

Unit 2

A whole-school approach to numeracy across the curriculum

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Objectives

- To consider one school's approach to numeracy across the curriculum
- To introduce activities to develop oral communication skills
- To discuss whether similar activities could be used in other subjects when mathematical skills are required
- To explore possible areas for inter-departmental cooperation in this type of activity

Suggested use and organisation

- All schools except those which have already established policies on numeracy across the curriculum; whole-staff meeting.
- Staff should sit around tables in departmental groups; where possible there should be a member of the mathematics department with each group.

Resources

- OHTs 2.0–2.4
- Handouts 2.1 (one each), 2.2 (one copy per group, printed on thin card and cut up to produce sets of seven cards), 1.4 (participants should bring their own copies)
- *Framework for teaching mathematics: Years 7, 8 and 9* (one copy per group)
- *Numeracy across the curriculum objectives* (one copy per group)
- Supply of coloured cubes (yellow, black, red, green, orange, blue)
- Counting stick (optional)
- Video sequence 2, 'Managing numeracy across the curriculum'

Session outline

75 minutes

Introduction and case study Considering the need to raise standards in numeracy	Video, group discussion	30 minutes
Developing oral communication skills Modelling activities that encourage discussion and that could be used in other subjects	Talk, group discussion	35 minutes
Conclusion Deciding on cross-curricular activities which encourage discussion of mathematics involved in other subjects	Talk, group discussion	10 minutes

Outline the session's objectives, using **OHT 2.0**.

OHT 2.0

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Introduce the school featured in video sequence 2.

Staff at John Masefield School in Ledbury have developed a whole-school approach to numeracy across the curriculum and made it the main school priority for the year. Their initiatives have included:

- running a whole-school INSET day on numeracy;
- surveying pupils and staff about the mathematics in other subjects;
- setting up a staff numeracy committee to coordinate activities;
- choosing a mathematical topic for each term, as the focus of activities across the curriculum.

Show **video sequence 2**, 'Managing numeracy across the curriculum', which lasts about 12 minutes. Ask groups, while they are watching the video, to consider the questions on **OHT 2.1**.

OHT 2.1

Managing numeracy across the curriculum

- Which aspects of the work done in Ledbury on numeracy across the curriculum could be developed in our school?
- Are there any other activities that might help to raise standards of numeracy across our school?
- How can we maintain a focus on numeracy skills?

Allow about 10 minutes for discussion of the video before taking brief feedback from groups.

The discussion on the video in the modern languages department confirms that their use of mathematics is not restricted to basic arithmetic. This may be true of a number of departments in the school.

An issue raised in the video is the timing of teaching topics in mathematics and their use in other subjects. Introduce the leaflet *Numeracy across the curriculum objectives*. This specifies the timing of topics in the Key Stage 3 mathematics curriculum. The matching of expectations between mathematics and other subjects is the focus of unit 9.

Developing oral communication skills

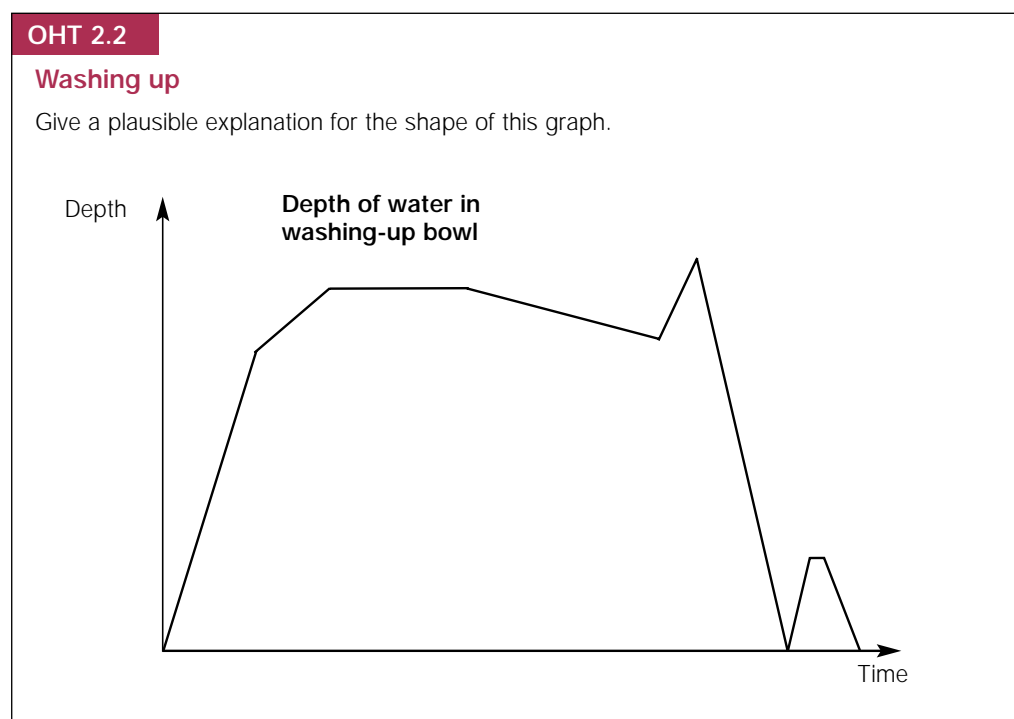
35 minutes

It is clear from the work in primary schools that encouraging interaction in oral and mental work develops pupils' reasoning skills, builds confidence and improves communication skills. This approach can be extended to other topics in mathematics, providing opportunities for interaction where previously activities might have been attempted without discussion.

Explain that in this section teachers will be able to try out three mathematical activities which could be adapted for their own subjects.

Activity A Washing up

Show **OHT 2.2**. Ask participants to discuss the problem and to arrive at a group solution.



Allow a few minutes for groups to discuss this before asking for examples of solutions.

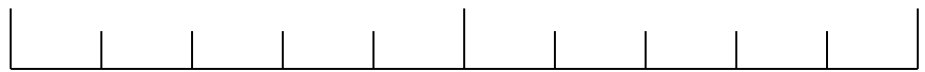
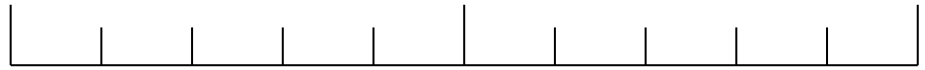
Activity B Reading scales

Everyone reads scales in everyday life – thermometers, tape measures or speedometers for example. Yet this is an area of mathematics which pupils often find difficult to transfer to other subjects.

The following activity could be used in mathematics and in other lessons. Use either an unlabelled counting stick or one of the scales from **OHT 2.3**.

OHT 2.3

Scales



Label the ends of the scale as 0 and 1:



Indicate the intermediate points on the scale (such as 0.8, 0.32, 0.05, etc.), asking participants to tell you the reading on the scale and how they worked it out.

Ask for volunteers to point to specific places on the scale.

Next, change the end points on the scale to, say, 40 and 45 or 0.3 and 0.4 and repeat the activity, sometimes with the scale positioned vertically.

Finally, suggest that using this activity whenever pupils start to read scales – whether in mathematics or in other subjects – might help more pupils to transfer the skill from subject to subject.

Activity C Solving problems

The final activity is designed to focus on the benefits of cooperative problem solving. Pupils often find solving logical word problems difficult, especially if they are asked to do it individually.

Distribute a copy of **handout 2.1**, 'Brainteaser 1', to each participant and ask them to attempt the problem without discussing it with anyone. Allow a few minutes for everyone to try to find a solution. (Answer: Brian scored 2, David 3, Simon 5, Rachel 6 and Julie 8.)

Now suggest they attempt a similar type of problem, this time in groups. Distribute one copy per group of **handout 2.2**, 'Brainteaser 2' (preferably copied on to thin card and cut into seven cards). Each group should also be given some **coloured cubes** to help with the problem.

Each group should divide the seven cards so that everyone in the group has at least one. Six of the cards each contain a clue to solving the problem given on the seventh card. Each person must share the information on their card(s) with the rest of the group but should not show the card(s) to anyone else – this is to ensure everyone takes part in the discussion.

Allow the groups a few minutes to solve the problem (answer: black, red, orange, green, blue, yellow, or vice versa) before asking them how this experience differed from solving the problem on their own.

The following points are worth raising if they are not brought out in the feedback.

Those taking part in group problem solving:

- help each other to understand the problem and identify key words;
- are more likely to use practical methods so that everyone can participate;
- gain confidence in reasoning, by sharing decisions with others;
- are more likely to reject redundant or superfluous information, for the same reason;
- are more likely to check that their solution makes sense and is correct.

Conclusion

10 minutes

Conclude the session by asking groups to discuss the questions on **OHT 2.4**.

OHT 2.4

Discussion points

Consider the activities modelled in this session.

- Do you use (or might you use) similar approaches to graphical interpretation or reading scales in your own subject?
- Could your own subject benefit from the group problem-solving approach?
- Are there any examples you could offer the mathematics department, to benefit both subjects?

Take feedback from participants and ask for any similar examples of collaborative activities which could be included on their copies of **handout 1.4**, 'Priorities for cross-curricular numeracy'.

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Key Stage 3 *National Strategy*

OHT 2.1

Managing numeracy across the curriculum

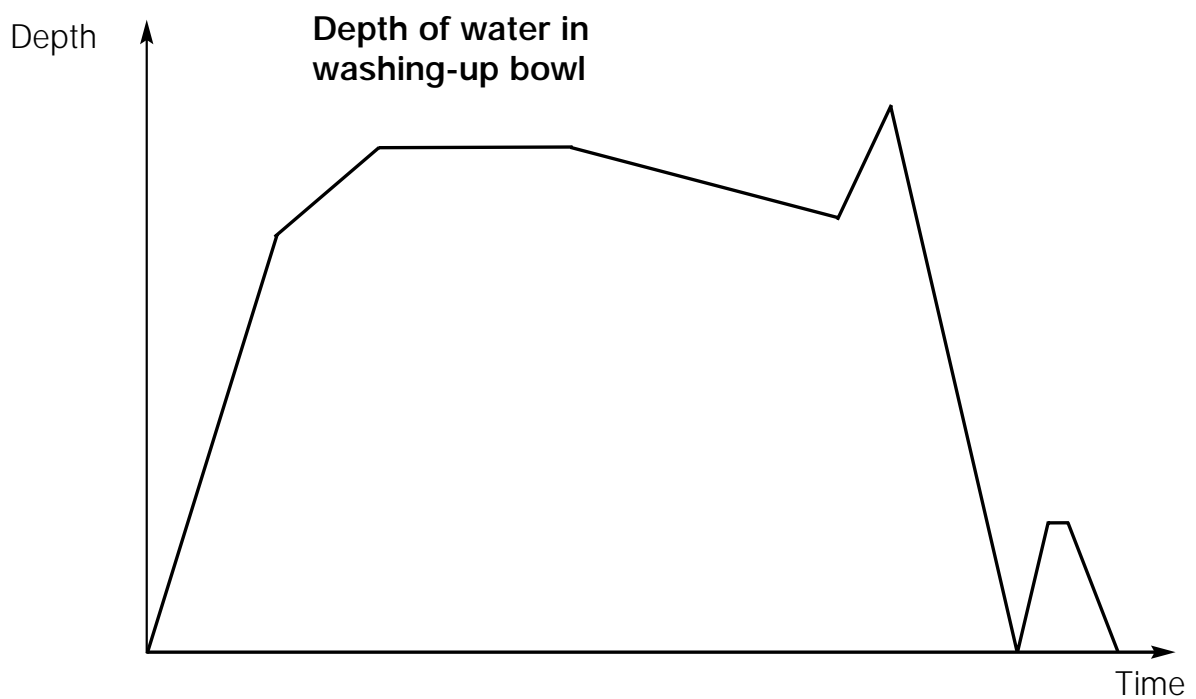
- Which aspects of the work done in Ledbury on numeracy across the curriculum could be developed in our school?
- Are there any other activities that might help to raise standards of numeracy across our school?
- How can we maintain a focus on numeracy skills?

Key Stage 3 *National Strategy*

OHT 2.2

Washing up

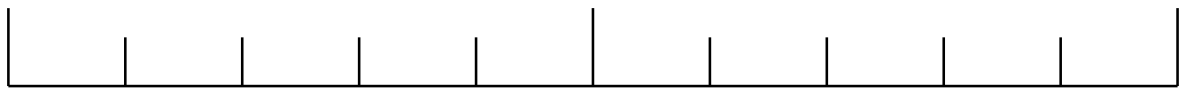
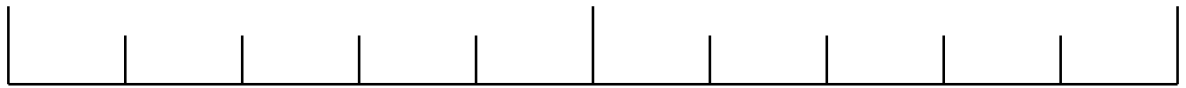
Give a plausible explanation for the shape of this graph.



Key Stage 3 *National Strategy*

OHT 2.3

Scales



Key Stage 3 *National Strategy*

OHT 2.4

Discussion points

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Key Stage 3 *National Strategy*

Brainteaser 1

Solve the following brainteaser, without discussing it.

In a mathematics test, no two pupils scored the same. Brian scored less than 4 and Julie scored more than 6, but did not get full marks. Simon's score was the sum of Brian's and David's. Rachel scored three times as many as Brian. Brian, Julie and Rachel all scored even numbers, while Simon's and David's scores were both odd. David's score was half of Rachel's.

What did each pupil score out of 10?

Handout 2.2

Brainteaser 2

Copy this on to thin card and cut it into seven cards. Each group needs one set.

The problem

Make the row of six cubes

The green cube is between the orange cube and the yellow cube

The blue cube is between the green cube and the yellow cube

The red cube is between the black cube and the green cube

The yellow and the black cubes are not between any cubes

The orange cube is between the green cube and the red cube

Every cube is a different colour from the others

