Theme: Education & Communication

Job: Tim Gadd, Key Stage 3 Teacher, St George’s Primary School

Activity outline

Having watched the video featuring Tim, a primary school teacher, pupils design their own 45 minute primary science lesson. Pupils choose from one of four topics for their lesson:

- How to tell the difference between metals and plastics
- Ways to separate various mixtures of two substances
- Why the moon appears to change shape over a month
- Identifying creatures found in pond water

They design four simple experiments. You are likely to need two lessons for pupils to plan, write and test their experiments. A third lesson may be needed for pupils to make modifications or to trial each other’s experiments. It is suggested that pupils work in groups of four.

Because pupils are designing their own experiments, you will need to leave sufficient time between the planning and carrying out of their experiments to allow your technician to source equipment, or for pupils to bring ‘everyday’ items from home.

The pupil sheet provides step-by-step instructions.

This would make an interesting activity for a new class at the start of the academic year, to see what they have learnt at primary school before building on this in secondary school.

Teacher notes overview

1. **Curriculum links**: where this activity can fit with the 2008 KS3 Programme of Study and Scottish 5-14 Science Curriculum.

2. **The Video**: providing a synopsis of the video content and ideas for viewing.

3. **The Practical**: including Equipment lists, Health and safety notes, a Possible approach (a comprehensive, suggested way of planning the lessons) and an Underlying science section (providing detailed information about the various scientific principles involved).

4. **Possible extensions**: suggestions for other practical activities using the video, or extending the suggested activity.

5. **Associated jobs**: guidance on how to deliver a plenary activity (or, if you wish, a stand-alone activity) focusing on the video interviewee, including a photo of the interviewee to place at the centre of a spider diagram.

There is also a blank ‘science lesson worksheet’ template available with this resource which you can photocopy for pupils to complete.
This lesson can be used to help teach part of the 2008 Key Stage 3 Programme of Study (England and Wales):

<table>
<thead>
<tr>
<th>Range and Content:</th>
<th>Key Processes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.2c, 3.3d, 3.4b</td>
<td>2.1a-c, 2.2b, 2.3a</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Attainment Targets:</th>
<th>Curriculum Opportunities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT1, AT2, AT4</td>
<td>4a, c, e</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key Concepts:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1b, 1.4a</td>
</tr>
</tbody>
</table>

This lesson can be used to help teach part of the Scottish 5-14 Science Curriculum:

**Main curricular links**
- E&F1 Properties and uses of energy
- E&S3 Changing materials
- E&S1 Earth in Space
- LT&PL1 Variety & characteristic features

**Attainment Targets**

**Knowledge & understanding:**

**Topic A**
- Level C
  - Construct simple battery operated circuits, identifying the main components; and
  - Classify materials as conductors or insulators...

**Topic B**
- Level C
  - Describe changes when materials are mixed
  - Describe how solids of different sizes may be separated

**Topic C**
- Level E
  - Explain day, month and year in terms of the relative motion of the Sun, the Earth and the Moon.

**Topic D**
- Level B
  - Give some of the more obvious distinguishing features of the major invertebrate groups.
  - Name some common members of the invertebrate groups
- Level C
  - Name some common members of vertebrate groups
  - Name some common animals and plants using simple keys

**Investigating skills:**

**Level C**
- Suggest a question for exploration and decide how they might find an answer
- Select and use appropriate measurement devices or make appropriate observations

**Level D**
- Make an organised report on an investigation using appropriate illustrations
- Identify limitations of the approach used

**Level E**
- Suggest improvements to the approach used
Watching the video

There are a number of things you might do before showing the video to your class.

1. Preview the video and write a few quick-fire questions. Then you can tell your class that they will be tested on their observation when it’s finished. This is an excellent way of encouraging them to pay attention!

2. Ask pupils to watch the video through once. Then ask them to generate one question that could be answered from the video and one question they would like to ask but the video did not answer. These questions are then exchanged with another pupil and the video is watched a second time. This gives pupils an opportunity to focus on something they may have missed first time, and provides a basis for discussion on what was learnt from the video, and what additional information is needed.

3. Ask pupils what sort of person might become a teacher. Does anyone in the class think they’d like to work with children? When the video has been watched, ask the questions again. Has anyone changed their mind/opinions?

4. Ask pupils to spot the science in the clip.

Synopsis of the video

Among other things, Tim makes these interesting points:

- Subject knowledge is key when teaching, and primary school teachers have to teach all subjects
- It’s important to make science lessons as ‘hands on’ as possible.
- It helps if science lessons are linked to pupils’ everyday life and experiences.
- Science is considered a core subject, along with maths, English and ICT.
Pupils decide what experiments they intend to perform, and produce their own equipment lists via the teacher. Likely requests include:

- **for A**: balance, magnet, battery, bulb and wires
- **for B**: beaker, glass rod, filter funnel and papers, magnet (heat sources should be avoided)
- **for C**: darkened corner/room, ball, torch or lamp
- **for D**: beaker, Petri dish, hand lens or microscope, pond life identification keys

### Health and safety

- Pupils’ suggested experiments and equipment lists must be risk assessed and approved (or otherwise) by the teacher.
- In particular, plastics must not be tested by burning in an open classroom.
- Suggestions should also be checked for suitability and feasibility for use by a class of 10-year-olds. Guidance on primary science safety can be found in *Be Safe! Health and Safety in Primary School Science and Technology*, ASE, 3rd Edition 2001.
- This activity may be a good opportunity to introduce writing risk assessments using Hazcards.

### Possible approach

The objective is to get pupils to appreciate:

- that even non-specialist primary teachers need to understand basic principles across all the sciences
- the purpose behind science lessons
- the importance of ensuring that experiments are tried and tested.

The practical activity will require some advance preparation by pupils. You might begin by asking them to recall their primary level science, and how the four topics (A to D in the pupils’ worksheet) were presented and related to everyday life. This should provide a selection of ideas to work from.
The challenge is for them to plan, and try out, a set of four short experiments to be carried out by a group of three 10-year-olds with limited facilities and equipment:

- three experiments for the primary pupils to perform individually – one per pupil
- one group exercise

It is suggested that your pupils work in groups of four, each member focusing on developing one experiment. However, they must work as a team to discuss ideas, ensure that the experiments have clear links, and decide who does what.

They should choose their topic (A to D), come up with preliminary ideas, and draw up equipment lists for vetting by the teacher.

In the next lesson they can try out their ideas – or teacher-modified versions thereof, if necessary. Having tried out the experiments, and (hopefully) overcome initial problems, they produce a set of instructions for 10-year-old pupils to follow.

You may wish to provide them a template for their instructions. An example is attached.

The Pupils’ Worksheet instructs them to re-test their experiments after modifying them in the light of problems met. If you are short of time, you may wish to limit this ‘refinement’ stage.

**Underlying science**

Pupils will need to recall and apply what they learned about their chosen topic at primary school, and also knowledge and practical skills acquired more recently. Details depend on which topic they choose, and the experiments they devise. They are likely to include:

- **A** characteristic properties of materials; simple qualitative testing of properties
- **B** physical separation and recovery methods, such as dissolution, filtration and evaporation/crystallisation
- **C** light and shadow; lunar motion
- **D** observation under low magnification; use of keys; distinctive/identifying features of organisms.
possible extensions

1 Test-driving the experiments
   If time allows, it could be instructive to allow groups to swap experiments, and ‘test-drive’ each other’s.

2 Relevance
   Discuss whether pupils think that the experiments they developed are relevant to 10-year-olds – if so why, if not why not.

3 Interest levels
   Get pupils to discuss what makes for an interesting science lesson.

associated jobs

A STEM (Science, Technology, Engineering and Maths) education provides pupils with skills and knowledge that are useful in all sorts of careers. The video demonstrates how Tim, a Key Stage 3 Primary School Teacher, uses such skills on a daily basis.

Tim works with numerous people – some directly, some indirectly. Some use STEM skills, others don’t. By exploring this network of associated jobs, pupils will, hopefully, begin to see that even those in non-STEM jobs will find STEM skills useful – if they’re communicating with someone “in-STEM”, for example, some knowledge of their work will be a great help.

Tim’s spider diagram

Try placing Tim at the centre of a spider diagram (we’ve provided a photo of Tim which you could use – see overleaf). You could either create worksheets for pupils to complete themselves, or create the diagram on your whiteboard and then pool ideas.

Ask pupils: “who does Tim work with”. They may draw information from the video – we see other teachers and classroom assistants – or they may come up with new ideas, such as the school nurse, special needs assistants or kitchen staff. Other, less obvious, suggestions might include Ofsted inspectors or educational psychologists.

Now ask pupils which of those jobs are clearly “in-STEM”. Who else might find some STEM skills helpful? Why?

You could extend this by taking any one of the associated jobs and placing them at the centre of a spider diagram, and starting the process again.
Studying science and maths can transform your career options. Future Morph: become someone.