

3D Printing. Part II



School subjects
STEM
Age of students
12-18
Aim of the activity
This activity provides knowledge about the STEM and transversal skills.
Background
3D printing has emerged as a wonderful tool in STEM education. Without much prior knowledge, learners can apply their theoretical STE(A)M-knowledge and solve real-world problems.
3D printing is both a very simple and a very complex technology. Nowadays, the use of a 3D printer does not involve high costs or a very long training period, but a target-oriented application requires the user to have an interdisciplinary understanding of the technology used.
This learning unit belongs to a workshop series that provides all-round knowledge about 3D printing in order to be able to develop products with this technology. The participants



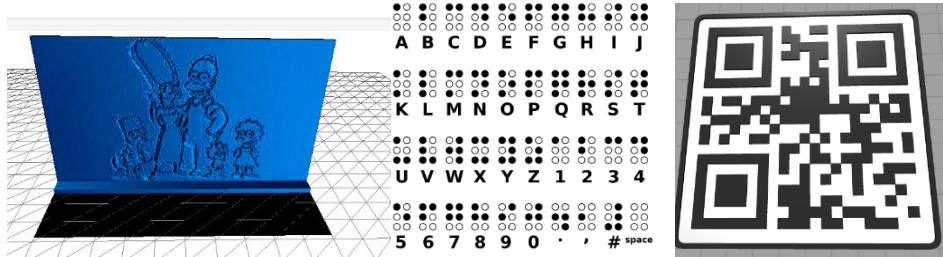
already learned how to operate the 3D printers independently, what influence the various settings have on the physical properties of the 3D print, and what they need to pay attention to in order for a print to be successful.

Activity

This learning unit should build upon the learning unit 3 D print part I.

Input

- Show the different technologies of printing by presenting the same object that was printed by different technologies.
- Show a video and explain what is happening as it runs.
- Cover the slicing topic in detail
- Show a 3D printer you will be using during the activity and explain how the parts are called and how they are working
- Cover the diversity of fillings and their physical characteristics (stability, weight and the time it takes to print them)
- Demonstrate by showing objects what are the most common mistakes that can happen and tell how to avoid them
- The next step is to offer more advanced functions and approaches. Consider the product the participants have to develop. In our case of building escape boxes, it would be the building of doors. It requires perfectly fitting sizes as well as connecting elements. Pay special attention to explaining the necessary steps in succeeding to develop the doors as it is important for the general success experience in learning and using STEM knowledge. Depending on your participants group you can add more advanced, nice to have elements. For example, tell about and show lithophany pictures, developing QR codes, vector graphics that can be converted in to 3 dimensional data. Actively ask and be open for the participants' needs and ideas.



- Finally, also introduce to the possibilities, to import extern and ready – made models in the participants’ design

Task

Give the participants time to work on their products and assign a mentor for the working phase to make sure, the participants do not stay alone with their questions and can ask for help to bring in their creative ideas.

Time necessary

45 minutes input and approximately 2 hours of individual work.

Learning outcomes

The participants have learned

- how to operate 3D-Printers
- the influence of the various settings have on the 3d-print
- how to design functional doors and hiding places for escape activities
- how to produce 3D-printed QR-Codes and lithographs
- where to get cost-free pre-designed 3d-models

The learning outcomes are reached, when the girls are able to produce functional escape boxes

Costs

Costs for printing material.

There is a variety of price range to consider when choosing the material. Also, one has to calculate some extra material in the event of printing mistakes. We suggest calculating 15 € per Person for printing during the whole Summer School (testing, printing the escape boxes with the approximate size of 10x10x10 cm)

Tinkercad = free of charge

3D Printer = 500 EUR (depends on the products you want to print. For the escape boxes this class of 3D printer works very well)



3 GB USB stick = 3 Euro

Materials

Teaching material, a power point presentation in German is available. Contact: icse@ph-freiburg.de

Further literature for preparing a session: 3D Printing in School: Student Lesson Plans for Teachers - 3D Insider

