3D Printing Cup

Key Stage: 2

Strand:

Mathematics: Measures (Learning Unit: 6M1 Volume (II))

General Studies: Science and Technology in Everyday Life

Objectives:

(i) To consolidate the recognition of the relation between capacity and volume

(ii) To use 3D design software and 3D printing technology

Prerequisite Knowledge: Conversion between centimetres and millimetres, relation between capacity and volume

Resources Required: 3D printers, measuring cups which can measure liquid of 250 mL, 3D design software (e.g. Tinkercad)

Description of the Activity:

Activity 1

The teacher asks students to work in groups and design a cup of capacity 250 mL on the worksheet.

Question for discussion:

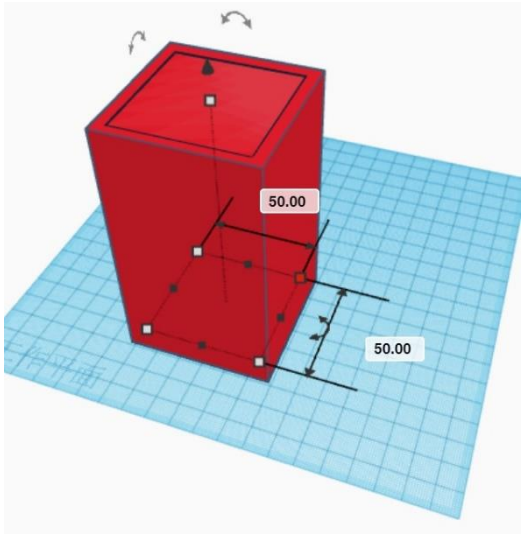
When you design the cup, what should you take note of?

Notes for Teachers:

1. The teacher can revise the relation between capacity and volume with the students at the beginning of the activity.
2. The cup may not be properly printed if it is not thick enough.
3. Students may do calculations by a calculator whenever appropriate.
4. The size of the cup is limited by the print dimensions of the 3D printer.

Activity 2

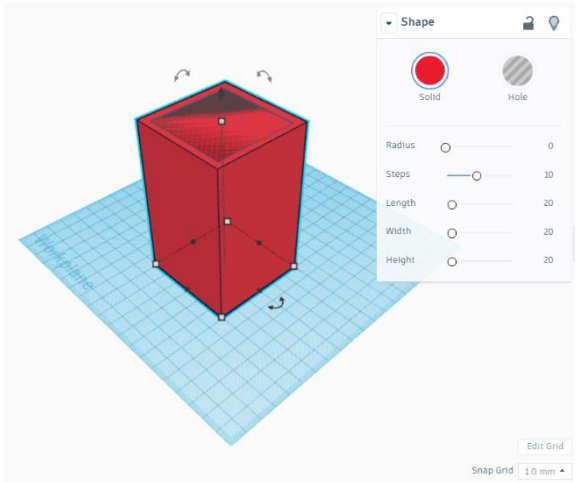
1. The teacher demonstrates how to input the design of a cup and its dimensions to the computer by using a 3D design software. (Figure 1)



(Figure 1)

For example, it's to remove a cuboid of 5 cm long, 5 cm wide and 10 cm tall from a solid, then the capacity of the resulting solid is 250 mL

2. The teacher demonstrates how to make a hole from a solid. (Figure 2)



(Figure 2)

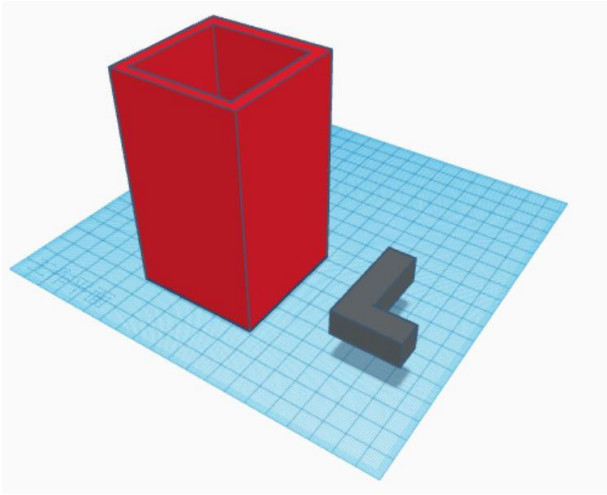
Use the function "Hole" to make a hole from a solid

Note for Teachers:

Students should be reminded that the 3D design software using millimetre as the unit. They should convert the length to centimetres for easier calculation.

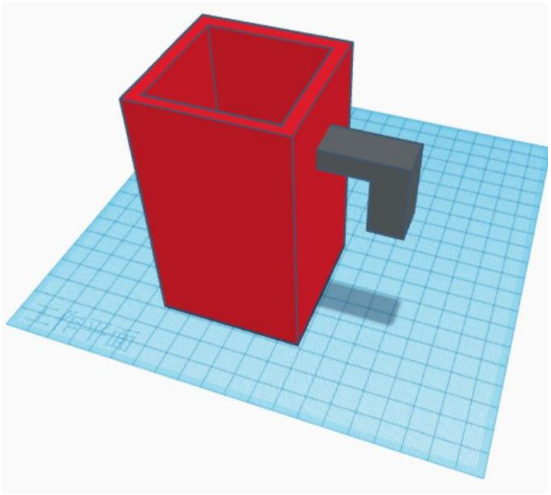
Activity 3

The teacher lets students decorate the products, for example, adding a handle. (Figure 3 & 4)



Select a suitable solid to be a cup handle

(Figure 3)



Final product

(Figure 4)

Activity 4

The teacher collects students' designs and export them to the 3D printer. The students use measuring cups to verify if the actual capacities of their products meet the requirement of the tasks.

Activity 5

Groups of students present their works and share their experiences.

Worksheet

Objective: Design a cup of capacity 250 mL

(1) Draw a draft design of the cup and mark its dimensions in the following box.

(2) According to the design of the cup, find its capacity in the following box with working steps.