



## *EARLY Teaching Scenario*

### Topic:

Tinkercad 3D design and printing with Ultimaker 2+; keychain.

### Aim(s):

That students ...

- utilize their creativity and learn to work with their ideas
- use your own initiative and creativity to put ideas into practice
- grasp the basic elements of the Tinkercad application
- learn to design things in 3D
- get to know 3D printing in Ultimaker 2+
- learn from their own mistakes, revise and correct their own design

## Applying the 7 key competences



**Skills pupils develop during the scenario:** connect to curriculum

The National Curriculum Guide for Compulsory School, Information Technology, states that by the end of class 7, students should be able to:

- use electronic learning materials in various forms in connection with work technology, work methods and other learning
- show independence in guided and collaborative work
- utilize different technological equipment in a cost-effective and varied way
- use electronic and interactive study material in a variety of ways

**The course components that are trained in the project are as follows:**

- creation, design and implementation
- technology awareness
- concept work, design and implementation
- go through the work process and follow the instructions

**Target group** Intermediate level, pupils in primary school

**Age of students:** Ca 10 -12 years

**Number of students:** Approximately 10 students, the number depends on the situation at any given time

**Duration (estimated time/number of lessons):** 1X60 minutes



## Prerequisites (necessary materials and online resources):

- Computers with internet access
- Tinkercad (free online)
- Students' email address so they can access the program
- Ultimaker Cura application
- And of course 3D printer Ultimaker 2+ :)

## Introduction to the scenario (incl. possible applications, alternatives and risks):

The project is an individual project. Have a look at this video <https://youtu.be/RCyPmDGdNmk> with students before you get started. The teacher needs to be familiar with the video and can stop it and explain better where needed. After getting an explanation of the project and watching the video, students log on to <https://www.tinkercad.com/> and make their access there which keeps track of what they are designing.

## Before the program begins (preparatory work for teacher):

Teachers get to know the Tinkercad application and learn about the 3D printer Ultimaker 2+

If teachers choose to do so, they can have school access and then share code with students who sign up there. Otherwise, students create their own personal area in the program, both options are free.



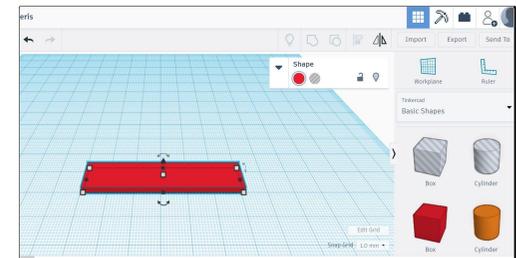
## Main part of the scenario (60 min lesson):

The teacher shows the students the video <https://youtu.be/RCyPmDGdNmK> and explains the project to them. After that, students open the program's website, <https://www.tinkercad.com/>, click JOIN NOW, follow the registration process and access.

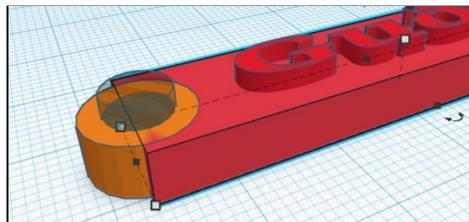
Here, teachers can decide whether to allow students to sign in to "Students, join class", or "Create a personal account", but in the first case they need to have school access and share the code to the students as mentioned before.

Once students have established their access, they choose to design a new item, "Create new design".

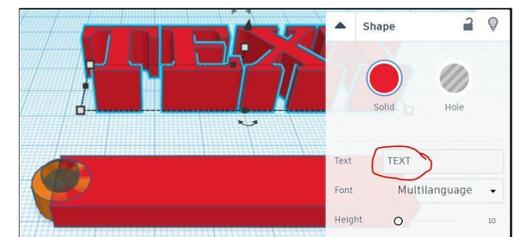
Teacher tells students that in this project, which is a keyring, they should use three blocks; *Box*, *Cylinder* and *Text*. In **Basic Shapes**, they find the *Box* they pull over on the workplane. They then need to adjust the block until it is about 12 x 60 mm in size, the thickness should be about 5 mm.



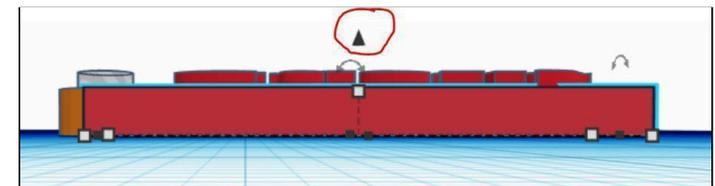
When the block is ready, return to the **Basic Shapes** toolbox and pick up the *Cylinder* for the keyhole loop. When it is in place and is about 10X10 in size and 5 mm in thickness, students get another *Cylinder* that is above the other to create a hole. It is placed inside the previous one and is made 6 mm.



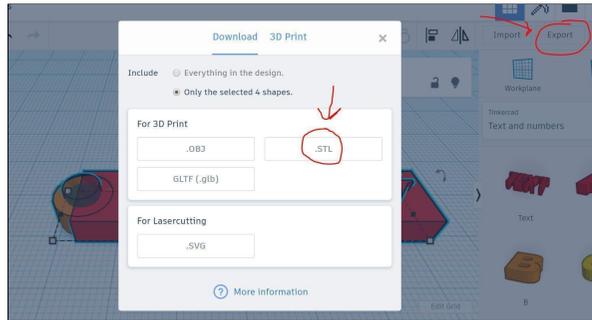
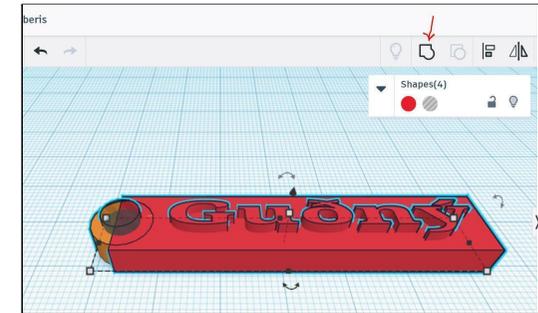
After that, students return to the toolbox on the right and select **Text and numbers** and choose *Text*. Drag it into the workplane and edit the text by typing your name instead of the word Text.



When finished, the height and size of the letters need to be adjusted to fit the block, about 7X48 mm. Please note that the letters do not fall under the workplane, also that they sit firmly in the bottom of the block. This is done by clicking the triangle that appears above the text when you click it. When you see 0.0, the form sits on the workplane, as it should be. If you see the minus, you have come under the surface and need to raise the object.



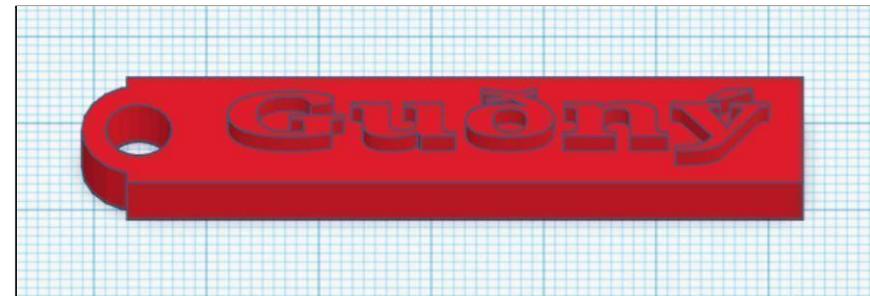
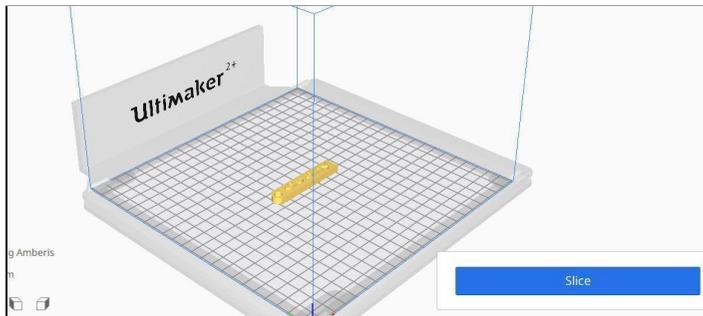
When you are comfortable with the look of your key piece, select all the blocks (Ctrl + A) and select Group (Ctrl + G), you will see the whole section and the final look. If you need to fix something, go the same way as selecting Ungroup (Ctrl + Shift + G).



Then it's time to move the design out of Tinkercad and change it for the Ultimaker 2+ printer. Select Export and then .stl.

Then send the .stl file to a teacher or open it in the Ultimaker Cura program.

Ultimaker Cura program: Open the document in Ultimaker Cura, select Slice and then save the .gcode file to the SD memory card. Insert the card into the Ultimaker 2+ printer and print the design!



NOTE. Printing on such a keyring usually takes about 90-120 minutes, depending on its thickness and size.

Once the work has been completed, it is good to have students **evaluate** the lesson. For example:

- What did you learn today?
- What was difficult?
- What was easy?
- What would you like to design next in Tinkercad?

**Summary** (knowledge, skills, understanding):

1. Students understand:
  - the design process of 3D printing
2. Students can:
  - Teste and get to know 3D printing
  - Design and print their own designs
  - create their own access in Tinkercad
  - Have communication / collaboration with other students
  - Evaluate their work
3. Students learn:
  - To design in 3D
  - To revise its design and repair
  - Working in Tinkercad
  - How a 3D printer works
  - The basic knowledge and skills needed in 3D design and printing