

## Schema

FACT  
BOX

## Conservation

ACTIVITY 7.1

## Introduction

*Conservation* is the schema that allows us to perceive that the total amount of a substance, such as water or plasticene, does not alter as it is transformed in shape: the amount is conserved.

## Aim

The fact that a quantity of water remains the same when you pour it from one container to another seems pretty obvious to us, but it is not at all certain for many seven-year-olds. The aim of this activity is to help pupils to develop a schema of *Conservation*, so that they understand that the *amount* of many substances stays the same, even when their *shape* or *place* has been changed.

## Activity 7.1: Conservation of Volume

This activity brings the pupils to an understanding that a volume of water remains the same when it 'changes shape' (i.e. when it is poured from a short fat measuring jug into a tall thin glass, for instance). This requires considerable mental processing. Because, as adults, we have been taking this schema for granted for such a long time, we find it hard to understand how difficult it is for some pupils.

## Conservation Activity 7.1

Conservation  
of Volume

## Aim

The pupils will think about how to measure the volume of liquids (water). They will be challenged to consider what happens to the volume of water when it is poured from a tall, thin container into a short, fat one. If they can conserve volume, then they should be able to compensate the depth for the width; however, many seven- and eight-year-old pupils may still not be working at this level. The pupils will then be asked to add 100ml of water to another 100ml of water and compare this with 100ml of *sand* being added to 100ml water.

## Materials

## Not supplied

- ◆ For each group: a measuring beaker containing 100ml of water, and a clear plastic cup. Greater cognitive conflict can be generated if the measuring beakers vary in shape.
- ◆ A piece of string for concrete preparation, for your own use.
- ◆ Some more water, in a large jug, from which you will need to pour out the further 100ml, per group, needed later on in the session.
- ◆ A beaker containing 100ml of sand, to help initiate discussion at the end of the lesson.

## Before you start

It is helpful to pour 100ml of water into each group's measuring beaker before the start of the lesson.

## Activity

## Concrete preparation

- ◆ Give each group a beaker containing 100 ml of water. Make it clear that this is **not** drinking water.
- ◆ **How much water is in your beaker?** Move around the groups. Ensure that the pupils understand how to use a measuring beaker and how to read off the volume. Encourage each person in the group to observe and measure the amount of water. This will help those who may not be clear about how to measure volume.

### *Cognitive conflict and social construction: Part 1 (Groups)*

- ◆ Generate class discussion about how to use a measuring beaker, volume and units.
- ◆ **How much water is in your beaker? Explain what you did to find out. Are you all sure? Does anybody think anything different?** Establish that each group has 100ml of water.
- ◆ Now ask each group to pour the water carefully from the beaker into the plastic cup. **How much water is in your cup?** After a few minutes, ask some groups to explain and demonstrate how they went about finding the answer to this question. **How did you find out?** Some pupils will not make use of the information that they have just acquired and will try to find a way of measuring the volume of water in the cup. Many will use the measuring beaker as a ruler, aligning the plastic cup against the gradations on the beaker. Because of the difference in dimensions between the cup and the beaker, they will obtain a different measurement from 100ml and will be convinced that this new measurement is the correct one.

### *Cognitive conflict and social construction: Part 2*

- ◆ **Who disagrees with that answer? Why?** This will cause a lot of cognitive conflict amongst the groups, especially between those who can conserve and those who cannot.
- ◆ **Why don't we all agree? Why do you think there is 100ml? Do you agree? Can you explain how you found out how much water there is in the cup?** If some are still confused, try using an analogy. **If you had a carton of orange juice in your lunchbox and I opened it and poured it all into a glass for you, would you have more or less orange juice? Would it make a difference?**
- ◆ **How could you check how much water there is in the cup? What could you do?** Ask them to carefully pour the water back into the beaker, read off the volume and then pour it back into the cup. However, for those pupils who are not yet ready to conserve, even this action will not change their minds. Do not push them to accept the schema of *Conservation* if they are not yet ready to.

### *Metacognition*

**When you poured the water from the beaker into the cup, what did you have to do?** Quickly recap on events during this activity. **Who can explain why some groups thought that the volume had changed? Were you surprised by what happened?** These questions can challenge those who understand *Conservation* to explain it to those who do not.

### *Cognitive conflict and social construction: Part 3*

- ◆ Now show the pupils one measuring beaker containing 100ml of sand and another containing 100ml of water. **If I poured this sand into the water, what would the total volume be? How many ml of the mixture would I have? Why?** Encourage them to discuss this in their groups and then share their ideas with the whole class.
- ◆ Then pour the sand into the water or, if you have enough materials, ask the pupils to do this in their groups. **What is the total volume? Who is surprised by the result? Why do you think this has happened?** Encourage the pupils to provide an explanation for why 100ml of water plus 100ml of sand does *not* make 200ml.

### *Metacognition (Groups or whole class)*

**What happened when I poured the sand into the water? Who was surprised? Why?** Encourage the pupils to recall this stage of the activity. **Why was it helpful to discuss your ideas with other people? Can you remember when someone said something that helped you to move your thinking forward?** This is a good opportunity for the pupils to reflect on how social construction and observation may have helped them to develop their thinking.