (e.g. old card boxes, unused plastic) - Institutions that work with recycling and that may help us (e.g. Resistrela - local organization on waste management, Lipor - Porto's organization on waste management) 	<ul style="list-style-type: none"> - Making undifferentiated garbage bins and recycling bins - Carrying out awareness-raising actions for students about disposing of garbage in the appropriate places - Carrying out training actions with school employees responsible for garbage separation
Several cases of domestic violence against women	There are programs/campaigns to prevent domestic violence against women (e.g. Project Noi , Red card to gender violence ; Do you like me well or do you like me badly? ,...)	<ul style="list-style-type: none"> - Establishing partnerships to help us: 1) understand more the challenge and 2) design and/or facilitate activities that can contribute to tackle the domestic violence against women - Developing gender equality awareness-raising actions

Figure 37: Canvas "Challenge – Opportunity – Solution". (a) First, learners write down the identified local challenges and opportunities and then they discuss how the school community (students, teachers, school staff) can contribute to tackle them and write down those ideas under the box "Solution". (b) Example of a canvas "Challenge – Opportunity – Solution" filled by Portuguese teachers and where similar challenges and opportunities were grouped under a common denomination.

8. Afterwards, ask each group to present to the whole class the identified local challenges/opportunities and respective solutions.
9. Finally, give each group some minutes to add to the canvas any missing challenges/opportunities that they identify as relevant in their communities, as well as some potential solutions that can be driven by the school community.
10. Before concluding this activity, allow some minutes for a final reflection together with the whole class.

Activity 3: My school, my community, my country, the world: analysing challenges

HOW?

Learners revisit the challenges, opportunities and solutions identified in the previous activity and, together with their groups, select which ones are more important based on community relevance, personal and professional motivations, and other factors considered as meaningful by them. Afterwards, they analyse how present these challenges are in four different spatial dimensions: their school, their community, their country and the world.

WHY?

Promoting the analysis and debate of locally relevant challenges in different contexts, from our school and community to national and worldwide dimensions.

HOW LONG?

1 hour 30 min

MATERIALS:

- Pack with editable and non editable files – “My school, my community, my country, the world: analysing challenges” (all images depicted below are included in the files)

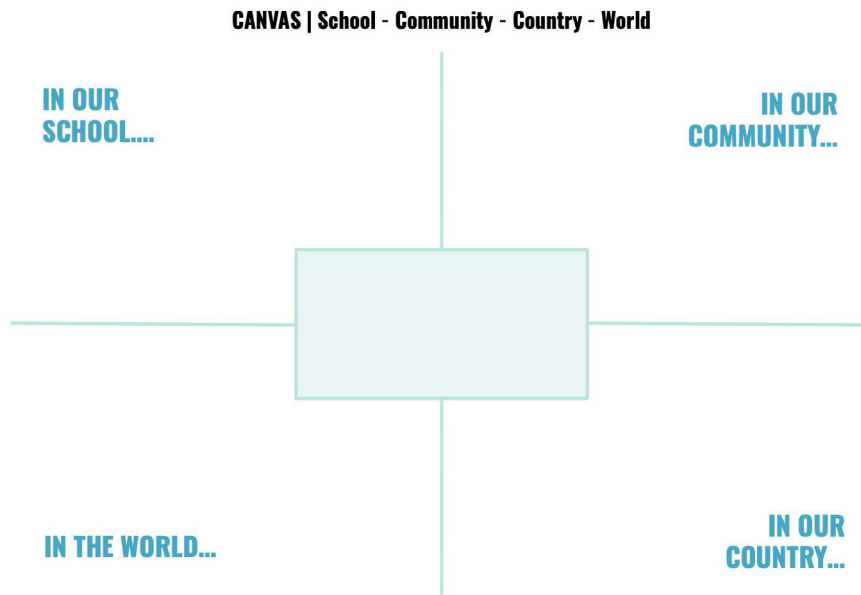
RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- “Debate the Domains of Citizenship and Development from local to global” [Portuguese]

STEP-BY-STEP:

1. Start by asking each participant to revisit their group canvas “Challenge – Opportunity – Solution” and to select three potential challenges they would like to pursue in their school projects based on the following parameters: community relevance, personal and professional motivations, and other factors that they consider relevant.
2. Bring the workgroups together and ask each participant to share with the rest of their group their individual choices and the respective reasons.
3. Give each group some minutes to make a joint decision regarding the three challenges considered more relevant given the previous discussion.
4. After this, explain that in the next exercise, each group will work on the selected challenges by analysing them “In your School...”, “In your Community”, “In your Country”, “In the World”, as depicted in Figure 38a.
5. Give three canvases “School – Community – Country – World” to each group, and ask them to write down at the centre of the images a question that is related to the challenges identified previously (one per canvas), such as “How is the reality of [replace with the challenge] in...”. These questions should lead the group to reflect how present these challenges are “In your School”, “In your Community”, “In your Country”, “In the World”. Examples of questions:
 - “How is the reality of stray animals in...?”
 - “How is the reality of waste management in...?”
 - “How is the reality of domestic violence in...?”Importantly, ask each group to provide concrete examples, real stories, news, etc. In Figure 38b you can find one example from the training program in Portugal.
6. At the end, ask each group to share their analysis and promote a discussion based on these reflections.

(a)



(b)

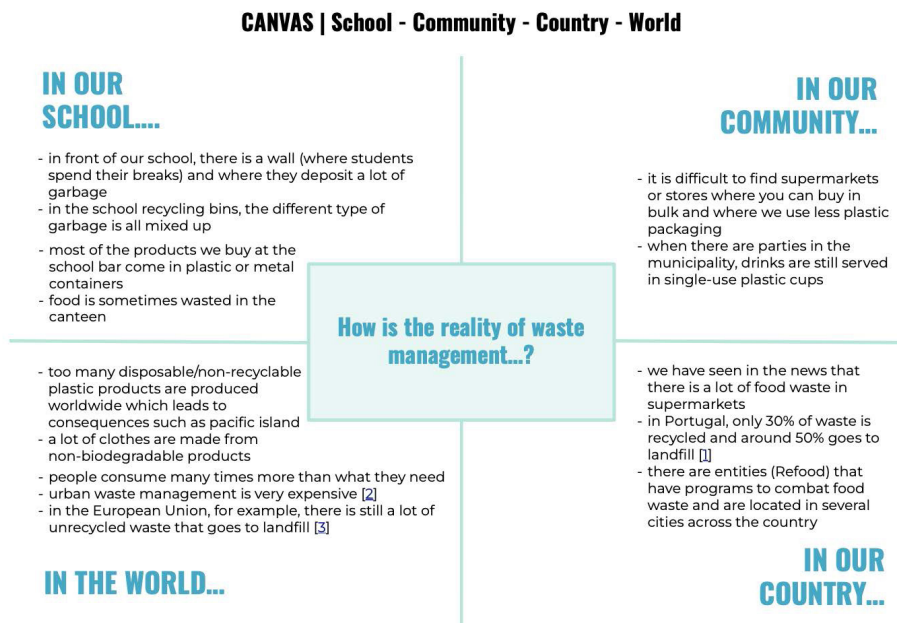


Figure 38: Canvas "School – Community – Country – World". (a) At the centre, the group should write a question based on the challenge identified previously, which will then trigger a discussion about the reality of this challenge "In your School", "In your Community", "In your Country", "In the World". (b) Example of a canvas "School – Community – Country – World" filled out during the training program in Portugal.

Activity 4: Involving families, friends, colleagues, citizens understanding the challenges from our community

HOW?

Learners prepare and make questions to their families and community members regarding the identified challenges, so that they can deepen their understanding about the local reality of these challenges and ways to address them with the help of others.

WHY?

- Promoting the diversity of opinions and information for a given challenge;
- Enhancing the collaboration with families, friends, colleagues and citizens from the local community.

HOW LONG?

1 hour 30 min

MATERIALS:

- Pack with editable and non editable files – “Involving families, friends, colleagues, citizens understanding the challenges from our community” (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- “Identify challenges/opportunities locally relevant in collaboration with the families and the community” [Portuguese]

STEP-BY-STEP:

1. Start by explaining to the participants that in this activity we will ask for the help of our family, friends, colleagues, citizens from our communities, to know more about the previously identified challenges, find potential solutions and identify people and organisations that could help us.
2. Give three canvases “Involving our families and local community” to each group (one per challenge identified in the previous activities; see Figure 39), and ask them to: decide which questions they would like to pose to their families and community members; and to identify the people they would like to contact for each challenge.
 - Suggestion: try to identify people that you can easily reach out to by making a phone call, since you’ll contact them during this activity.
3. Ask the groups to write these questions down in the corresponding canvases together with their opinions (in the box “My opinion”).
4. Now it’s time to make some phone calls! Ask each group to make the respective contacts and to take note of the respective opinions in the corresponding canvases. !
5. Give each group some time to analyse the obtained answers, to group common opinions and to create different clusters. After this, hopefully each group will be better informed about their challenges and how to tackle them.
6. To conclude this activity, ask the groups to share and discuss their findings with the rest of the class.

CANVAS | Involving families and the local community

QUESTIONS: <i>Examples:</i> - In your daily-life and in our community, in which situations do you find ... (complete with the identified challenge)? - Who could help us tackle this challenge? _____ _____ _____		
MY opinion:	The opinion of a member of my FAMILY:	The opinion of a person from my COMMUNITY:

Figure 39: Canvas “Involving families and the local community”. Learners are asked to write questions they would like to pose to their families and community members, to know more about the previously identified challenges, find potential solutions and identify people and organisations that could help them. They also answer these questions with their opinion.

Activity 5: Voting the challenge of the project

HOW?

The challenge that will guide the project that each group is going to develop during the training program will be decided through a voting process, happening in this activity. For that, each group prepares a pitch per each of the challenges identified in the previous activities and presents them to the whole class. After this, each participant votes on the challenge that they consider more locally relevant given the arguments presented.

WHY?

- Fostering communication and argumentation skills and the capacity to listen and respect different viewpoints and to build one’s opinion based on the integration of different arguments;
- Promoting democratic school practices, in which learners are the main agents in the decision-making process.

HOW LONG?

1 hour 30 min

MATERIALS:

- Pack with editable and non editable files – “Voting the challenge of the project” (all images depicted below are included in the files)

- *“Vote the core Domains of the project of Citizenship and Development”*
[Portuguese]

STEP-BY-STEP:

1. Start by explaining that, in this activity, each group will ask for the help of the class in deciding which challenge will be the one guiding their project. For that, each group will prepare a short pitch about each of the challenges they have been researching and, after this, the class will vote on the one they consider the most relevant considering the arguments presented.
2. Ask each group to prepare a 2 min-pitch per challenge (in total, each group has to prepare three pitches), by using as a basis the canvas “Preparing the pitch about the challenge” (Figure 40), where the pros and cons of each challenge are analysed. Distribute one canvas per group.
3. Ask the first group to present the pitches regarding their three challenges.
4. Open a discussion moment for the other groups to pose questions and provide comments.
5. Ask each learner to vote in one of the three challenges presented.
 - NOTE: Voting can be done in many different ways. We suggest using Menti-meter (or a similar platform), which is fast, promotes the use of digital tools and avoids wasting paper.
6. Repeat the last three items (3-5) with the other groups.
7. To conclude the activity, ask the group to share and discuss their opinions about how each group felt about the outcome of the vote and how they saw this joint decision-making process.

CANVAS | Preparing the pitch about the challenge

Challenge 1:	Challenge 2:	Challenge 3:
_____	_____	_____
_____	_____	_____
Arguments in favor:	Arguments in favor:	Arguments in favor:
Arguments against:	Arguments against:	Arguments against:

Figure 40: Canvas “Preparing the pitch about the challenge”.

Part 3:

Activity 6: Developing and planning the project: section “Why?”

HOW?

This activity and the following ones are dedicated to the development and planning of the project. In this activity, each group focuses on the voted challenge of the previous activity and they reflect and collect evidence on why addressing that challenge is relevant. In order to do so, learners also search for projects and local stakeholders that may collaborate and/or help them with additional information and expertise.

WHY?

- Promoting the development and planning of the project that addresses a challenge locally relevant, based on searching and gathering of evidence.

HOW LONG?

2 hours

MATERIALS:

- *Pack with editable and non editable files – “Developing and planning the project: section “Why?””* (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- *“Develop and plan the project of Citizenship and Development”* [Portuguese]
- *“Research on the challenges/opportunities selected for the Citizenship and Development project”* [Portuguese]

STEP-BY-STEP:

1. Bring the workgroups together and start by giving one canvas “Develop and plan the project” (Figure 41) to each group and explain that during this activity we will focus on the section “Why?” (Figure 42). The sections “What for?”, “How?”, “Did it work?”, “What and how to communicate?” will be filled out later.
2. Ask each group to write down the challenge voted in the previous activity in the box “What is the local challenge we want to tackle?”.
3. Then, ask each section of the group to think and complete the sentences “We know...” and “We don’t know...”, identifying the sources (observation, research, news, etc.) of the respective information. Ask each participant to share their reflections with the rest of their group. Give each group some minutes to analyse the information, to group common opinions and write them down in the canvas.
4. Afterwards, ask each group to fill out the sections: “Which projects do we know that address this challenge?” and “Which stakeholders can help us learn more and address the challenge?”. Tell the participants that in order to answer these questions they can search on the internet, call friends or colleagues, etc.
5. To conclude this activity, ask the groups to share and discuss their findings with the rest of the class.

CANVAS | Develop and plan the project

The canvas is divided into several sections:

- WHY?** (Yellow header)
 - What is the local challenge we want to tackle?** (with sub-sections: We know... and We don't know...)
 - Which projects do we know that address this challenge?**
 - Which stakeholders can help us learn more and address the challenge?**
- WHAT FOR?** (Teal header)
 - What success of the challenge will the project address?**
 - What is the objective of the project?**
 - Which projects do we know that address this challenge?**
 - Which stakeholders can help us learn more and address the challenge?**
- HOW?** (Purple header)
 - Activities that you are going to do that will address the challenge?**
 - Stakeholders whose help?**
 - Resources: what do you need?**
 - Chains how much will it cost?**
 - Time duration how long will it last?**
- DID IT WORK?** (Pink header)
 - What indicators will we measure?**
 - What tasks will we implement?**
 - What tasks will we use?**
- WHAT AND HOW TO COMMUNICATE?** (Blue header)
 - What are we going to communicate?**
 - Through what channels will we communicate?**
 - Which communication channels and channels will we use?**
 - Who do we know that can help us address the challenge?**

Figure 41 : Canvas “Develop and plan the project”.

WHY?

What is the local challenge we want to tackle?
 Example: Around the school area, we find trash on the ground and low recycling.

We know...
 Example: The wall in front of the school, which is a meeting point for students, is full of trash. Also, recycling bins at the school are full of mixed rubbish.

We don't know...
 Example: We are not certain if students are primarily responsible for the trash behind the wall and, assuming they are, what are the reasons for doing so.

Which projects do we know that address this challenge?
 Example: Eco schools program that rewards schools that demonstrate care for the environment and sustainable development.

Which stakeholders can help us learn more and address the challenge?
 Example: The municipal waste management may have additional information on how to encourage people to throw garbage in the right containers.

Figure 42: Section “Why?” from the canvas “Develop and plan the project”.

Activity 7: Developing and planning the project: section “What for?” and inviting local stakeholders to the school

HOW?

Each group identifies causes of the challenge and analyses which ones are able to be tackled or not by them. Then, learners define the objective of the project, by thinking what they would like to achieve at the end of the project. Afterwards, learners revisit the local stakeholders and will contact the more relevant ones in the next activity, so that they can help them tackle the identified challenge and achieve their objective.

WHY?

- Promoting the development and planning of the project with an objective that reflects the addressing of the challenge and that allows the measurement of the project impact.
- Involving local partners in the project, leveraging project work based on local knowledge and experience.

HOW LONG?

2 hours

MATERIALS:

- Pack with editable and non editable files – *“Developing and planning the project: section “What for?” and inviting local stakeholders”* (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- *“Learning from local partners about selected challenges/opportunities: dialogue and debate session”* [Portuguese]
- *“Analyse the causes of the challenge/opportunity and define the objective of the Citizenship and Development project”* [Portuguese]

STEP-BY-STEP:

1. First, start by explaining to the class that this activity will be focused on the section “What for?”. Then, ask each group to identify and write down the underlying causes to the challenge identified in section “Why?”, i.e. what originates the challenge.
2. After this, ask the learners to analyse the identified causes and to separate them into the boxes “Causes we are not able to tackle” or “Causes we are able to tackle” (Figure 43).
3. Then, by focusing only on the box “Causes we are able to tackle”, ask each group to rank the causes according to the question “Which causes contribute the most to the identified challenge” and to position them along the horizontal axis at the bottom. On the left side of the axis should be the causes that contribute less to the challenge and on the right side the ones that contribute more.
4. Now it’s time to build the objective of the project, i.e. what each group would like to achieve at the end of their project. Importantly, explain to each group that their objective needs to be measurable and that in the section “Did it work?” they will identify the indicators, tasks and tools that will be used to evaluate if their objective was accomplished or not (Image 13). Give each group some minutes to formulate their objective and to write it down on the canvas.
5. Then, ask each group to revisit the section “Why?”, in particular the boxes “Which projects do we know that address this challenge?” and “Which stakeholders can help us learn more and address the challenge?”, and to analyse which projects and stakeholders they identify as the most inspiring and relevant ones to tackle the identified challenge and achieve their objective.
6. Let the class know that, for the next activity, each group will have the opportunity of inviting one stakeholder to discuss their projects with. As such, ask each group to choose three stakeholders by order of preference (in case the first choice is not available, then the group

already has more options). Remind the class that the objective of the next activity will be to plan the next steps of the project in collaboration with the invited stakeholder – the expert on the topic, therefore it will be important to select people/entities that, given their knowledge and experience, will help them in that regard.

7. Finally, ask each group to write an email to the first of the three selected stakeholders, inviting them to the next session, with the objective of helping the group to develop and plan their project given their expertise.

WHAT FOR?

What causes* of the challenge will the project address?
 * What is at the origin of the challenge
Example: Absence / reduced number of trash containers. Students are not aware about the cycle of trash, how it is produced and where it goes after being disposed on the ground, and its impacts on the environment

What is the objective of the project?
What do we want to achieve by the end of the project in a measurable way?
 * Measurable means that you can define indicators to assess the impact of the project see box "Did it work?"
Example: Declare the amount of trash disposed behind the wall.

Causes we are not able to tackle **Causes we are able to tackle**

Contribute less ← → Contribute more
 + +++

Considering the causes that we were able to tackle, which ones contribute the most to the identified challenge?

Figure 43: Section “What for?” from the canvas “Develop and plan the project”.

Activity 8: Developing and planning the project: debating with stakeholders

HOW?

This activity requires the participation of one stakeholder per group, since local partners are specialists in the themes they work on and can be a great ally in addressing challenges. First, each group plans a script with questions they want to ask their partners, to incorporate their expertise knowledge in the development and planning of their project. Then, each group will have a discussion and debate with the respective stakeholder.

WHY?

- Strengthening the relationship between stakeholders and the school, in order to guarantee a more integrated and sustainable action of the projects.
- Enhancing the collaboration and co-creation with stakeholders.

HOW LONG?

2 hours

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- *“To involve local partners in the development and implementation of the Citizenship and Development project”*
- *“Learning from local partners about selected challenges/opportunities: dialogue and debate session”*

STEP-BY-STEP:

1. Start by explaining to the group that this activity will be divided in two different parts. In the first hour, each group will prepare a script with questions for the invited stakeholder, that will help them plan the development of the project by taking into account the knowledge, experience and expertise of the invitee. After preparing the script, each group should start thinking about potential actions that could be performed to achieve the defined objective. In the second hour, each group will meet with their invited stakeholder and will start by presenting the elements of the canvas that have been filled out already, namely the challenge and objective, and then will go through the question script and discuss the actions.
2. After this introduction, start the first part and ask each group to prepare the question script. You can give learners some example questions:
 - Do you consider the identified challenge to be locally relevant?
 - Do you have suggestions of other projects and/or partners that could be relevant to help tackling this challenge?
 - Do you think that the causes have been correctly identified and that the defined objective is adequate, meaningful and measurable?
 - Do you consider that the project objective will contribute to address the identified challenge?
 - What do you think of the proposed actions? Are they aligned with the proposed objective? Do you have suggestions for other actions?
 - How could we measure the impact of these actions?
3. In the second hour, welcome and introduce the invited partners. Each group will then discuss their canvas with the respective stakeholder, with the support of the question script prepared during the first hour. Each group should have, at least, one person appointed to take notes of the conversation with the stakeholder.
4. To conclude the activity, give each group and stakeholder some minutes to share their thoughts about the respective projects with the rest of the class.

Activity 9: Developing and planning the project: sections “How?” and “Did it work?”

HOW?

Learners focus on “how” to develop and plan their project, by designing actions that allow them to achieve the objective. For each action, learners define a set of measures that will enable them to assess the impact of the project when it’s finished, allowing them to answer the question “did the project work?”. In the end, learners prioritise activities, according to parameters of feasibility and impact.

WHY?

- Promoting the development and planning of the project based on actions that contribute to tackle the selected challenge.
- Fostering the assessment of the project’s impact, as a way to analyse what should not be repeated, what can be improved and what is successful.

HOW LONG?

2 hours

MATERIALS:

- Pack with editable and non editable files – “Developing and planning the project: sections “How?” and “Did it work?”” (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- “Analyse and prioritise the actions to be implemented during the project of Citizenship and Development” [Portuguese]
- “Assess the impact of the Citizenship and Development project” [Portuguese]

STEP-BY-STEP:

1. Start this activity by telling the class that in this activity we will focus on the sections “How?” and “Did it work?”, which will be filled out based on the suggestions given by the invited stakeholders.
2. Before jumping into these sections, ask each group to revisit the “Why” and “What for?” sections and to analyse if they would like to change anything considering the previous conversation with the invited stakeholder.
3. Ask learners to take a look at the sections “How?” (Figure 44) and “Did it work?” (Figure 45). Let’s start by focusing on the “How?” section, in particular, in the action box. Remind the group that actions need to be aligned with the objective, i.e. actions are aimed at achieving the defined objective. This implies that actions need to have concrete and measurable outputs, which allows one to test if the objective has been achieved or not. Ask each group to define and write down their actions.
4. After this, for each action, ask the groups to fill out the other boxes from the section “How?”, regarding stakeholders, resources, costs and duration.

DID IT WORK?		
<p>What indicators will we measure?</p> <p>Indicators correspond to variables (quantitative or qualitative) that are in line with the project's objective; are easy to collect and to interpret, and allow to measure changes over time.</p> <p><i>Example: Quantity of litter behind the wall, number of students who put rubbish on the ground.</i></p>	<p>What tasks will we implement?</p> <p>Tasks are ways of measuring the indicators. In order to assess the effect of the actions on achieving the objective, tasks should be repeated before and after the implementation of the action.</p> <p><i>Examples: photographic record behind the wall before and after the action (to measure the amount of litter), survey to students before and after the action (to assess the number of students that put rubbish on the ground).</i></p>	<p>What tools will we use?</p> <p>Tools consist of the formats and platforms that allow to implement the task.</p> <p><i>Examples: paper format; Google Forms; Mentimeter; spreadsheet in Excel/Google Sheets; photographs.</i></p>

Figure 45: Section "Did it work?" from the canvas "Develop and plan the project".

Activity 10: Developing and planning the project: section "What and how to communicate?"

HOW?

Firstly, each group will define a communication action for each of the actions defined in the section "How?", by using different formats and channels for project sharing. Secondly, the groups will have a practical exercise which consists of writing a social media post about this training program on Open Schooling. In the end, each group presents their post and discusses good practices on communication, particularly in the school context.

WHY?

Promoting the dissemination of the project among the school/local communities, transmitting knowledge about it and facilitating the involvement of these communities in the project.

HOW LONG?

1 hour 30 min

MATERIALS:

- Pack with editable and non editable files – "Developing and planning the project: section "What and how to communicate?"" (all images depicted below are included in the files)

RELATED CONTENT FROM OPEN SCHOOLING MANUAL FOR THE CITIZENSHIP AND DEVELOPMENT DISCIPLINE:

- "Dissemination and involvement of the school/local community in the Citizenship and Development project" [Portuguese]

STEP-BY-STEP:

1. Start by explaining that this last activity will be dedicated to the section “What and how to communicate?” and will consist of two parts: in the first part, each group will define a communication action for each of the actions defined in the section “How?”; and in the second part, the groups will have a practical exercise which consists of writing a social media post about this training program on Open Schooling.
2. For each project action, ask each group to define and write down in the respective boxes: 1) the message they want to communicate (box “What are we going to communicate”); 2) the target public, for example, teachers, students, local community (box “To whom are we going to communicate”); 3) the formats (text, poem, song, video) and channels (newspaper, social media, radio) on how they want to communicate their message, which will be very dependent on the target public as well (box “Which communication formats and channels will we use”); and 4) who could help them disseminate their message (box “Who do we know that can help us spread the communication”).
3. After completing the canvas, ask each group to share one communication action with the rest of the class.
4. Then, it’s time to create a social media post about the experience that learners had during this training program on Open Schooling. For that, ask each group to do the same exercise as in 2., but now knowing that the channel used will be a social media channel. However, groups still need to define which channel will be used (Facebook, Instagram, TikTok, Youtube, etc).
5. Finally, let each group present their post and promote a discussion about good practices on communication, particularly in the school context.

WHAT AND HOW TO COMMUNICATE?			
What are we going to communicate? What is the message? <i>Example: It is our responsibility to keep the school clean.</i>	To whom are we going to communicate? Who is our target audience? <i>Example: School community – other classes; school cycle; school group; families; local community; local associations; local political power.</i>	Which communication formats and channels will we use? <i>Example: Disseminate the awareness video on social networks.</i>	Who do we know that can help us spread the communication? <i>Example: Groups of students developing sustainability-related projects at school (eg. in other school subjects), local associations concerned with sustainability issues, local radio and/or newspaper, Municipality communication channels</i>

Figure 46: Section “What and how to communicate?” from the canvas “Develop and plan the project”.

Credits: This activity was developed by OSHub Portugal, in collaboration with teachers of the discipline of Citizenship and Development, from the school group of Figueira de Castelo Rodrigo.

5.2 Session Title: Open Science Hub Board

ACTIVITY IN A SENTENCE:

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.

DISCIPLINES INVOLVED IN ACTIVITIES:

Management, Pedagogy

RECOMMENDED AGES:

18+

LEARNING ENVIRONMENT (CONTEXT SETTING):

Class, meeting room, virtual room

LEARNING OUTCOMES:

- Will understand the key elements of Open Schooling
- Can relate specific stakeholders and resources from their community or their experience of the categories in this framework
- Can think of examples in different contexts when they read the description of cards in each category
- Will be able to use the Open Science Hub Board to assess their activities

RECOMMENDED EXPERTISE:

- Facilitation
- Open Schooling
- Education

SDG LINKS:

- *Goal 4:* Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
- *Goal 11:* Make cities and human settlements inclusive, safe, resilient and sustainable
- *Goal 17:* Strengthen the means of implementation and revitalise the Global Partnership for Sustainable Development

TIME IT TAKES TO COMPLETE:

90 – 120 minutes

MATERIALS / RESOURCES NEEDED:

- White Board or Miro (virtual) board
- Cards (Found on Miro)
- Tables and chairs
- Screen and internet connection

CONTENT FOR LEARNERS (PRINTABLE MATERIAL):

- The Miro board can be shared or printed as a PDF https://miro.com/app/board/o9J_ly7x5QY=

TIPS FOR SCALING FOR DIFFERENT AUDIENCES:

The activities described in this training program can be adapted both to formal and non-formal educational contexts, depending on the educator's objectives and needs. Also, although the activities of this training program were carried out sequentially, they can be used independently, and with a different order than the one proposed here. Note that some resources are in Portuguese, so translation may be required.

Activity

INTRODUCTION:

The Open Science Board is a board game to introduce educators, students and Open Science Hub practitioners to the Open School methodology. Participants work in groups of at least three members for a maximum of 6 groups.

They mimic the process of setting up an Open School programme and participants go through the different steps of the implementation, identifying the required resources and relevant stakeholders.

To start with, participants decide a topic related to SDGs and have access to inspirational cards of already developed Open School programmes (via the *Miro board*). The more "open" the activity is, the more tokens and chips can be achieved. Time permitting, we advise to carry out one "demo" round all together and then split the group into teams for the second and third rounds.

Part 1: Getting familiar

- Check the OSHUB cards (orange – see Figure 49) and choose one topic that you are working on or interested in. Place it on your board.
- Check the Inspiration cards (green – see Figure 49) and choose one that you like and that corresponds to the chosen topic. If you don't know the project, google it to find out more. Place it on your board.

Part 2: Shape your activity

- Write your activity on a white card and place it on the board. The activity must relate to the chosen topic, and should be an Open Schooling activity. More information can be found on the Miro board. Example of activity: *'Our Coffee Culture'*
- Which stakeholders do you have? Choose one or more stakeholder cards and place them in the box next to the white card.
- Which resources do you have? Choose one or more resource cards and place them in the box next to the white card.
- Is your activity contributing to scientific research? Is it creative and financially sustainable? If so, pick a OSHUB token from the pile and place it next to the white card.
- Add a new white card and repeat steps 2.2, 2.3 and 2.4.

You can find images of the Miro-Board layout and cards at the end of this section.

Part 3: Count your points

Is your activity complete, have you added a token, or were you the first to complete a line? Then let the others know by placing a book chip on the OSHUB board!

Part 4: Again!

Choose another topic and repeat Parts 1, 2 and 3.

Part 5: Share what you learned

Allocate 5-10 minutes per group (depending on the number of groups) to share what they learned or discussed during the exercise. The format is a simple roundtable with one speaker per group.

Give 10 minutes if there are less than four groups, but only 5 minutes if there are more than four.

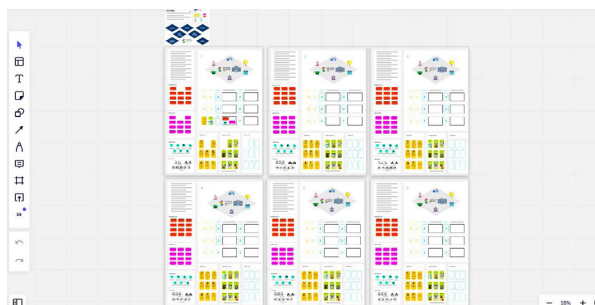


Figure 48: Overview of Miro Board. Credit: IAAC Barcelona.

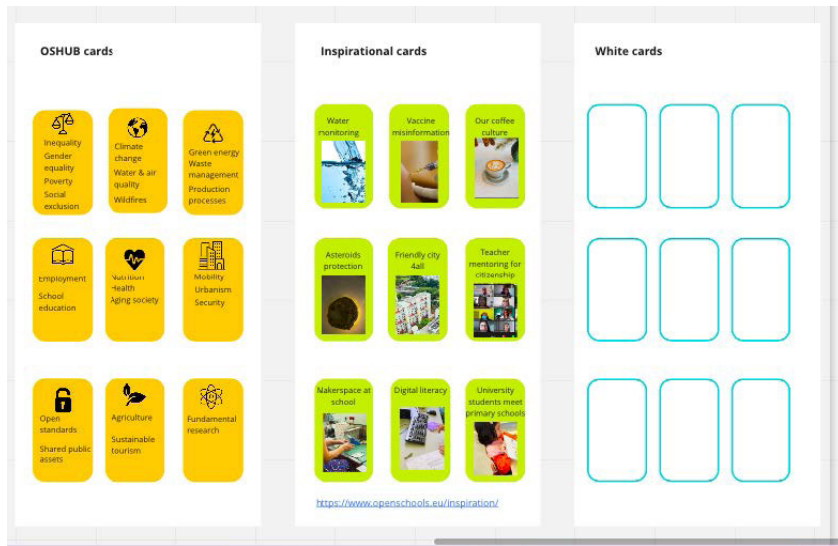


Figure 49: Close up on OSHub Cards and Inspirational Cards. Credit: IAAC Barcelona.

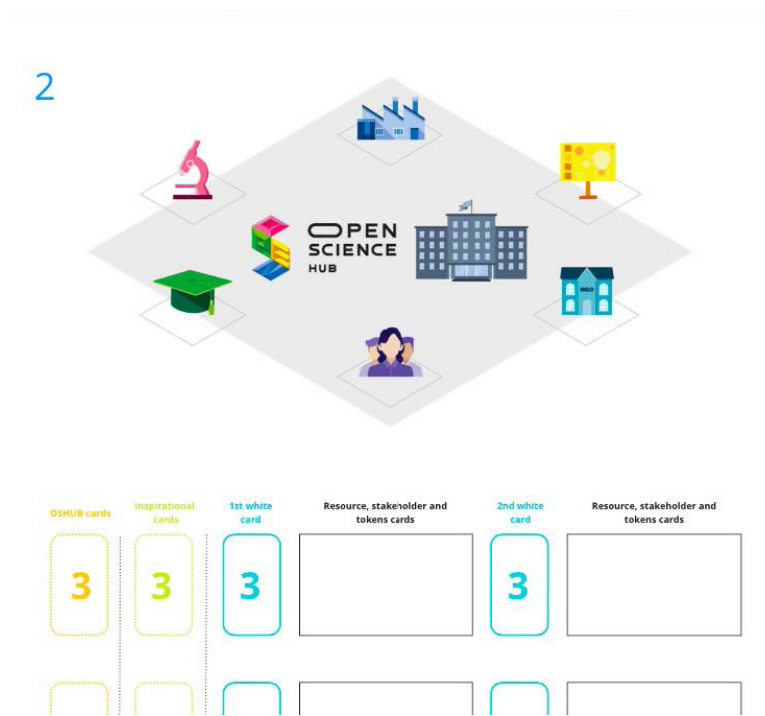


Figure 50: Close up of game board. Credit: IAAC Barcelona.

Credit: This activity was adapted from the Full Stack Board Tool, developed by IAAC, Barcelona. Adaptation was carried out by Onl'Fait Makerspace, OS Hub Switzerland.





**OPEN
SCIENCE
HUB**

**EMPOWERING CITIZENS
THROUGH STEAM
EDUCATION WITH
OPEN SCHOOLING**



DELIVERABLE 4.5

**Handbook of OSHub.Net
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