Making and Makerspaces

Educational level: Primary, Secondary 1

AGE: >10

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, card, 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 (https://fcl.eun.org/icwg-makerspaces)

NARRATIVE OVERVIEW:

Activities in makerspaces can include analysing objects, especially electronic, mechanical and IT devices, breaking these down and creating new objects from the pieces and knowledge acquired; as well as creating new objects by working in design cycles that lead to a solution by progressively correcting errors. Makerspaces allow students to progress from passively using objects created by others to better understanding how technologies work and creating innovative objects themselves.

Students typically start with introductory projects requiring basic knowledge of specific technologies or subjects. They progress to applied knowledge projects, that may be collaborative and interdisciplinary, in which they enhance their knowledge and skills through problem solving activities. Students can also participate in more ambitious, long-term projects, that may simulate a professional context. These can relate to competitions that require planning, teamwork and project management skills in addition to making skills. Students working in makerspaces in several of the case study schools have participated in national or international competitions.
There is no one-size-fits all makerspace. Makerspaces in schools vary according to factors such as the level, type and size of school; the nature of the physical space available; the funding available; the interests, aims and skills of school leaders and teachers; support available from, and involvement of, industry partners, local community makers or local education authorities.

As well as start-up funding, refurbishing and equipping a physical space, school leaders also need to consider how their maker- space will be funded over the longer term, how it will be managed, and how teachers will be trained, motivated and supported. Ongoing school funding/fund raising; local authority funding; self-supporting communities with makers paying fees plus industry partner sponsorship; public/private partnerships. (https://fcl.eun.org/icwg-makerspaces)

APPROACH TO TEACHING AND LEARNING

Integration of the Curriculum:

You may, however, decide that what you are trying to achieve by setting up a makerspace is best achieved by keeping it somewhat separate from normal school activities. Integration of all makerspace activities into the curriculum is not an aim of the school's makerspace.

This is because it is seen as a good thing for students to have opportunities to work in a different context outside the pressures of the curriculum". Although, there should be links to the curriculum.

ASSESSMENT:

Collaboration, group work, informal testing.

ROLES DESCRIPTION

LEARNERS:

Students decide what they want to build and with whom they collaborate

Different products are developed in parallel running.

Students use their prior knowledge and acquire information and knowledge in context.

TEACHERS use the Learning zones circular:

Students are given clear and structured guidance.

The students are extensively prepared for the tasks

The students' products are evaluated on predetermined criteria.

OTHERS: External experts can be addressed (e.g Laser cutting)

ENVIRONMENT – FCL LEARNING ZONES:

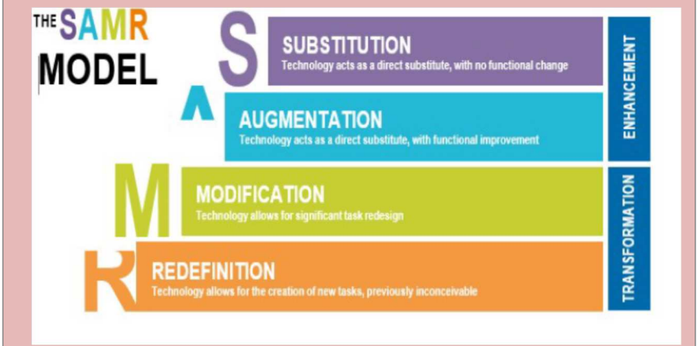
Create: Prototyping, using the 3D Printer, Vinylplotter and Lasercutte

Interact: Desgning the software part of the Protype: https://www.tinkercad.com/

Develop: redesigning of the Prototype, instructed by the teacher or an external expert

Makerspaces in schools: compare: https://fcl.eun.org/icwg-makerspaces,

RESOURCES: Prototyping in Makerspaces



https://www.schoology.com/blog/samr-model-practical-guide-edtech-integration

WHERE IT CAN BE IMPLEMENTED

1. INTERACT: Investigation and designing the Protoype
2. DEVELOP: remaking and redesigning the Prototypes
3. CREATE: 3D Printers, Plotters and Lasercutters are used to create the models, leaded by an expert or the classroom teacher.

There is no universally applicable recipe for creating the perfect makerspace. Choose the equipment that best suits their specific environment and requirements, it may be helpful to focus planning on four categories of equipment used to support making activities: Furniture, Storage Machinery and Tools. A variety of materials will also need to be purchased or acquired to be used for making things either by hand or using machinery.

LITERATURE to support

Cater Heroman, Making and Tinkering With STEM, ISBN 978-1-938113-28-4 Solving Design Challenges With Young Children.

EUN Schoolnet: https://fcl.eun.org/icwg-makerspaces

EUN Schoolnet: https://fcl.eun.org/guideline

Software for designing:

https://www.tinkercad.com

https://inkscape.org/

https://www.blender.org/

LEARNING ACTIVITIES:

Once teachers and students are able to use different machines and teachers increasingly collaborate with the makerspace coordinator/technician, new kinds of activities can be tried out by modifying activities they already have designed.

For example, a science activity based on observation of the effects of light on plants can be strengthened with light sensor tools created with Arduino in middle schools to measure the value of light during time, or students in primary schools can add 3d objects to supplement their drawings for their history homework.
Once teachers see that students are confident using the tools and machinery safely and are capable of organising their activities in the makerspaces in a given timeframe, new activities related to real life problems can be created based on different topics and in collaboration with the makerspace coordinator/technician.

For example, students can create something to help birds in the school park (or another park where students can develop a school project). This activity can be part of a long-term project involving observations and studying plants and birds in and around the park, which affect birds' lives, and identifying problems and solutions using the makerspace.