



Makerspaces in schools



Practical guidelines for school
leaders and teachers

Case Study

Agrupamento de Escolas Fernando
Casimiro Pereira da Silva Secondary
School, Portugal



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Picture credits:

Agrupamento de Escolas Fernando Casimiro Pereira da Silva Secondary School, Portugal (cover, pp.3, 4, 5, 6, 7, 8 and 9)



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Introduction

Makerspaces, which are designed for hands-on, collaborative, creative work, are a recent addition to some schools in Europe and worldwide. Students in school makerspaces can work with materials such as paper, cardboard, wood, metal, plastics, clay, fabrics, electronic components, microcontrollers, construction kits or programmable robots to create many different objects, and complete many different projects, using a variety of tools and machinery.

This case study is one of 15 developed from interviews with school leaders, teachers and other staff who have set up makerspaces in their schools. The schools are located in nine countries i.e. Austria, Belgium, The Czech Republic, Ireland, Italy, Luxembourg, Portugal, Switzerland, and Turkey.

The interviews were part of research carried out by European Schoolnet's Interactive Classroom Working Group and the schools' experiences, the lessons they have learned and the good practice they have developed, have informed the development of a publication "Guidelines on Makerspaces in Schools".

Find the full report and other case studies here: fcl.eun.org/guidelines

Motivation and aim/s

The principal, Paulo Almeida, explained that the option of setting up a makerspace became a need when their FCL inspired ActiveLab was unable to cater for all the active learning activities the teachers and students wished to undertake.



Activelab

At this point the school decided to create five more active learning spaces with diverse uses including a Makerspace as well as Cookinglab, MediaLab, MusicLab and ParkourLab (Parkour is fitness training developed from military obstacle course training¹) in addition to extending the ActiveLab space.



Parkourlab



Makerspace

The makerspace aims to improve active methodologies and experimental activities, developing students' skills and giving them freedom and the opportunity to develop their own projects, and in collaborative work, in different areas of knowledge.

The implementation timeline

In 2015 the school started to develop the idea of creating a space that allowed students to carry out different activities. This evolved into the ActiveLab space when the school learned about Future Classroom Labs that were being set up. Paulo Almeida, and his deputy Cidália Marques, who became the project co-ordinator, visited different spaces in Portugal, as well as the FCL in Brussels, together with several head of department teachers. On these visits they investigated different aspects of the use of these kinds of spaces.

¹ <https://en.wikipedia.org/wiki/Parkour>

When it became clear that ActiveLab was not big enough for all the students' needs, the school started planning for expansion and for setting up more spaces for specific uses including a makerspace.

The school planned the makerspace and its objectives for 6 months, initially working with the municipality and another school in the city because they hoped to obtain public funding. When the process of obtaining funding took more time than the school expected, they applied for funding from external partners.

Building and equipping the maker space

Most of the school's active learning spaces have been created by adapting existing spaces within the school. More recently, however, they have built a new space for their MediaLab with the help of the municipality. Most of the new spaces are integrated into existing classrooms and the school also uses some of the makerspace equipment in a mobile lab.

Both MediaLab and ParkourLab are directly accessible from outside the school. ParkourLab occupies a space approximately 300 square meters in size which is a few seconds from the main school building. The other active learning spaces are inside the main school building. ActiveLab is the largest of these spaces, occupying about 50 square metres. The MusicLab is about 20 square metres. The MediaLab, the makerspace, and CookingLab are each approximately 30 square metres.



Image Mediaalab

Equipment purchased for the makerspace, and the other active learning spaces, was selected based on the objectives of the design project and in consultation with teachers.

Cost and funding

The school started the project with school funds, equipment that they already had within the school and help from students and staff to do the refurbishment work needed.

After this the school applied to various funding bodies in order to purchase specific equipment and sought sponsorship. All equipment was acquired through sponsorship, external funding or use of school funds.

The total cost of setting up the school's active learning spaces, including the makerspace, was about 80,000 euros.

Sustainability is addressed by the school continuing to seek funding in the community and from municipality as well as by allocating some school funding to maintaining the active learning spaces.

Organisation and management

The school has made a different teacher responsible for managing each of the spaces, the equipment used within it and the activities scheduled. The teachers were selected based on their ability to use the equipment and to support other teachers in using it.



A team of support staff are responsible for setting up and maintaining tools used in the active learning spaces. Booking of time in the spaces is arranged by teachers who wish to use the space agreeing a time with the teacher who is responsible for that space. The main difficulty encountered is scheduling all the activities teachers want. This is why there are already six active learning spaces and why, as Principal Almeida explained, “*we are extending the number of labs and this year we might open a fully equipped ScienceLab*”. The makerspace is made open to the outside community if requested and a member of the school’s staff manages the makerspace outside of school hours.

Health and safety

When asked to describe how the school guarantees safety in the makerspace, the teacher explained that rules have been defined for the use of the space and students activities are closely observed by the supervising teachers.



Networking beyond the school

The school are in the process of organising an external network for their active learning spaces. The teacher reported that already “*we have a volunteer programmer working in some tasks and we hope to recruit more volunteers*”.

The school shares knowledge with different future classroom labs in other areas of Portugal. They also host seminars, attended by people from all over the country who wish to learn about makerspaces and how to use them.

Training and support of teachers

A teacher interviewed explained that *“the school’s resident ICT trainer and the principal regularly deliver pedagogical and technical workshops to help staff develop new skills”* and *“we frequently have trainers from the DGE (Ministry of Education) helping us with special courses”*.

The school organises meetings in the ActiveLab and the MediaLab where teachers are encouraged to practice using some of the makerspace equipment. There are also workshops in which teachers learn how they can use the equipment in the classroom.

Teaching and learning in the makerspace

A broad range of activities take place in the school’s active learning spaces including:

- ▶ projects created by the students with the support of the teachers
- ▶ experimental activities
- ▶ coding and robotics
- ▶ cooking lessons
- ▶ physical activities
- ▶ creation of movies and plays.



All the school’s teachers can use the active learning spaces, according to their class needs. Teachers from kindergarten to 9th grade use the facilities. There is free access to the spaces and they are mostly fully occupied on every school day. The makerspaces are used mainly during school time and there are also workshops held at weekends and during the school holidays.

Teachers, and groups of teachers (depending on the type of activity), lead activities in the makerspaces. These activities are integrated into the curriculum by the teacher responsible for the management of the learning process.

A major objective of the school is to implement more collaboration activities, so teachers are encouraged to work in collaboration, supported by the pedagogical teams.



Regarding the type of pedagogy used in the school's active learning spaces, the project coordinator, Cidália Marques, explained that *"We started by defining the methodologies before having the spaces designed and teachers were trained in the pedagogical uses of the space"*. When defining the methodologies the school drew on EUN information about using learning labs for teaching and learning and EUN Academy resources regarding active methodologies e.g. project based learning.

The project team discussed the pros and cons of using different methodologies in makerspaces and shared ideas, resources and good practice related to:

- ▶ Project-based learning
- ▶ Cooperative and collaborative work
- ▶ Innovative methodologies
- ▶ Working with values
- ▶ Development of students' growth mindsets
- ▶ Coaching

Added value and benefits

Teachers at Fernando Casimiro Pereira da Silva school have observed that students have benefitted from involvement in activities in the school's makerspace. They seem happier in their learning, are developing new skills and knowledge and have expressed a desire for every classroom to contain the tools available in the active learning spaces.

One benefit of having a dedicated maker space instead of trying to carry out these activities in a traditional classroom is the equipment can be shared. Also the lighter and more mobile furniture used makes transforming the spaces into different learning areas easier.

The majority of the school's teachers now use the makerspace and the number using it is increasing every year. Teachers often share the use of the space, thereby learning together and supporting one another. They also deliver workshops for other teachers in the makerspace.

Challenges

Key challenges for teachers are the need to learn how to use specific tools and then to design student centred learning activities around their use. Another challenge identified by the school was that much of the planning and development of activities had to be done outside of school time. Cidália Marques says the school has responded to this challenge by *"redefining the way the teachers schedule is organised, allowing them to have more time to collaborate and design activities"*.

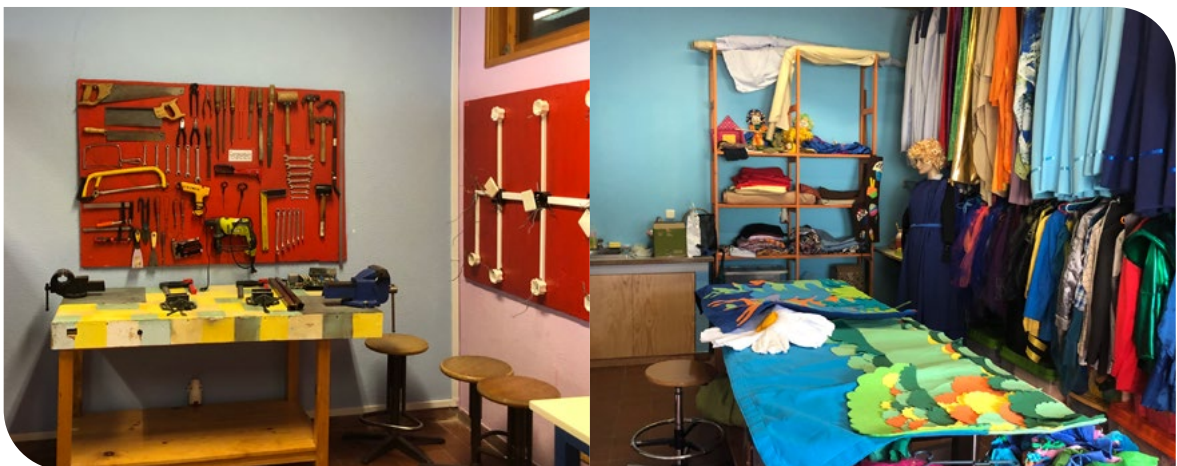
Equipment and technology used

Technological equipment used in the maker space includes:

- ▶ Interactive boards
- ▶ Tablets and computers
- ▶ Robots
- ▶ 3D printer
- ▶ Response equipment
- ▶ Laser cutting machine



- ▶ Soldering machine
- ▶ Drilling machines
- ▶ Potter's wheel
- ▶ Clay ovens



Plus various tools for working with wood, metals and other materials. The school uses freeware software wherever possible in order to control costs.

Future plans

The school has ambitious future plans. Initially they plan to invest in a science lab but the Principal Paulo Almeida says the eventual goal is *“we want our school to be an open lab and we want to create a Learning Street that will unify the whole school into one giant lab”*.

The case study complements the European Schoolnet's publication "Makerspaces in schools / Practical guidelines for school leaders and teachers" (2020).

Find the full report and other case studies here: fcl.eun.org/guidelines



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