

Makerspaces in schools



Practical guidelines for school
leaders and teachers

Case Study

New Middle School of Information
Technology and Junior High School
Konstanziagasse, Austria



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Authors:

Hermann Morgenbesser, Future Learning Lab Wien, Austria
Jill Attewell

Editor:

Anja Balanskat, European Schoolnet
Jim Ayre, European Schoolnet

Acknowledgements:

Gerrit Brunner, Teacher
Edith Hülber, Headmaster during the project, now: Schulqualitätsmanagerin (Inspector for STEM in Bildungsdirektion Wien)

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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

The New Middle School of Information Technology (NMSI) and the Junior High School (JHS) Konstanziagasse, which are managed as one school, are located north of Vienna in the region of Donaustadt. Donaustadt has approximately 180,000 inhabitants and many of schools including primary and secondary schools, a vocational school specialising in ICT, business schools and a tourism school. NMSI and JHS Konstanziagasse currently has 420 students, aged 10 to 14, and 52 teachers. They specialise in English (with some Mathematics, Biology and Physics lessons delivered in English), Entrepreneurship, Inclusion and MINT (Mathematics, IT, Natural sciences and Technology).

NMSI & JHS Konstanziagasse has an excellent relationship with the University of Vienna. They participate in projects with the university and also with other partners including the TGM Institute of Technology, Vienna, industry partners and schools in different European countries via the European Commission's Erasmus+ programme.

NMSI & JHS Konstanziagasse invest in innovation and educational technology; they are one of two eEducation plus¹ Schools in Vienna and there is a plan to link their makerspace via the internet to a similar makerspace at a partner school in another part of Vienna.

Motivation and aim/s

The school's main motivation for setting up a makerspace was a desire to recruit more students and to make technical education more attractive to girls. The original idea came from two of the school's teachers.

The aims of the makerspace are: to make an innovative and creative work space available to the school's students and teachers as well as to other interested external people; and to work in partnership with other schools in Vienna.



¹ eEducation Austria is a project of the Federal Ministry of Education, Science and Research that has brought together various eLearning initiatives of recent years.

The implementation timeline

The idea of setting up a makerspace first arose in 2018 and the maker team worked on the plans for approximately one year. Work on developing and fund raising for the makerspace is still on-going. It will be open to the outside community, including parents, friends and makers, from the end of November 2019.

Building and equipping the makerspace



The makerspace was created by adapting existing space within the school's existing building. The school's workshop teachers helped with installation of electrical and water supplies, decorated the room and set up the ICT infrastructure.

The space consists of two rooms with a total floor space of about 80 square metres. There is a creative room, a modular room with computers, a chill-out lounge in the library, a conference table and a toilet.

Technical equipment and technology used

The equipment used in the makerspace was selected by the maker team, in consultation with local industry partners and includes:

3D printers	Drilling machine
Sewing machine	Laser room with laser cutter and materials
Embroidery machine	Electronics table with soldering and an oscilloscope
Circular saw	Thermopress

The school say they prefer to use open source software whenever possible e.g. Inkscape² for laser cutting and embroidering.



² Inkscape is a vector graphics editor that can be used to create or edit illustrations, diagrams, line art, charts, logos, etc.

Health and Safety

The school's principal explained that *"all tools and devices are of high quality and safety standard and additional safety features have been added for some tools"*. Also the Future Learning Lab in Vienna is developing a health and safety policy which the school will adopt.

Cost and funding

Setting up of the makerspace was funded by money from the Mayor of Donaustadt, the City of Vienna and the school's Parents' Association. The cost was approximately 5,000 euros.

Sustainability

On-going funding for the makerspace will be provided by charging external users membership fees and by sponsorship.

Organisation and management

The makerspace officially belongs to the Parents' Association of NMSI and JHS Konstanziagasse.

There are two managers responsible for the makerspace, publicity and timetabling and there is a maker who knows the tools and provides support for the teachers.

Some of the equipment used in the makerspace is installed and maintained by the makerspace managers and some other tools are set up by craftsmen who teach the technical workshops.

Networking beyond the school

The school plans to create a network of volunteers around the makerspace.

Training and support of teachers

Teachers' training is organised by one of the school's staff, usually one of the makerspace managers, in collaboration with the Pädagogische Hochschule Niederösterreich (the teachers' training academy of Lower Austria) and the Future Learning Lab at the Pädagogische Hochschule Vienna.

The trained teachers will then provide workshops for students and for other teachers.

Following initial training by a pedagogical specialist, teachers then carry out:

- ▶ Inquiry-based learning and learning by doing.
- ▶ Collaborative learning using online resources, manuals, etc.
- ▶ Learning from skilled student buddies.

Teaching and learning in the makerspace

Learning in the makerspace integrates well with the curriculum as the school focuses on technical subjects. The makerspace is used for practical workshops related to subjects like project development, project management, electronics and computer aided drawing and students have developed a small device in the space for a maker challenge competition.

Teachers at NMSI & JHS Konstanziagasse acknowledge that they cannot know the answers to all the questions students may ask in the makerspace and therefore their role is changing from teaching to coaching. They also find that collaboration with teachers from other disciplines is often necessary but say this has, so far, never been a problem.

One teacher commented “*supporting the students and helping them to find a way through development circles, which include dead ends and loops, in a non-frustrating way is the biggest challenge for the teachers*”.



Added value and benefits

When asked about the added value and benefits of the makerspace, the principal identified the following:

- ▶ Students become more resilient.
- ▶ Students are allowed, and requested, to include own ideas in their work, so they are very involved in their projects.
- ▶ Students learn how to use development failures in their favour to design a better artefact.
- ▶ Students develop expertise in using makerspace equipment and tools.
- ▶ The makerspace fits absolutely perfectly with our digital innovation aim.

and teachers added:

- ▶ “*It is not possible to work with this variety of tools in a traditional classroom*”
- ▶ “*making means mainly learning by doing sequences, i.e. a constructivist approach, learning from failures, making design decisions and working in teams*”.
- ▶ “*improvements in team work, communication skills, use of oral language and problem solving*”

Challenges

A key challenge for the school is likely to be ensuring sufficient funding is available to continue operating the makerspace. However, the budget is guaranteed for the next two years.

The amount of planning teachers need to do outside of school hours is also a challenge and disseminating good practice beyond the small group of early adopter innovative teachers is likely to remain a challenge in the future. Also teachers recognise that they need to work on developing assessment strategies.

Future plans

The school’s plans for the future in relation to the makerspace include:

- ▶ The formal opening of the makerspace to external makers at the end of November 2019.
- ▶ Creating new teaching materials and lesson plans.
- ▶ Bringing more teachers into the makerspace.
- ▶ Possibly creating a new department with responsibility for the makerspace.

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

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