Interactive Classroom
Working Group

Future
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Makerspaces in schools

Practical guidelines for school leaders and teachers

Case Study

Istituto Comprensivo Lucio Fontana,
Italy

European
Schoolnet

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Introduction

Makerspaces, which are designed for hands-on, collaborative, creative work, are a fairly 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, micro-controllers, 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*

The School

IC Lucio Fontana is a primary and lower secondary school located in the district of Labaro on the outskirts of Rome. The school has 4 buildings (three primary buildings and one for the lower secondary). There are about 150 teachers and approximately 1300 students from low to middle income families. The curriculum focus of the school is STEAM, mainly Arts, Technology and Engineering.

The school has strong connections with the local community and several projects have been led by students' parents or by local Associations. The school has a history of investing in educational technology. Almost all of the classrooms have at least one computer and a projector or IWB.

The school is investing in improving the school's makerspace and every school year they submit entries to competitions funded by Ministry of Education or other public bodies.

Motivation and aim/s

The School Director, Lucia Presilla, noted that "*the school was already oriented towards developing creativity, so it had been quite natural for us to build a makerspace*".

The original inspiration came from Manuela Pattarini, who is an architect, a technology teacher and the school's Digital Manager. She had visited and used some makerspaces, and had been "*spellbound by their sharing and creative environment that could fit perfectly into the school*". Lucia Presilla, understood at once that a makerspace was an excellent tool, being both inclusive and an enhancement for the school so she immediately gave it her full support.

The implementation timeline

In 2016, as part of the National Digital School Plan, an invitation to tender was issued by the Ministry of Education for schools to apply for funding to build "atelier creativi"[1] (creative workshops). These are workshops in which students use different tools and use their acquired knowledge to create real or virtual objects.

The School Director and the Digital Manager involved the local council, which owns the school buildings and an external association. It then took about two years of planning and preparation to start work on creating the space. The makerspace opened in 2018 and was enlarged during the 2019 summer holidays.

Building and equipping the maker space

All of the school's teachers were involved in making the decision to create a makerspace in the school during a staff meeting. The Digital Manager gave a presentation explaining what the space would be like and how it would be used for educational purposes. The teaching body voted unanimously in favour of creating the makerspace.

To create the makerspace the local council renovated an Art lab on the ground floor of the lower secondary school building. The room is inside the school but has a separate entrance which provides access to external users when the school is closed. The makerspace is a 55 square metre room divided into four thematic zones with work tables in the middle and machines against the walls.

The equipment for the room was selected with the aim of creating a makerspace type environment. An external association, Roma Makers, provided the initial equipment. Then the school bought more machinery and materials, using funds obtained from the Ministry of Education. Some additional equipment has been donated by students' parents or neighbourhood citizens who are particularly keen to support the school's makerspace.

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1   https://www.istruzione.it/scuola_digitale/prog-atelier.shtml

Equipment and technology

The equipment in the makerspace includes:

- Cutting plotter (Silhouette Cameo 3)
- 60W Laser cutter
- 4 x 3D printers (1 x Delta and 3 x Kloners)
- Cutting and printing plotter (Roland BN-20)
- Digital embroiderer
- Heat press
- 3D scanner
- Welding machine

- Arduino starter kits
- 3 x Raspberry Pis
- 20 x Circuit Scribe kits
- 10 x Lego Mindstorms
- 10 x Lego WeDo kits
- 2 x Desktop computers
- 3 x Lapbooks
- 3 x Android tablets.

Health and Safety

The school has a Safety Manager who inspects the makerspace regularly in order to verify that all the machines still comply with the safety standards. For security when it is not in use the makerspace has an alarm.

Cost and funding

The largest amount of funding for the school's makerspace, 28,000 Euros, was obtained by responding to a Ministry of Education call for tenders. The school also received some donations.

The local council refurbished the space to house the makerspace, the school administrators collected funds and the Roma Makers Association provide equipment.

The overall cost of setting up the makerspace was approximately 45.000 Euros, including some funding set aside for the maintenance costs.

Sustainability

In the beginning, the sustainability model was based on a partnership involving:

▶ The local council, which renovated the school lab.

▶ The Roma Makers Association, which provided equipment, makerspace managers, equipment maintenance, technical advice and technical training courses for the teachers.

▶ The school, which raised funds and provided utilities as well as making the space available to the Association in extracurricular time

When using the makerspace outside of school hours the Association was allowed to offer courses to external people for fees.

Unfortunately, after a while the Association broke up for what interviewees described as "*members' private reasons*". As a result the school had to advertise for new makerspace managers to take on the role previously undertaken by the Association. The school remains responsible for overall management of costs and the new makerspace managers are responsible for their own courses.

Organisation and management

The two makerspace managers manage the space in terms of technical supervision and timetable updating. The timetable is planned and agreed together with the school's Digital Manager. The managers also schedule and hold training courses in the makerspace during the afternoon and the evening.

The makerspace is used almost every day, in the morning for curricular activities, in the afternoon for curricular or extracurricular activities, and in the evening for extracurricular activities.

Networking beyond the school

School Director, Lucia Presilla, says the school is "*trying to create a more and more motivated network including parents, volunteers and local amateur makers*". Also the external freelance professional makers, who are the makerspace managers and collaborate with the school's teachers to design activities, are building their own businesses by using the makerspace when it is not being used for school activities.

Training and support of teachers

All of the school's teachers have attended basic technical courses for the equipment provided in the makerspace e.g. 3D printer, laser cutter, cutting plotters, Arduino boards, etc. The courses are delivered by the makerspace managers.

Technical courses for the school's teachers have always been voluntary. As a result, courses have been attended by the teachers that are really interested in the use of makerspaces for educational purposes and, also, sometimes for their own interests.

Some teachers have decided to take advanced training courses on specific technologies and few of them have attended professional certifying courses. Teachers always are free to experiment, with or without a makerspace managers' support.

School Director, Lucia Presilla, says "*the more teachers become expert, the more often students can use the makerspace. The more the students use the makerspace the more the space becomes interesting for parents and for new teachers who are intrigued and therefore use the makerspace*".

Usually the activities that take place in the makerspace are designed by teachers together with the makerspace managers. One manager is always present when classes of students use the makerspace. The teacher looks after the students and their learning, whilst the manager deals with specific technical issues.

In 2018, the School Director decided to organise training courses for teachers from other schools. These are free in curricular time, when they are delivered by the school's teachers with the assistance of the makerspace managers. In extracurricular time the courses are delivered by the makerspace managers and a fee is charged.

Teaching in the makerspace

The most frequent users of the makerspace (not less than two hours per week each) are a group of about ten teachers who teach Science, Mathematics, Technology, Arts, History, Geography and Literature. About 50 more teachers of different subjects have used the maker space for at least one activity of between four to eight hours duration per year.

Most of the learning activities in the makerspace are developed by teachers during lessons. Teachers, with the assistance of the makerspace's managers, have gradually developed their own projects to support curricular objectives. They have also created a digital archive of educational materials, where other teachers, particularly those not very well-versed in this kind of activities, can find project ideas to use with their classes.

Starting in the current year, all classes in the school, from kindergarten to the lower secondary, will carry out at least one mandatory project using the makerspace. There are between 18 and 25 students in a class. In this way all the students will come into contact with the makerspace.

A science teacher explained that activities in the makerspace may relate to an annual school theme or to part of the curriculum. The teacher considers what students could create in this context. Then they prepare a draft of the lessons being planned and share this with the makerspace manager for his, or her, suggestions regarding both technologies and how to organise the workflow. Workflow can be important when the students use slow machines e.g. 3D printers.

Another teacher described how after their first technical training they started to develop simple activities for the students, typically something they did before without the technology that would be enhanced by using the equipment in the makerspace. Then, when they had more experience of using the makerspace and felt more confident, they were able to go further and design more complex activities. For these activities they work with one of the makerspace managers, both to design the activity and for support in the makerspace with the students.
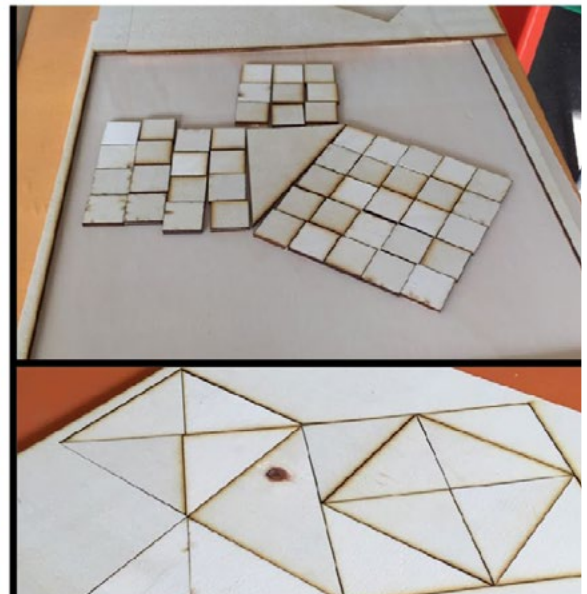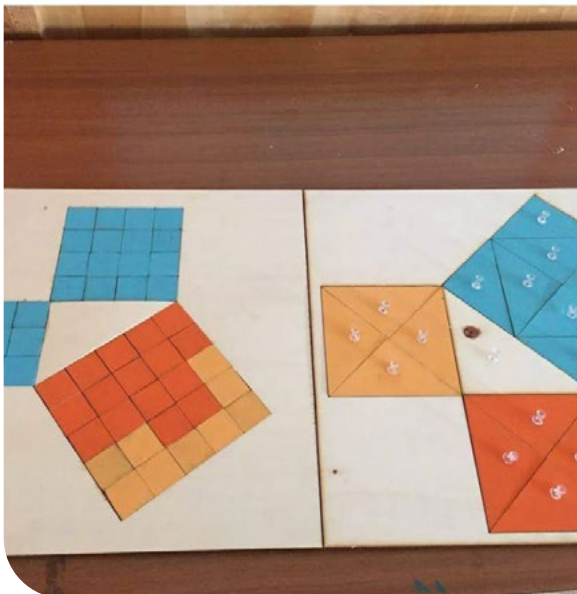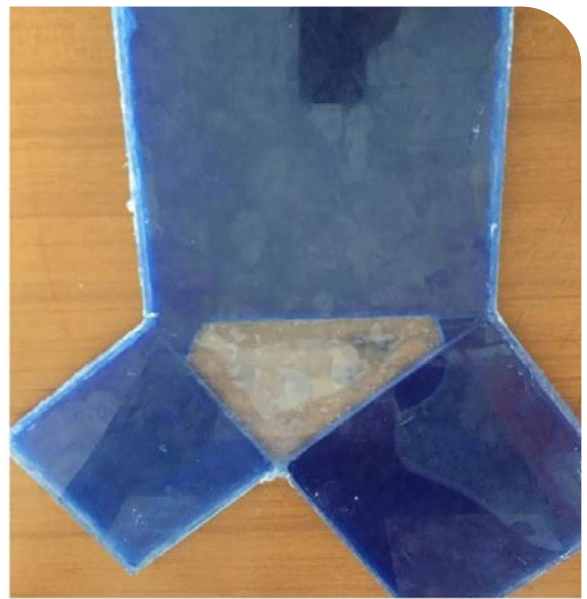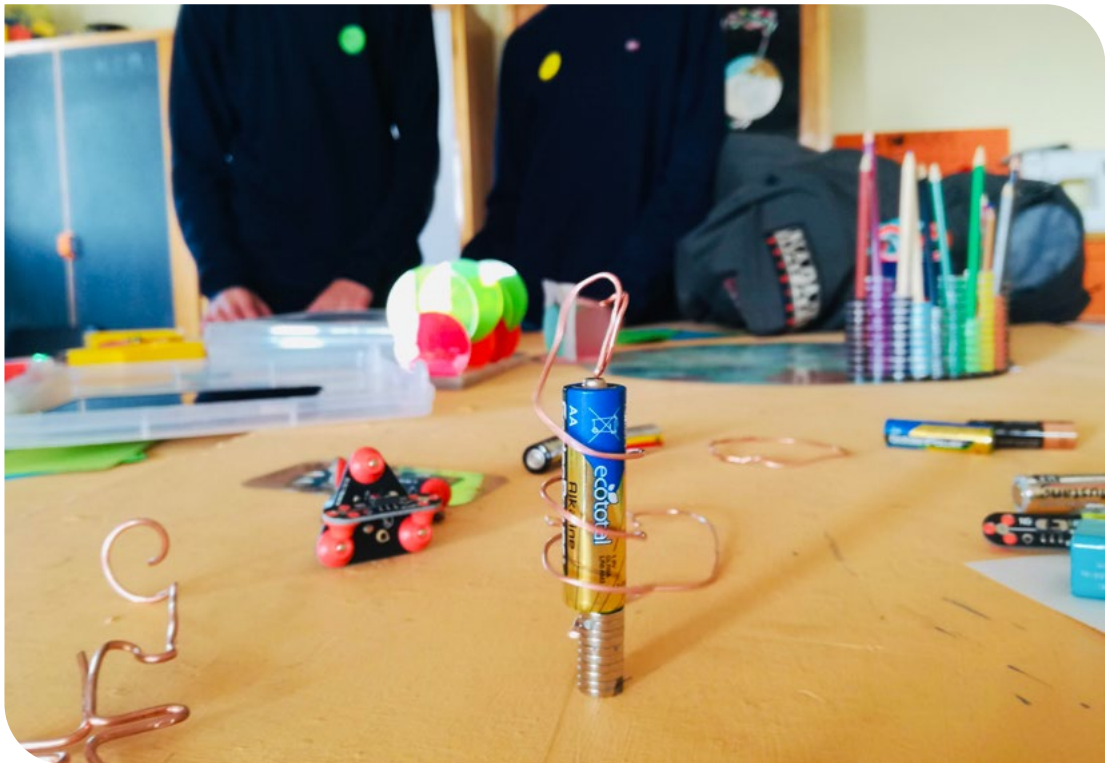
The makerspace manager has become a "*second reference person*" who students can ask for help. The teachers emphasised that the makerspace managers, due to their qualifications and experience, including experience working within this school, have an understanding of pedagogy and of the school's priorities. Therefore they are able to effectively support the teachers and the collaboration with them is very successful.

Added value and benefits

A specific added value of a dedicated makerspace, identified by the School Director, is that "*a dedicated makerspace is a privileged kind of learning space, better than an external one, because it directly serves the school and therefore can be developed to address the school's specific pedagogical needs and priorities*". Also "*peer tutoring, collaborative learning and interdisciplinary projects are usual approaches to activities in the makerspace. And they are effective*".

Lucia Presilla and the teachers have observed the following benefits from setting up the makerspace:

▶ Students are forced to be active learners.

▶ Students develop the skill of being part of a work group.

▶ Students are more are interested in their learning activities.

▶ Students become more autonomous learners.

▶ Improvements in students' self-confidence.

▶ Improvements in students' communication skills.

▶ Working in the makerspace can push students, who encounter difficulties with the traditional teaching, to find a way to learn.

▶ Teachers must design activities that enable different aptitudes to develop.

▶ Creative activities naturally change the point of view, therefore facilitating teachers' development.

Digital Manager, Manuela Pattarini, commented that "*students enjoy working in the makerspace because it is a more informal learning space, full of stimulating objects and tools, ready to be used and tested. They also like to use technology to make their own projects*".

Challenges

An early challenge faced by the school was difficulty managing the necessary refurbishment works because all school buildings are local council property. This meant the school administration and local council administration had to cooperate, funds had to be found and many bureaucratic steps needed to be completed.

Then there was the issue of some teachers being uncomfortable about changing the way they teach and having to learn to use new tools, some of which are quite difficult to fully master.

When addressing both of these challenges the school relied upon help from a group of enthusiastic teachers who were helped by clear pedagogic objectives and plans. Also internal communication was an important factor. This ensured that all school staff understood what was going on and supported the changes.

Future plans

The School Director says in future "*the makerspace will continue to be maintained and developed by on-going collaboration with the makerspace managers and by using both European and national funds for technology and digital projects and for the implementation of innovative learning spaces*".

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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