Estimating Metric Volumes

Overview

This is a practical activity which uses estimation of the volume of household containers to introduce and/or reinforce the concept of volume, the units used to measure it and the relationship between them. It also allows students to examine the effectiveness and purpose of the different shapes used for packaging common supermarket items.

Skills and Knowledge

- Estimating volumes
- Measuring volume
- Units of volume
- Meaning of metric prefixes
- Converting between units
- Language of volume

Preparation and Materials

- Photocopy Activity Sheet (1 per volume set for each small group)
- Prepare volume sets as described below
- Make a copy of the answers for each set, as described below
- Measuring jugs and cups of assorted sizes (optional)
- A handful of small MAB Blocks (optional)
- A large MAB block (optional)

Making the volume kits

Collect a range of empty household containers and bottles of varying volumes and shapes, in large, medium and small size sets (5 – 7 in each set). For example:

- Large: large drink bottles, ice-cream and juice containers or casks, oil bottles and tins …
- Medium: shampoo or detergent bottles, milk cartons, smaller drink bottles, jam jars …
- Small: medicine or perfume bottles, teaspoon, tablespoon, medicine glass, vanilla essence …

Include some items that are misleading shapes, such as tall thin bottles and short fat containers of similar volume. It is good to include items of varying shape but equal volume if possible (see graphic on page 4).

1 set per 4-5 students is ideal, but for larger groups the activity can be done in conjunction with other problem solving or estimation activities, so that you do not have to collect too many containers at one time.

For each set, Label the containers A, B, C etc., record the volume of each container on an answer sheet, and then cover it on the container so that students cannot read the volume from the label (check the bottom of the container also).

One way to collect these is to ask students to bring them in (well in advance). This ensures a range of products and also some familiarity with the

If you store the sets in a well labelled box (preferably with a lid) that cleaners will not mistake for rubbish it can be re-used many times with different groups of students.

Suggested Procedure

Arrange students into small groups at a table or flat surface – leave space between the groups.

Give each group one volume set and a copy of the Activity Sheet. Point out that each container is labelled with a different letter.

Introducing the activity

Explain:

- *This is an estimation task.*
- *You are not expected to know exact answers, it is about using what you do know about to see how close you can get.*
- *It will work best if you work together as a group and share your knowledge.*

Arranging them in order

- *Your first task is to try and arrange the containers from smallest to biggest.*
- *Next write the letter labels on the answer sheet in that order.*
- *If you think some have the same volume then put a circle around the letters.*

Estimating the volumes

- *The second task is to estimate the volume of each of the containers and write that into the estimate column on the sheet.*

Comparing the actual volumes

When groups have decided on their estimates there are two alternatives for continuing the activity.

1. For students who need practice at reading volumes from measuring equipment, get them to fill the containers (where possible) to the level that they would normally be filled in the shop, using water or a dry substance such as rice or lentils, and measure the volumes using the appropriate equipment.

2. Give the group a copy of the prepared set of answers.

Ask:

- *Fill in the correct volumes in the last column on your sheets.*
- *If you notice any surprises or differences from what you estimated discuss why they might have happened.*

Example

Label	Description	Estimated volume	Actual volume
A	*Honey*	*300 ml*	*250 ml*
D	*Shampoo bottle*	*250 ml*	*250 ml*

Writing a group response (optional)

It can be valuable to extend students' thinking from the particular instance to the 'big idea' or general principle, by encouraging them to reflect on what they learned about or discussed during the activity.

One way to encourage reflection is to ask them to decide together how they could respond to a prompt or question, such as:

- *One of the most surprising things about this set of containers was:*
- *During this activity we discovered:*
- *Which containers caused the most discussion? .... Why?*
- *Have any of your ideas about volumes of containers changed during this activity?*

It will also help their use of numeracy language if you circulate and assist them to put their ideas into words, or brainstorm suitable vocabulary, such as 'volume', 'capacity', 'height', 'base', 'diameter'.

Estimating other sets

Ask students to shuffle the containers on their table before moving on to repeat the procedure for another set.

Depending on concentration spans, students can try one, two or three sets. It is best if each group can try at least one easy set (familiar larger containers) and one more challenging set, either smaller or less familiar containers.

Debriefing the activity

Discuss students' observations about shapes, sizes and thickness of containers and the differences they make in our perceptions of capacity when we are shopping. For example, tall thin cylindrical containers used in some more expensive products, like shampoo, liqueurs and more expensive ice cream, look as if they have greater capacity than short squat containers. This can be quite deceptive if the actual volumes are compared. For example the illustration shows two containers with equal capacity.

Estimating metric volumes

Activity Sheet

Label	Description	Estimated volume	Actual volume