Exemplar 2：Making Solids

Learning Dimension: Shape and Space

Learning Unit: 3-D shapes (III)

Key Stage: 2

Objectives:
(i) To make solids with cubes
(ii) To explore the methods used to make all possible solids with cubes
(iii) To describe the solids made
(iv) To group the solids made
(iv) To describe the methods used in grouping the solids

Prerequisite Knowledge: Identifying and describing 2-D and 3-D shapes

Teaching Resources:
(i) Cubes
(ii) Grid paper

Description of the Activity:

Activity 1:

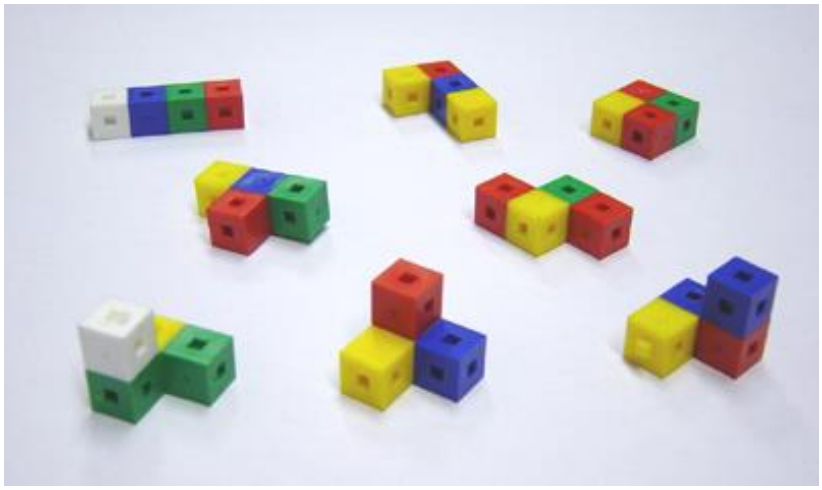
1. The teacher gives each pupil a box of cubes.
2. Pupils make solids with two cubes and display them on the desk.
3. Repeat the activity in (2) with three, four and five cubes.
4. Pupils are grouped in pairs to describe the solids to each other.
5. Pupils group the solids into several categories according to the characteristics of the solids.

Questions for discussion:

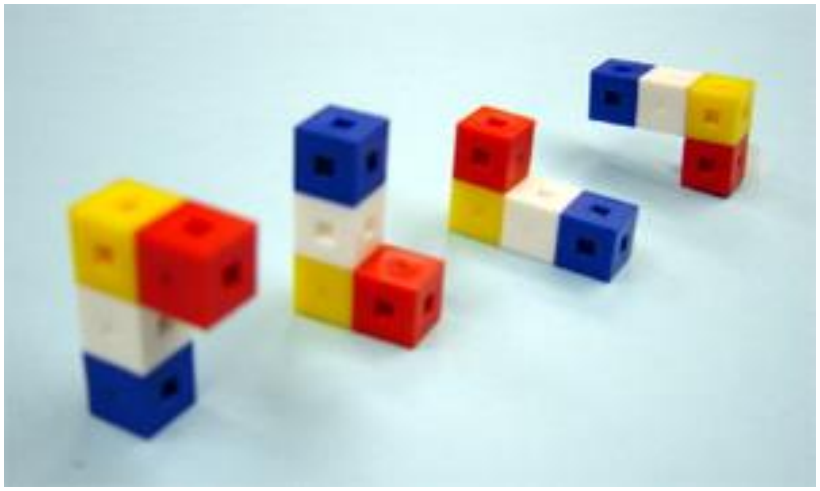
1. How many solids can be formed with two, three, four and five cubes?
2. Are you able to make all the possible solids? How?
3. What are the rules you followed in grouping the solids?

Notes for Teachers:

1. The teachers should let pupils explain freely their ways of making and grouping solids with cubes.
2. All the possible solids made with four cubes are as follows:

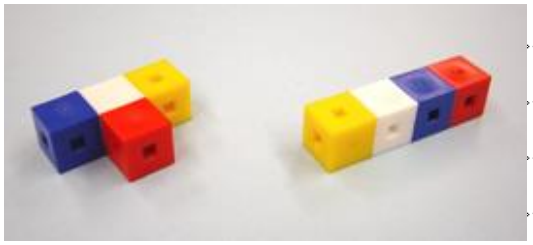
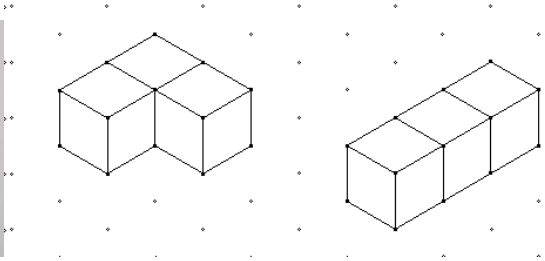


3. Any shapes which are formed by rotating or turning over other shapes are counted as identical.
   For example: the four solids below are considered to be the same.



4. Through observing pupils' performance in class, the teacher can identify their strengths and areas for improvement in learning shapes. Ways to improve their spatial sense can then be sought.

Activity 2: (For more able pupils)
Record the solids made in Activity 1 on the grid paper.
For example: The following shapes are formed by using four cubes.

Notes for teachers:

The teacher can prepare grid papers using suitable software. If Cabri Geometry is used, press "Define Grid" to show the axes. Move the x and y axes to form a grid.

This exemplar mainly involves the following generic skills:

1. Communication Skills
   - Describe the solids orally with simple and appropriate mathematical terms
   - Explain orally the rules they followed in grouping the solids
   - Present the results of tasks with appropriate drawings and symbols, for example, recording the solids made in Activity 1 on the grid paper

2. Critical Thinking Skills
   - Categorize information using various criteria, for example, grouping the solids into several categories according to the characteristics of the solids
   - Reason inductively in the process of exploring ways of making all the possible solids

3. Problem-solving Skills
   - Use simple methods in solving problems, for example, devising an appropriate plan for making solid
   - Apply knowledge learnt from past experience to solve new problems, for example, making solids with 4 and 5 cubes, based on the experience of making solids with 3 cubes