

# Deita Gatos

building a school  
repair community  
toolkit

**Buinho**

# Introduction

This toolkit was designed by Buinho Associação in the framework of the Creative FLIP Learning Laboratories as a collaborative and cross-sectional project, called “Deita-Gatos”<sup>1</sup>. This guide is based on our experience of building a makerspace at the secondary school of Santa Maria in Beja, Portugal where the Repair project was introduced. The Repair project started as an inclusion initiative, which bridges the creative and school sectors, as well as other civil society institutions and the local community. Its aim was to create alternative learning incentives for young people who are at risk of early-school abandonment. We are convinced that this toolkit and our reflection of our experiences can inform future initiatives in other education institutions and creative hubs who work with schools.

The Creative FLIP Learning Laboratories is an initiative within the pilot policy project Creative FLIP (Finances, Learning, Innovation, Patenting), co-funded by the European Union, and that has the main objective of fostering cross-sectorial cooperation between CCI's and educational institutions.

## Toolkit

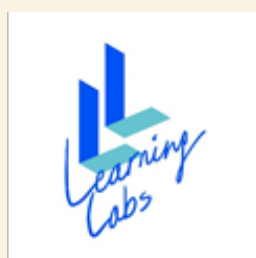
Repair is a relevant tool for teaching young students about circular economy, sustainability, collaboration, and creative practices.

Repair in a school is more than a simple fix, it is an important role modeling that educators can provide to the next generation regarding the following aspects: sustainability of natural resources, ownership rights and consumer behaviour. For example: A loose toy car wheel or a wobbly toy that may need some fixing, or a nonfunctional electronic toy that can be hacked into something new. Even better, an old computer or obsolete printer can become a spare parts store for new inventions.

Such a lesson can be successful in any grade and type of school, as long as it is tailored to the needs and development of the pupils. You can always adapt the level of explanation and the nature of the repairs to the level of knowledge and the perception of the children. Nevertheless, we recommend the use of this guide/manual for the teaching of children from 8 to 12 years old (3rd to 6th graders).

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<sup>1</sup> “Deita-Gatos” it is a humble profession of fixers in the 19th and early 20th century in Portugal. Instead of disposing household items, common people used to recur to these self-taught professionals who worked in the street, to repair their goods.



# (Un) Makerspace



The use of Makerspaces in schools builds on a constructivist pedagogical method which was introduced by Jean Piaget and developed by Seymour Papert. The primary goal of the use of constructionism in education is to have an experiential approach of learners, where their knowledge is built by creating and interacting with physical objects.

With this toolkit we add a twist to the former makerspace approach, by introducing the reversed idea of an (UN) Makerspace. To us it is a space where students learn to disassemble by taking things apart, understand how they work, before reassembling them to repair or even hack other objects.

Obviously, sometimes not everything can be repaired. Particularly complex electronic devices such as computers can lead to some frustrations within the classroom. To us such moments become crucial in the overall process, as they will teach students to think critically and creatively, for example reusing parts in other creations.

By adding a micro controller and lots of imagination, you can even start a trash robotics makerspace in your school! In this manual we show you, what are the three main components of a (UN) Makerspace to help you to get started.

## 1 BreakSpace

Gather old electronic junk, broken toys, or any other disposed items. Set them on big open tables, and start disassembling! A Breakspace is a workstation within a more conventional makerspace. It's a zone where students can safely disassemble, take apart and discover old technology, harvest for parts, repair, remix or reinvent trash into something new.

## 2 Trash library

Such as an ordinary library is composed of books from different subjects, available for others to consult, discover, and reuse. A trash library is composed of multiple sets of compartments, very well organized by categories, where disposed and harvested components are stored for future use. Motors, pulleys, buttons, springs, fans, sensors, all that could be salvaged and constitute raw material for future creations or repairs.

## 3 Makers Bench

Every makerspace needs those. We advise you to divide the benches by the type of activity: A bench next to a set of tools to disassemble objects; a bench where we put 3D printers; a bench for showing and testing devices and prototypes. The combination may vary, but we recommend for our (UN) Makerspace the following list of budget material and tools:

## 3D printer

A simple FDM 3D printer with heated bed. Buy smartly. Ask other makerspaces about their experience with certain brands of 3D printers and evaluate cost-quality relation before acquiring printers. From our experience sufficient technology starts around 180 to 200Euros. Keep in mind that 3w printing technology is still slow and printing an object is not instantaneously. You might need more than one printer in your classroom, in order to make multiple printings at the same time with different groups of students.

## 3D pens and glue guns

## Screwdrivers (several types and sizes)

## Pliers (jaw, needlenose, cutting, etc)

## Crimps, metal shears, wire snips, wire strippers

## Wrenches (several types and sizes)

## X-knives and coping saw

## Files (several types and sizes)

## Clamps (Bar, C-type, spring)

## Hammers (ball-pen, carpenters, non marring)

## Table Vise (big)

## Rulers, levels, calipers

## Heat gun

## Rotary cutting tool (Dremel)

## Sewing machines

## Multimeter

## Soldering irons

## Putty knives

## Desoldering braid and solder sucker

## Safety glasses and gloves

## Organizers (lots and lots)



# Work Methodology

## 1 Find a space

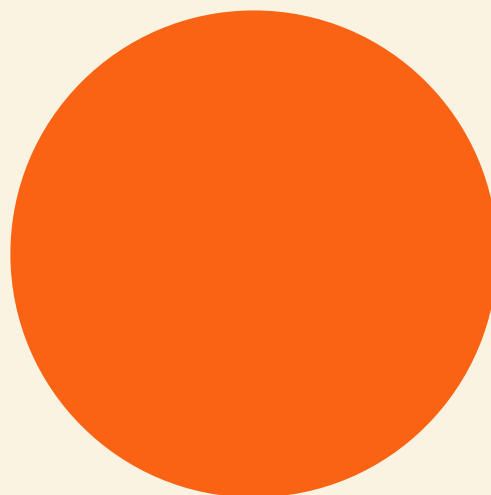
The classroom should be organized and be large enough to accommodate different groups of students. The areas should be well divided (see above) and signaled/marked. Clear markings can help to maintain a certain order during the creative process. At the same time, they indicate where to find tools and materials, and where the different activities take place. Finally, they help to organise the UNMakerspace after the sessions.

## 2 Prepare a discovery box

The discovery box (it can be more than one) will be filled with broken household items and toys that will be used during the activities, and more importantly, to motivate students to engage with those activities during spare times.

## 3 Divide tasks within groups

Maintenance of space, separation of material, organization of tools, these are all tasks that should be assigned to groups of students in order to distribute responsibilities



## 4 Get volunteers

It is important to reach out to possible volunteers that can operate households' repairs. The volunteer is an important element to enrich the experimentation and learning experience inside the classroom.

## 5 Create a trash in/trash out circuit

It's equally important to designate an area for receiving broken items (discovery box), and another area dedicated for recycling of disposed items. Remember that most items of the discovery box may not be repaired, and not everything will be useful for our trash library – contain clutter!

## 6 Make good use of digital platforms

Use collaborative digital platforms as padlet, canva, trello, among others to involve the students and share practices. Sharing will ensure empowerment and more stimulus for collaboration and creative practices. It will also help in the process of documentation and evaluation of the process.



# Involving the School Community



Students should be asked to collect broken items at least one month in advance. A request for such items can be disseminated within the school, not just your students. Talk with colleagues, in parent's meetings, and seek the support of the school board of directors. Please keep in mind that you aim to collect small objects and avoid 230V powered devices, so make sure to pass on that message.

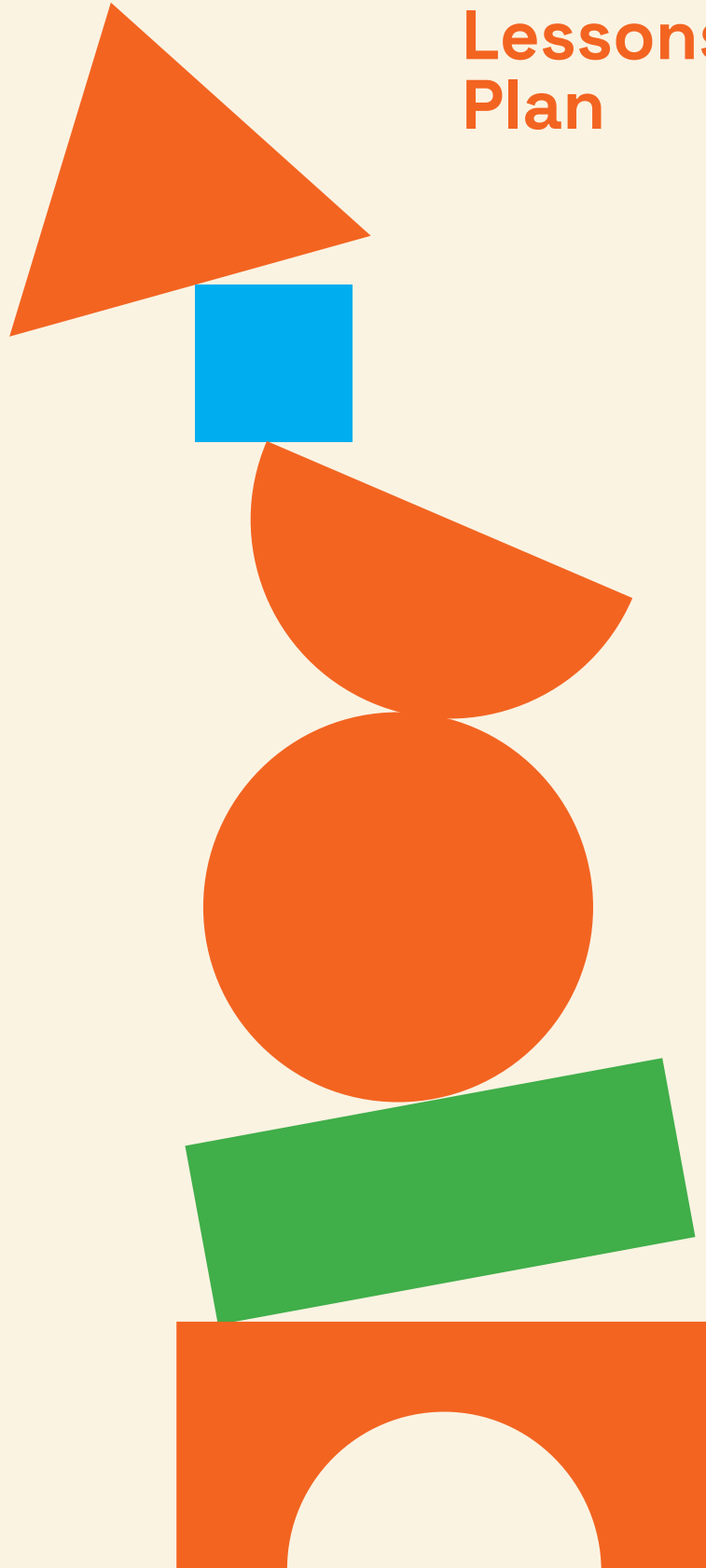
We can also add broken items or obsolete equipment found within the school. It is important to look for safe and motivating items to repair and remix. For example, mechanical things are preferable to electrical or electronic items as they can usually be more easily repaired. Nevertheless, electric appliances can provide a treasure hunt for components, as motors and other actuators that can be later used for making other creations.

Stimulate your students to bring their own broken toys or devices as toothbrushes or bicycles. Having them repairing, upcycling or just customizing their things will increase the magic and the future commitment to the activities. Empower your students and they will become active ambassadors for repairing and recycling at their households and community. Try to involve their parents, keeping them informed about the project goals and learning objectives, as well as sharing the results as the project progresses. This may very well contribute to the dissemination of the repair cafes in your community.

Also, keep in mind the importance of setting a space for the discovery box. A space that is visible, acts as a daily reminder to bring more items, and stimulates all students to contribute to the project. Such a space could even be set up in the school entrance.



# Lessons Plan



# Introductory Lesson

It is important to increase the awareness about the unsustainability of our consumerist behaviour. Our planet has limited resources and it is struggling to provide humankind unlimited needs. The production of goods and food is depleting the natural resources at a faster rate than its regeneration capability. But we are also polluting the planet to produce the goods and with the waste that we are generating. We are producing far too much waste, as we're constantly buying new products. Repairing means reducing waste and the need for producing more new things.

The introduction to these topics could also be achieved by the visioning of a movie instead of a presentation by the teacher. Nevertheless, at the end promote a roundtable to discuss this problem and generate answers to the following questions:

- What happens at the children's home if something is broken?
- Do they ever repair something themselves?
- Does their father/mother/guardian ever repair something?
- Do they think it's a shame, or even feel bad, if something breaks?

- If they throw away broken things, what happens to those things? Where is it taken?
- What do they think about many of these things being burned?
- Do they like getting new things, like toys or a bag?
- Where do new things come from?
- What is needed to make all these things?
- Do they think that children all over the world have as many toys and other stuff as they do? Why/Why not?
- Do they think that children in other countries might want all these things? Why/Why not?
- Do they think it's possible, that everyone in the world has as many toys and stuff as they do? How?





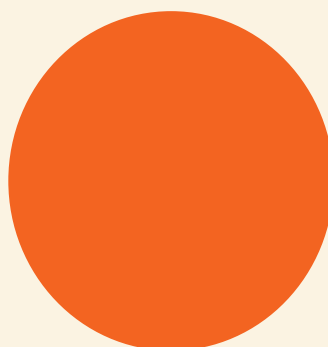
# Following Lessons

You can (and you should) be able to invite some volunteers to help you with the repair activities. Due to Covid this may not be possible, and even after these pandemic constraints you may struggle to find available people to volunteer in these activities. In either case, and if you cannot rely on the help of others to repair, do focus on the scavenging and upcycling. Also keep in mind that most items that are broken are in reality just with a loose connection or need a cleaning – you will be surprised with what people are ready to put in the trash nowadays.

You and the volunteers try to distribute per the set of tables available.

Invite the students to find one broken item from the central table, ideally, choose an item that belongs to one of the children in the group. Firstly, because children want to see their own toy being repaired. Secondly, because the owner of the broken item will remember the repair tips the best and will be more attentive.

Secondly, it is important to provide freedom for the students to do their own experimentation. Make sure they are not passive observers. Not only they can assist you and the volunteers in the repair, but they can also be entertained in the opening and disassembling of objects, or making small experiments with motors, multimeters, and 3D pens. They have the opportunity to understand how the devices work, grasp better certain electronic concepts, experiment with hacking, and learn how to use tools. For many students, browsing around the items displayed on the tables and benches is a unique experience by itself. It's entirely possible that they've never seen certain things before. Think of a soldering iron or a multimeter. That's why it's nice when a volunteer is available to explain the items in the discovery box and tools used.

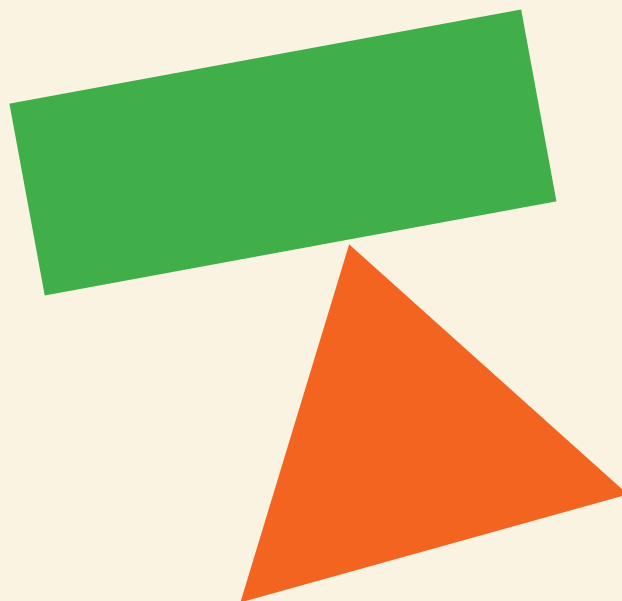


Switch every 15-20 minutes - To introduce the children to as many different repair skills as possible, you can, for example, have the groups move on to the next volunteer every fifteen minutes or so. But after 1 hour or so, it is time to reach group conclusions.

It is important to revisit what we were able to repair and why. Make sure to analyse what wasn't possible to repair. Discuss the 'why and what' we did with those unrepaired devices and toys. It is also important to discuss what they learnt about the use of tools and components, as well as letting them highlight what they found more surprising and fun.

It is crucial to have everyone involved collaborating in the cleaning up and organization of the material and the (UN)Makerspace. Remember that the disposable items should now be either repaired, divided in small components, or left with just unusable waste. Everything should go to the designated storage area. The benches and floor should be left clean and the tools properly stored.

A group photo with the accomplishments of the days is also a great way to close the session and have something to share to the parents and rest of the school community.



# Toy Hacking



This activity is centered around the practice of Toy Hacking as a learning device for citizen and environmental values. A Toy Hacking action takes place when the original or primary function of a given toy is altered and tampered with. The modification of the toy's function can be analog, digital, complementary, disruptive, among other multiple categories of intervention. However, in general, it always offers the opportunity to understand the functioning of mechanical and electronic equipment as it always involves the disassembly (partial or total) of the toy, as well as a DIY attitude that encourages creativity and reduces barriers to technological entry. Toy hacking is a STEAM (Science, Technology, Engineering, Arts, and Maths) activity of increasing popularity in schools and libraries, with a particular focus on the reuse of materials and using the components stored in our Trash library. The creation of such a library, and the scavenging and division of components (actuators, sensors, motors, leds, buttons, etc.) from electronic waste without possible repair will serve as a resource base for the realization of the Toy Hacking activity.

## 1st Session (90 minutes)

- Introduction to the problem of electronic waste;
- The issues and difficulties of recycling electronic components. Reuse and maintenance as a solution for sustainable development;
- Presentation of workspace, tools, rules of use and security;
- Disassembly of toys;
- Understanding of its internal functioning;
- Interaction with existing elements individually;
- Cleaning of the workspace.

## 2nd Session (90 minutes)

- Introduction of electronic waste components;
- Gambiarras experimentation in the original circuit;
- Modification of the toy's functions;
- Toy Hacking Free Toy Design;
- Presentation of the project to the class and documentation;
- Separation of components and cleaning of the workspace.

# Evaluation

## Duration: 30 minutes

We believe that the evaluation would work better if it doesn't take place right after the repair session.

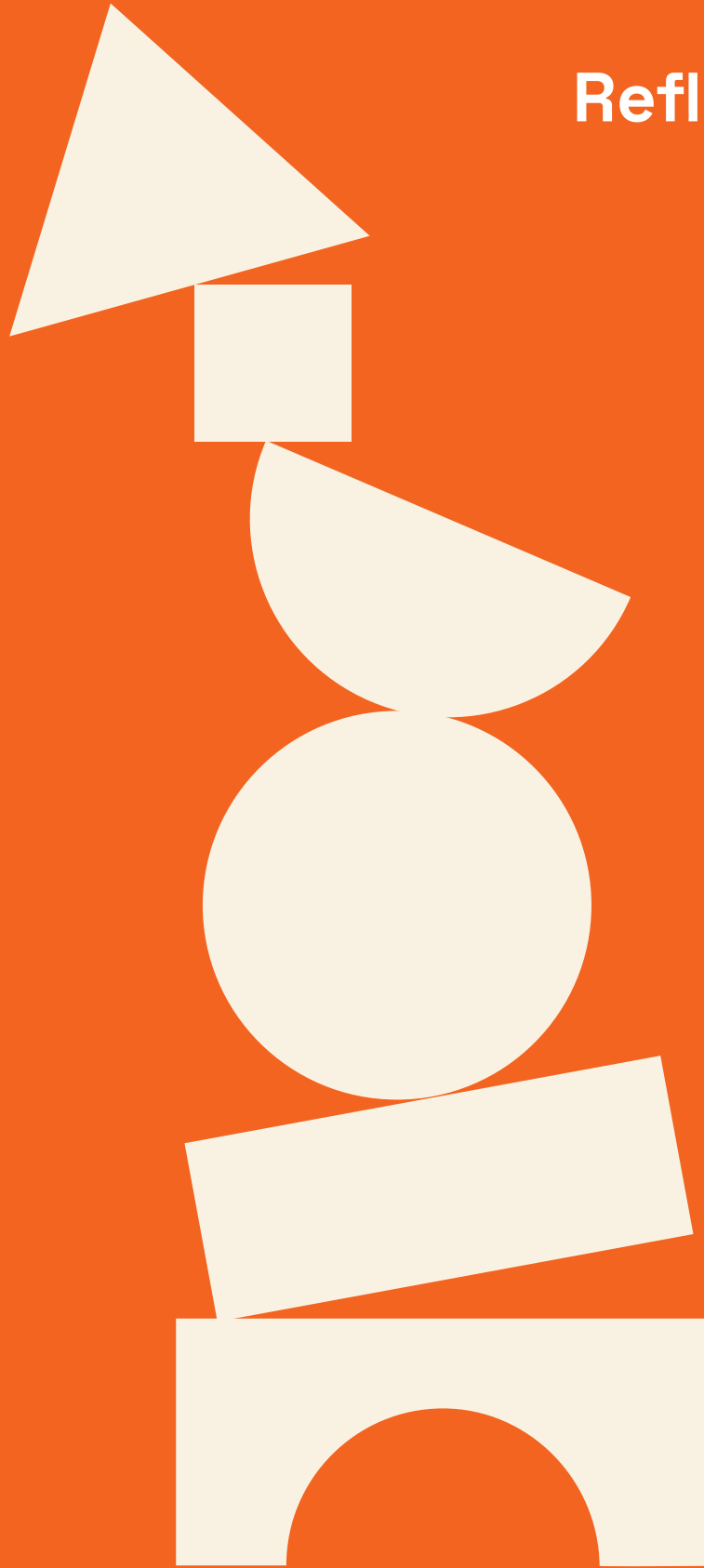
You will find that your students will disperse and have little focus. It is better to have a discussion and evaluation of lessons learnt in the day after, as it provides a simple way to understand what they kept in mind.

The evaluation session shouldn't be more than 30 minutes and it should lead to answering the following questions:

- How did the children experience the practical lesson?
- Which part did they like most and why?
- What did they learn?
- Did they notice anything specific? If so, what?
- Was the item they brought with them repaired? If so, what was wrong and how was it fixed?
- Did they help with the repair? If so, what did they do?
- Which items were repaired, which ones weren't?
- Why could certain items not be repaired?
- What will happen to the items that haven't (yet) been repaired?
- What items were in the discovery box?
- What did they learn by working with this box?
- Do the children think differently about making repairs?
- What will they do from now on if something at home breaks?
- Will they repair more at home?
- Will they change their behavior in any other way?
- Would they like to learn more about making repairs?
- Would they like it if there were more opportunities at school to repair broken items, together with people who can?
- Would their father/mother/guardian like to help with repairs at school from time to time?

**Extra: The evaluation can be done verbally or written, you could also use online tools such as [mentimeter.com](https://www.mentimeter.com) or [miro.com](https://miro.com). If you'd like to implement the project for a longer period of time, it might be a great idea, to prepare activity-journals, so the children can reflect and document the process individually.**

# Reflexions



# The initial project

Originally the “Deita-Gatos” project was planned for a timeframe from December 14th 2020 until 18th of March, 2021. In weekly sessions, pupils from the Santa Maria school Beja, were expected to build a makerspace and engage in repair activities, which were planned to result in a repair café as a final community event.

The project worked with a class of 18 students, from ages 14 till 17 years old. This class from the 6th grade is composed by the students manifesting the most indiscipline and lack of results. It is a PCA (Alternative Curricular Path) class, subject to a special social inclusion program aimed to prevent school dropout in high risk students. The Corona Pandemic had an impact in the implementation of the project due to the fact that Portugal has entered a severe lockdown which closed the schools disabled activities in person from the 12th of January 2021 up to 19th April 2021, surpassing the planned time frame with its in person activities, such as the preparation of a repair café.



Nevertheless the few sessions that occurred (3 sessions) were significant, because they enabled the students to participate in building their own makerspace at school and this added motivation and stamina not only to the group, but also created a momentum for future projects.

Even though the implementation had to be readapted several times, while facing many challenges, we could experience a significant change in the engagement of students and their willingness to learn. These students, who are expected to skip classes, attended willingly all presential sessions, and even wanted to continue throughout the lockdown. To us this shows that makerspaces can become inclusive environments within existing school systems, even though we faced many challenges.

In this report we would like to address these challenges in order to give advice for future inclusive projects involving creative hubs and practical advice by designing a toolkit, including our personal learnings.



# A situation with many layers



We are aware that FLIP learning labs are a pilot initiative to bridge educational institutions and creative hubs. Therefore, we got to experience at first hand how policies and stakeholder engagement can influence and block dynamics of project implementation on various levels.

Our relationship with the school involved in this project started previously through a cooperation with the municipality of Beja in the framework of a public program in early 2020. The school of Santa Maria, where the activities were inserted is a TEIP School, which means that it distinguishes itself for the high levels of school dropout and failure, being inserted in a National program to promote curricular and infrastructure improvements.

To set the scene, we are going to map out the stakeholders in the following, before we are reflecting on our experiences: The main stakeholders involved on an institutional level were Buinho Association (private organisation), the Santa Maria school (public institution) as well as the municipality of Beja (public organisation). On a rather individual level, the school was represented by the teacher, who anticipated the project (main gatekeeper) and the current vice president (main decision maker). Even though the students and their caregivers could be seen as part of the school system, we'd like to list them as an additional stakeholder, due to their special interest and key-role for this project. Taking into account their caregivers, who got involved later on in the decision process due to project continuation, we can take a community level perspective.

Due to the current pandemic situation, the Portuguese Ministry of Education guidelines to fight the pandemic at the schools system directed the broader frame for decision-making. There were few exceptions that could be applied to pupils at risk, where they could attend school for nuclear disciplines of the curriculum. Regardless of whether the decision-making process took place on institutional, individual or community level, it seemed to be rooted in three main principles: trust, empathy and willingness to take risks.

If these three principles were met, within the implementation of between the different stakeholders involved, the ones from the public and private sphere. In this regard Buinho Associação seemed to be perceived rather as a service provider for extracurricular activities. Nevertheless, we encounter challenges that overcome policies and they are related to communication skills and institutional trust, when we bridge institutions with different cultures and expectations.

When positive cases of Covid 19 started to rise in the overall school community, there was insecurity within the system transmitted to students resulting in lower participation, however children still showed up, willing to keep project going, which is special, knowing that usually these students use every opportunity to miss class. The decision for closure of the Deita Gatos projects during the curfew became an administrative red label decision of the school directive board, although the activities could be safeguarded by the exemption clause these students had due to lack of family support. In fact, we came to realize together with the teacher that was responsible for mediating the project with the school, that the decision of the school governing board to suspend the project actually reduced the safety of the students that would then just wander around their neighborhood even during curfew. Also it withdrew the students' incentive and willingness to return to school after quarantine, reducing their future education perspectives.

# Lessons learnt



Therefore we believe similar projects should be part of the curriculum in order to reinforce its operationalization and relevance in the school context. The personal relevance was understood because the pupils, the teacher involved and the families wanted to keep the activities running during the lockdown. But the institutional relevance was not acknowledged due to power imbalances. Therefore if there was an external mediator, such as an NGO working with these risk communities it would have balanced forces.

We also learned in the future pre/discuss the terms of the project and make contingency plans including situations such as lockdowns and school closures. A protocol agreement between institutions should be signed between the head of each organization involved stating the terms and responsibilities.

We also learned that if you start a project which requires a high interest and motivation of students make it long-term in order to see continuous results and avoid frustration of unmet expectations of students and other interested parts.

Public schools are less adaptable and often exhibit subjective decision making procedures that come down to the will, motivation and approval of teachers in higher positions. Such decision making procedures are conflicting to the more flexible and horizontal decision making process of Creative Hubs, and as seen, it does not help if we are working with marginalized groups that require less risk aversion.

Possible remedies include the reinforcement of the role of mediators, inclusion of gatekeepers, or other relevant stakeholders that may provide a higher balance of power in the decision making process of the project. Regardless of the value of the developed activities, schools and Creative Hubs should always seek the creation of common operational agreements, as it may reveal to be mandatory for the success of any initiative.