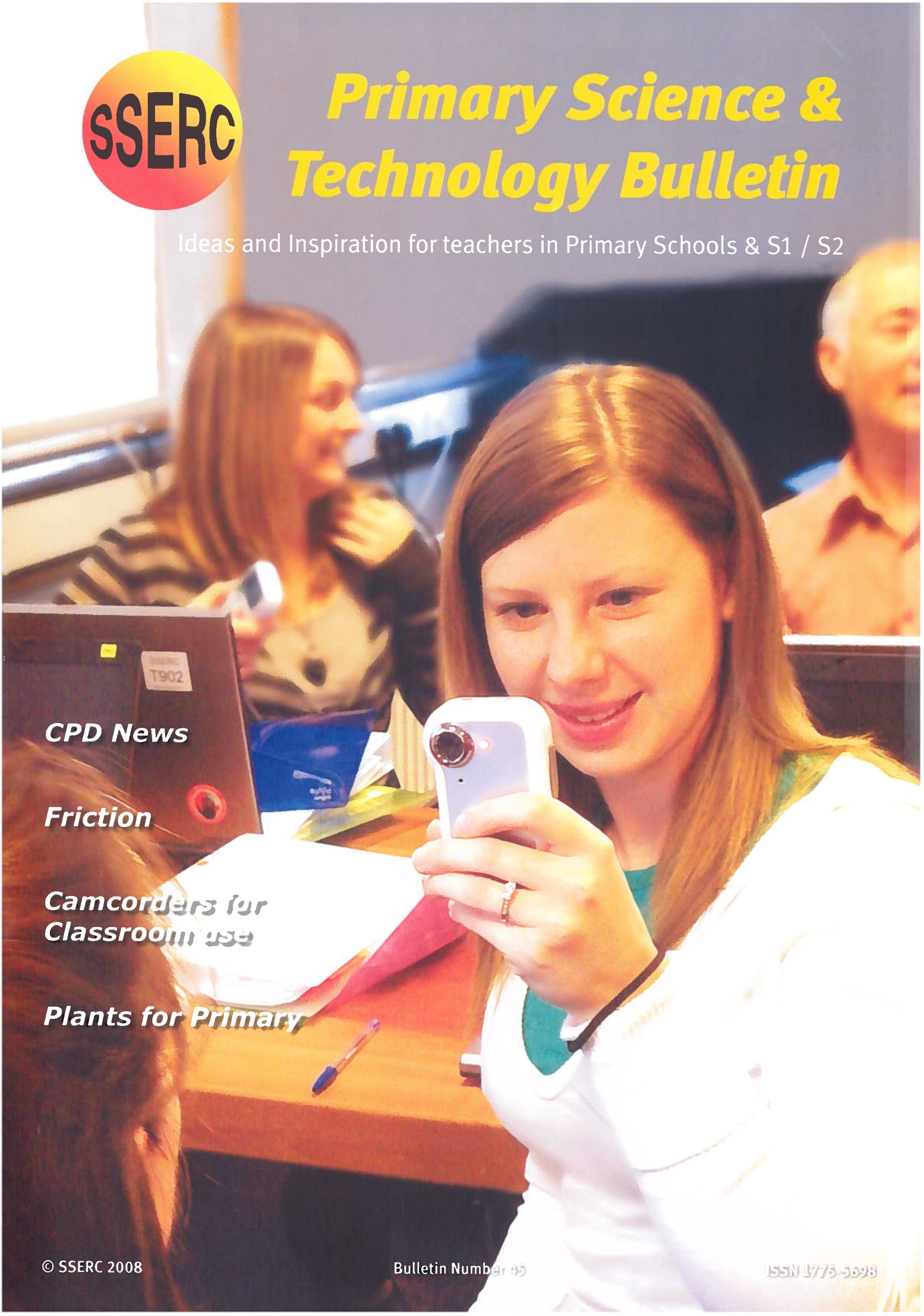
Primary Science & Technology Bulletin

Ideas and Inspiration for teachers in Primary Schools & S1 / S2



CPD News

Friction

Camcorders for Classroom use

Plants for Primary

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SSERC is delighted to once again be able to offer ***Bridging the Gap*** courses to support implementation of ***Curriculum for Excellence*** in the sciences. These two-part courses will follow a similar programme to those run in 2007–2008. The photographs and quotes below highlight some of the activities that were used and provide a flavour of the courses.

Activities to use in the classroom

Topical Science: **engaging pupils in open-ended activities that enable them to investigate everyday or topical science issues and questions.**

Investigating sound: *a variety of activities using simple resources to take back to the classroom*

Activities to promote discussion around scientific issues

Puppets to encourage pupils to talk about science

Resources to take back to the classroom All delegates received equipment and resources to take back to their schools.
Digital video cameras: and a workshop on how to edit!

Some recent quotes

'This has been by far the most inspiring and valuable course I have attended.'

'Thank you very much for all the obvious hard work that has gone into this to make it so great'

'You have great facilities, great resources and, most of all, great people!'

For further information about courses in primary science,
visit: http://www.sserc.org.uk/public/CPD/2008-9/BTG.htm

Forces & Motion: **Second**

By carrying out investigations into friction I can explain how it affects movement, and can use my understanding of friction to design or improve a product.

SCN 222L

Who Says Friction's a Drag?

Children are often aware of friction because it is one of the forces that can slow or even stop moving things. Weel kent investigations are based on moving objects down a ramp [1].

As an alternative investigation try this:

You've got a horizontal pole and set of masses tied to one end of a length of string. How can you suspend the masses plus string on the pole without tying a knot? The masses have weight because the force of gravity is acting downwards on them. See if any of the children come up with the solution in Figure 1. What force is holding the weight on the bar and opposing the downward force of gravity? Friction.

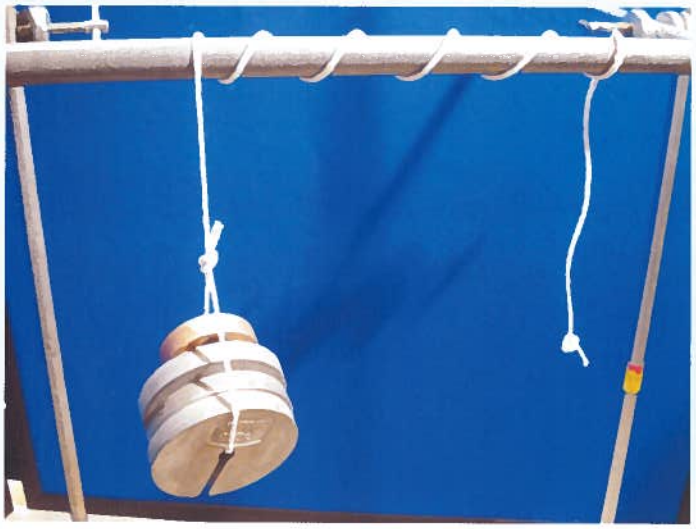

Figure 1 – Using friction to hold things up

Where can we see this method of tethering in action? Watch a cowboy film – this is how they secured their horses outside the saloon – no need for a knot! Ever done abseiling or mountaineering? Check out the ways they use for getting down, and up, ropes. We can't go abseiling in class or bring in a horse, but the simple apparatus in Figure 1 lends itself to the investigation of a range of variables.

Possible variables to change in your investigation include:

Number of turns of the string round the bar • Type of string • Thickness of the string

Diameter of the supporting bar • Material the supporting bar is made from

Some schools will be able to borrow the clamp stands shown in Figure 1 from their local secondary. If you can't, you should have something in your technology box that you can use, for example, G-clamps.

Example investigation

Investigate how the diameter of the bar affects the weight which can be held.

Vary: Diameter of bar

Measure: Maximum weight that can be held

Keep all the other variables the same throughout the experiment. Wooden dowelling of various diameters can be used as the bars. Draw up a table to record your findings.

Diameter of bar (mm)	*Weight supported (g)*

Note that if you have already taught the difference between weight and mass, you should refer to the "Mass Supported (g)".

Look at Figure 2. A small weight seems to be able to support a larger one. This principle can be extended to a tug-o'-war – in a contest where the rope is straight a teacher would have little chance against 3 or 4 pupils but loop the rope round a tree (or strong, fixed pole) and the odds change! Alternatively, this principle can be used to move objects which are heavy – an example being capstans (Figure 3). A capstan is used mainly on ships to lift heavy loads. Originally worked manually, electric versions are now available but they both work by winding rope around a drum.

Figure 3 - Capstan wheel

Figure 2 - A small weight supports a larger one

For other friction related activities on the new **www.science3-18.org** website see:
http://www.science3-18.org/index.php?option=com_content&view=category&layout=blog&id=135&Itemid=181

Reference

[1] - **http://www.bbc.co.uk/schools/ks2bitesize/science/activities/friction.shtml**

Some ideas in this article come from an article by Iain MacInnes & Stuart Smith, *Frictional wrap and the exponential function*, School Science Review, December 2006, No. 88, p11.

Technologies: Promotion of the development of skills in ICT

Camcorders for Classroom Use

If you were inspired by the article on *Digital Video in the Primary Science Class* (Primary Bulletin 41) but felt that the cameras looked too complicated or fragile, two new models may be of interest. The first is the *Busbi* (Figure 1).

Figure 1 - Busbi Camcorder

Figure 2 - Only four buttons - even an adult could use it

Technologies: Early

I capture and present my world and experiences by taking photographs, or recording sound and moving images.

TCH 008G

Technologies: First

I can create, capture and manipulate sounds, text and images to communicate experiences, ideas and information in creative and engaging ways.

TCH 111G / TCH 212G

This is a very basic camera, and is all the better for being so. It has only four buttons (Figure 2): *On, Record, Playback and Delete.*

Figure 3 - Take me to your leader. The TTS Tuff-Cam

It has no zoom and cannot take still pictures. The Playback and Delete buttons only allow you to view or remove the last clip but all movies can be accessed by hooking the camcorder up to a computer. Unless your PC has an old version of Windows, the Busbi will behave just like a pen drive when you link it via a USB socket. It comes complete with an SD memory card that can store an hour of video. The quality of the clips is surprisingly good. Colour, in particular, was better than on some of the more expensive cameras we have tried. We also failed to find a computer that would not play the Busbi movies - we tried PCs, Macs and our new *ASUS EEE*. The camcorder uses two AA batteries. SSERC staff liked the Busbi so much that we bought them for the delegates on our latest round of CfE CPD courses.

If an alien spaceship lands outside your school, it is probably best not to film the event using a *TTS Tuff-Cam* (Figure 3) as it looks rather like a ray gun. It has a pistol grip and large, clearly-labelled buttons that could be operated even when wearing gloves.

The Tuff-Cam has more features than the Busbi. It can take still pictures, and has a digital zoom, a flash and a threaded socket for a tripod. Tuff-Cams have a menu button that allows the resolution (level of detail) of the video to be altered and lets the user step through all film clips, viewing or deleting them. It has 64 megabytes of memory built in. This is only enough for a few minutes of filming but there is a slot for a memory card to increase this dramatically. Like those from the Busbi, clips played on all the computers that we tried. The guide that comes with the Tuff-Cam states that rechargeable batteries should not be used. Instead, it recommends Energizer Lithium batteries. These have a long life, though they are more expensive to buy than ordinary alkaline batteries. We contacted the company to ask why they were against the use of rechargeables. These batteries will not harm the Tuff-Cam but TTS say that they run down quite quickly in the unit. We think that a school with a number of Tuff-Cams may still decide that rechargeable batteries represent the most cost-effective solution.

The cameras came with CDs but we found that no installation was needed to simply copy clips for viewing on a computer. At its best quality, video from the Tuff-Cam is slightly better than that taken on the Busbi. We think that pupils will love its looks. It is easy to hold, thanks to the pistol grip, though the trigger has to be held in for filming. At the time of writing, the Busbi can be bought for around £40 [1] including VAT. The Tuff-Cam [2] is nearly twice as expensive. We wouldn't pay the extra money just to get the stills feature as the quality was not that good, but potential buyers may feel that the camera's design and its other features justify its cost. Both cameras are easy to use, even for those who don't consider themselves to be computer experts. They feel tough enough for the primary classroom, where they have the potential to add another fun dimension to science and ICT.

References

[1] www.busbi.biz [2] www.tts-group.co.uk

Plants for Primary Pupils

For some years Science and Plants for Schools (SAPS) has been producing, in collaboration with the Field Studies Council (FSC), a series of booklets - *Plants for primary pupils*. The final title in the series *(Plants in their natural environment)* is currently being prepared with publication scheduled for the early part of 2009.

All of the booklets are available as free downloads from the SAPS website [2] or purchased from FSC publications [3]. Additional supporting material is given on the website including:

- Full-sized templates of drawings of parts of a plant, of cards for card games
- Two PowerPoint presentations, one illustrating pollination, and the second explores some of the stories about plants and their names.

The aim of this article is to give an overview of the series... not just a blow by blow (or booklet by booklet) list of contents, but a bit of an insight into the different threads that have been woven into the different themes that have been tackled - educational and scientific. This might help you see how you can weave different activities into your teaching programme to:-

- Make cross-curricular links with literacy or numeracy
- Find opportunities for developing creativity or role play
- Indulge in a few games that are fun but help to reinforce learning
- Create opportunities for ongoing assessment of a child's achievement.

Figure 1 - Parts of a plant and their functions

Figure 2 - Reproduction and life cycles 1: Parts of a flower

Figure 3 - Reproduction and life cycles 2: Pollination, fertilisation, fruits and seed dispersal

Figure 4 - Living processes and what plants need to grow

Figure 5 - Grouping and classification

The booklets have been produced by a Writing group led by Erica Clark. The Writing group includes primary teachers and others with experience of teaching children in the field or training of teachers. Members of the Writing group have themselves run many workshops, mainly for teachers, using the materials and ideas contained in the booklets. This means that all the activities have been trialled, with children and teachers. The activities are presented in a way that teachers should have enough information to do the activity as well as giving them the confidence to tackle something that may be unfamiliar to them. Some activities draw on the well-tried SAPS film pot, lemonade bottle or other practical techniques - so they are not demanding in terms of resources. Probably the main driving force behind the Writing group responsible for the series is a love of, and interest in, plants and a belief that they can become fascinating to children and provide excellent material for teaching different parts of the curriculum.

Figure 6 - Create a plant for a habitat

The titles show some progression of ideas through the series, but there is not necessarily a hierarchy of difficulty level. For example, the Pupil Sheets are simple in early booklets and allow children to develop more independence later. There are increasing opportunities for use of ICT. Some booklets have activities for mixed ages, denoted as 'younger' or 'older' children. As teachers, you know what is best for your class and how to use the different activities. The Writing team hope the different approaches encourage you to think 'outside the immediate box' and that the activities can be adapted to suit your class and their needs. Above all, it is hoped that you and your pupils will understand more about plants and enjoy doing things with plants.

The following pages just give a splash of ideas, all drawn from the booklets. It is the Writing team's hope they entice you to delve deeper and enjoy using many of the activities in the booklets.

We hope you all have fun with plants . . . after all, they are rather important!

Games

Games in the booklets are often quite short and give a bit of fun, but they can have their serious side. They can be used for starter or plenaries or give a chance for formative assessment. They reinforce understanding and can help get the children involved. Some games, like ***Seeds and chaffinches***, give a chance for the children to let off a bit of steam.

Card games in the early booklets help give ways of learning vocabulary and matching similar items, as words or as pictures. This can lead to links with literacy. Old favourites, such as 'Snakes and ladders' or 'Happy families', find new life as ***Vines and villains*** (the vines are the growing bean plants and the slugs become the villains) or ***Plant Quartet***. Here striking colour photos encourage children to become familiar with some common flower names and while they collect the families, they learn about what plants need to grow successfully. A 'Food chain' game is in the pipeline for the final booklet ***Plants in their natural environment***.

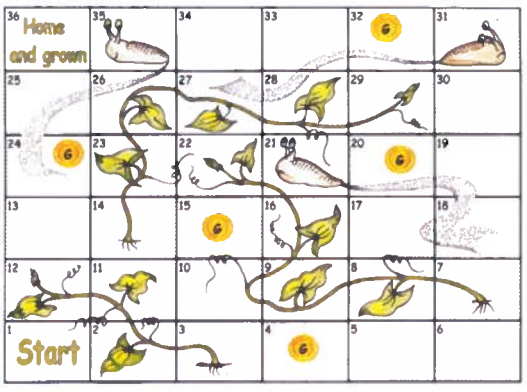

Figure 7 - Vines and Villains

Figure 8 - Games with cards

Figure 9 - Plant quartet

Figure 10 - Seeds and chaffinches

Figure 11 - Design a seed packet

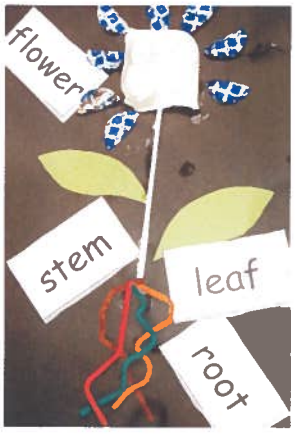

Figure 12 - Create a plant

Figure 13 - Design a seed

Some games are more active and these should help children enjoy learning... for example, about pollination (***The pollination game***) or start thinking about seed dispersal (***The sultana game***) - lots of children like being busy squirrels, especially if there is a reward.

Literacy . . .

Opportunities to develop literacy pervade many of the activities, and often it is difficult to draw a line and say 'this is literacy' and 'this is creativity'. The card games in the early booklets (***Snap, Dominoes, Splat***) help children become familiar with the appropriate vocabulary. There are plenty more opportunities in ***Grouping and classification*** for children to develop vocabulary when trying to describe leaves - first in their own words, then building up a feel for suitable scientific words. There are suggestions for making a poster in the ***Pollination and fertilisation*** challenge, the ***'Design a seed packet'*** activity gives a chance for both literacy and presentation skills and the final booklet promises to have prompts for a debate on a topical issue, such as conservation as applied to a particular area and situation.

Creativity . . .

Primary school classrooms usually are filled with drawings, posters or other products of children's creativity. Perhaps one could add a few more ideas from the booklets? In the earlier booklets, ***Create a plant*** and ***Create a flower*** give opportunities to establish the structure (and function) of different parts of a plant and the vocabulary to use to describe this. As an offshoot from these activities, depending on the materials brought in for this activity, you can have discussions on sustainability and recycling. The later booklets toss in ***'Design a seed'*** or ***'Design a seed packet'*** (both from an imaginary plant 'discovered' on an expedition).

The final booklet promises a ***'Design and make a plant for a particular habitat'*** as a way of linking into adaptations for particular habitats. All give opportunities for creativity in the children, as well as developing skills of presentation, including perhaps telling other children about their discovery. One appealing activity comes in ***'What can you turn <u>your</u> leaf into?'*** On this page we illustrate this with a 'cat and mouse', but children do come up with lovely ideas themselves.

Numeracy . . .

In most of the booklets, there are opportunities for doing something with numbers. In ***Reproduction and life cycles 1: Parts of a flower,*** children learn to dissect a flower and count up the numbers of the different parts, looking for an underlying relationship between the numbers. In ***Living processes and what plants need to grow,*** children find out how fast roots grow and learn to work out a growth rate for their roots (seedlings grown in Petri dishes). They look at whether adding mineral salts affects the growth of radishes - try to find out the best way to measure 'growth' and can give their results in the novel form of a 'radogram' (really a modified bar chart).

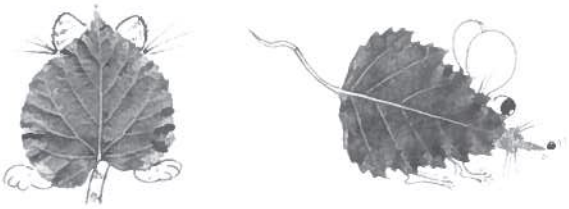

Figure 14 - What can you turn your leaf into?

Figure 15 - Recording colours of flowers

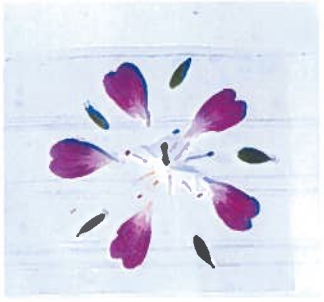

Figure 16 - The parts of a dissected flower

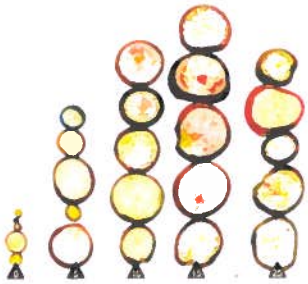

Figure 17 - A 'radogram'

Figure 18 - Which radish has grown better?

Figure 19 - The Planning Plant

Figure 20 - Growing a sugar snap pea

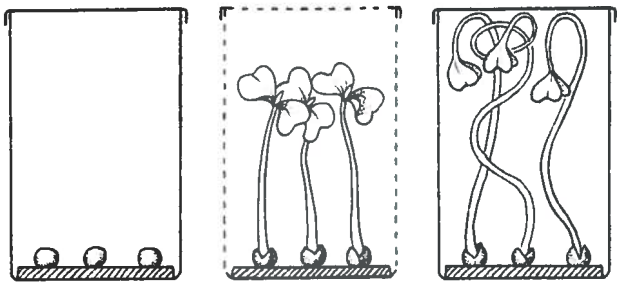

Figure 21 - Using a film can: Do plants need light to grow?

In *Grouping and classification*, children need to make quite accurate measurements when trying to describe leaves or the seeds they are sorting. The final booklet (*Plants in their natural environment*) promises to let children estimate the number of seeds produced by a plant (such as Rosebay willowherb) and wonder what happens to all the seeds that the plant produces. Can you make a guesstimate of the answer? . . . or will you wait for the final booklet and do it systematically with the children (and help them use their numeracy skills)?

Investigations. . .

To many people, doing investigations seems to be the start of doing 'real science'. There are plenty of these in *Living processes and what plants need to grow* . . . do seeds need water to germinate . . . or do they need light? . . . how strong are plants? . . . how fast do roots grow? . . . how does water travel through the plant? With the help of the '*Planning plant*', children (and teachers) are led gently through the steps of an investigation - starting with the questions and what they want to find out, then leading to predictions, what they will do, how they will observe or measure, how to record and present their results and finally evaluate any results or conclusions from the investigation. There are '*Pupil sheets*' to help children record results or observations from investigations, and in the different booklets, these sheets are designed to help children become more independent as they get older, or for teachers to adapt as appropriate for their class.

Even from the first booklet, children have opportunities to grow their own plants using the well-tried techniques of a film pot (as long as film pots last in this digital age) or making observations of seedling growth through the lid of a Petri dish. This gives children the feeling of ownership of 'their' plant and the excitement of watching it grow. Full details are given of techniques that can be used for growing plants - in the classroom and outside - including the special benefits of having a light bank in the classroom.

A section on *Having fun growing plants* comes in *Living processes* and what plants need to grow and this may provide ideas for activities in an after school club or for enthusiasts wanting to do more in the school grounds. This 'having fun' section gives details for growing geraniums (pelargoniums) from cuttings, growing potatoes in a bucket, growing bulbs and corms in a lemonade bottle or establishing a willow arch from pussy willow shoots . . . and lots more ideas to encourage children to get involved with plants both inside the classroom and outside in the school yard (using tubs or pots) or school grounds.

Acknowledgements

a. All drawings by Anne Bebbington and all photographs by John Bebbington FRPS. Thanks to the children of The Cavendish School for making all the models.

b. This article is adapted from one written by Erica Clark and published by SAPS [1]. We are grateful to Erica for allowing us to reproduce her efforts in this issue of the SSERC Primary Science & Technology Bulletin.

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[1] September 2008 issue of *Primary Osmosis*. http://www-saps.plantsci.cam.ac.uk/osmos/primary28.pdf.
[2] http://www-saps.plantsci.cam.ac.uk/docs/p4pp/pp4pintro.htm
[3] www.field-studies-council.org/