



Primary Science & Technology Bulletin

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



A Gift to the school Putty investigations

For a number of years Science and Plants for Schools (SAPS, www.saps.org.uk) has been involved in the production of a series of booklets - *Plants for primary pupils* [1]. In their final booklet in the series (*Plants in their natural environment*), the authors indicated that they were also involved in the design of a separate resource, 'A gift to the school: what shall we do with the garden?'

In this brief article we explore this new CD-based resource and consider how it might be used in the classroom.

An elderly lady lived at 'Hazelbury', a large (imaginary) house, next door to the school. The lady always took an interest in the school and gave a lot of support to school activities. She was a keen gardener and very interested in natural history. When she died, her son decided to renovate the house and sell it, but he carried out his mother's wishes and bequeathed the garden as a 'gift to the school'. He wanted the children to decide what they would like to do with the different parts of the garden, ensuring that they took note of conservation issues and ways to learn about and maintain the wildlife in the garden. The garden includes a paddock, an orchard, a walled garden, a pond, a flower garden and a wood.

For each section of the CD there is a set of Teacher Guidance notes which give background information and list possible ideas which the pupils may wish to explore or discuss in more detail. Ideas for pupils to consider include:

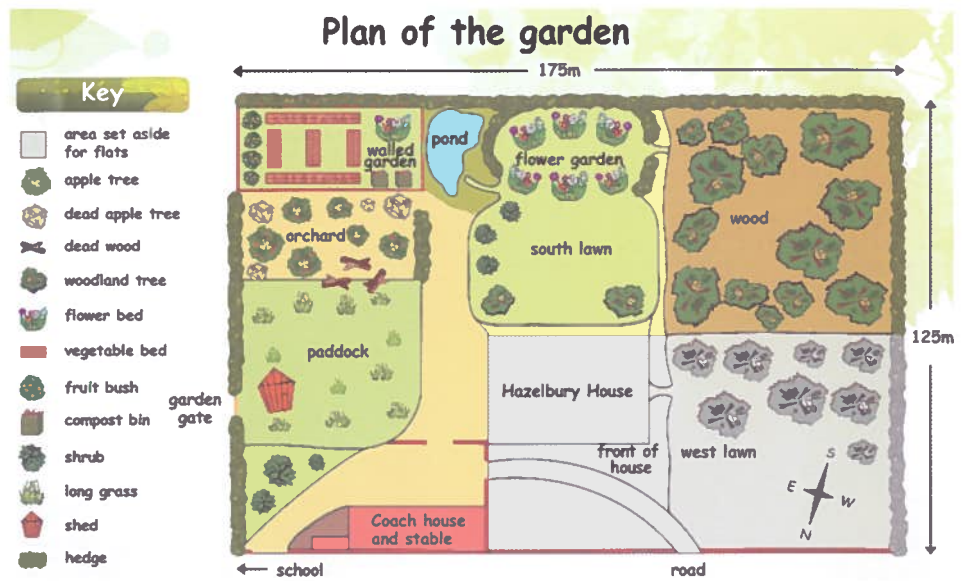


Figure 1 - Plan of the garden at Hazelbury. On the CD the sections marked paddock, orchard, walled garden, pond, flower garden, and wood can be further explored.

- › Who is responsible for the fence around the paddock? Should it be repaired? Who would do the repairs and how much would it cost? Think about work to be done on the walled garden and the orchard - it may be possible to share the costs for the repairs.
- › Should the old shed be removed? What reasons can you think of for keeping it?
- › Are there any signs of rabbits? What effects might they have on the paddock?
- › Wild flower meadows are often rich in both animal and plant life. Could the paddock be kept as a wild flower meadow? What would you have to do to maintain it as a meadow?
- › Would it be best to mow the grass and provide a good play area for the school?

A range of science topics are covered and the authors have created a table to show where these are covered:

Science topic	Paddock	Orchard	Walled garden	Pond	Flower garden	Wood
Habitat diversity and variety of wildlife	✓	✓		✓	✓	✓
Adaptation	✓	✓		✓	✓	✓
Feeding relationships	✓	✓	✓	✓	✓	✓
Caring for the environment		✓	✓	✓	✓	✓
Life cycles	✓	✓	✓	✓	✓	✓
Pollination		✓	✓		✓	
Seed dispersal	✓	✓	✓		✓	✓
Photosynthesis	✓	✓	✓	✓	✓	✓
Decomposition		✓	✓	✓	✓	✓
Weather, climate and season		✓	✓		✓	✓
Healthy eating		✓	✓			

Table 1 - In each of the garden areas, there are opportunities for discussion of different science topics.

Making this wonderful material is easy and varying the quantities used can alter the physical properties. This gives children an opportunity to do some chemistry as well as the putty being used for investigations allowing the development of enquiry skills.

Making putty

You will need :-

- borax (sodium tetraborate) – available from school chemical suppliers
- PVA glue (available from several sources – see Table 1 below)
- plastic cups, disposable (x3)
- sheet of plastic or plastic-coated paper sheet (Figure 1)
- stirring rod or teaspoon
- cling film or small poly bags
- plastic disposable gloves
- stopwatch
- putty rings (Figures 3-6)

*Making 4% borax solution - Dissolve 4g borax in 100 ml of water.

Eye protection and disposable gloves should be worn. The solution should be prepared in advance, by an adult, and stored in a clearly labelled container.

The putty we used was made up using the following quantities :-

Water (cm ³)	PVA* (cm ³)	Food colouring (a few drops)
10	50	green
This putty was very slow moving and was not used in all the investigations.		
20	40	pink
30	30	yellow
40	20	blue
50	10	not usable in investigations – no blob formed

* Not all PVA-type glues work equally well. We used NES Arnold PVA Medium [1] to carry out the investigations described in the article and found from testing a variety of PVA glues that the Early Learning Centre's Bits and Basics Washable Glue also gave good results. The quantities given above are a guide only and may need to be adjusted depending on the glue you use. In a subsequent investigation using ELC PVA we found that using 25:35, 30:30 and 35:25 ml water: PVA gave comparable results to those shown here.

Table 1 - Guide to quantities used for different putties

To each of three plastic cups add the combinations of glue and water shown in Table 1. Add the indicated food colouring at this stage and mix well. Slowly add 10 cm³ of 4% borax solution* to each cup, stirring all the while. A blob of putty should form on the stirring rod.

Wearing disposable gloves, remove the putty and work it for a few minutes to remove the excess moisture. At this stage the process is quite messy. Thereafter, the putty can be handled without gloves. However, we would recommend using a non-absorbent, easily cleaned or

► Pupils are invited to decide how best to use the garden and to maintain different areas within it so as to encourage a diversity of wildlife. They undertake research to back up their proposals and practise negotiating skills to resolve conflicts that may arise. There are no predetermined or fixed outcomes for the debates and discussions, but rather pupils are encouraged to explore their ideas creatively, yet becoming aware of constraints that might interfere with their aspirations. Their work is under-

taken in small groups and ideally would culminate in a presentation to an audience wider than their own class.

The CD has a wealth of images that help build up a picture of each garden area, of plants and animals that might be found there. It has interactive materials that allow pupils, for example, to discover what lies underneath a log, create a food chain, to reveal stages in the life cycle of moths or butterflies or watch a privet hawkmoth larva feeding.



Figure 3 - Two crab spiders with prey. Can you spot the one in the right hand picture?

help with the science. Full guidance is given as to how teachers can work with the pupils.

Detailed guidance notes for teachers include descriptions of the garden in the past, what it is like today and ideas the pupils can explore. Teachers, and other adults who may be involved in helping, have further support from notes that give background information and some

The CD-ROM resource is available for purchase directly from SSERC at a cost of £25 (inclusive of VAT and postage).

For further information contact Paul.Beaumont@sserc.org.uk

Reference

- [1] All of the booklets are available as free downloads from the SAPS website – www.saps.org.uk.



Figure 2 - A caterpillar of the brown hairstreak butterfly protects itself from predators with its exquisite camouflage.

preferably disposable surface when investigating the putty – old laminated sheets are ideal!

The putty can be kept in clean plastic cups and covered with cling film or in sealed plastic bags to prevent it drying out.

What properties does this material have? What happens when you leave it on the table? What happens if you pull it? If a small piece is rolled into a ball it will bounce? Do the different combinations of PVA and water affect the properties of the putty?

Altering the proportion of water and PVA does affect the putty and the differences can be used to carry out investigations. The colours shown in Table 1 correspond to the ones used in our investigations and so to the photographs shown in this article.

The activities can be used to help meet Experience and Outcome **SCN 2-15a** from A Curriculum for Excellence: *By contributing to investigations into familiar changes in substances to produce other substances, I can describe how their characteristics have changed.*

Possible investigations - It is possible to measure how the rate of flow differs between the putties. Three ideas are shown below. If you carry out a different investigation send SSERC [2] details and photos. You never know, your investigation might appear on our website!

Running down the slope - A fair test was set up to see how runny the different putties are. Scientists use the term *viscosity*. The runnier the putty, the less viscous it is. If a liquid is very viscous it is not at all runny.

A sheet of plastic-backed paper was stuck over a board which was propped up at an angle. The same size blobs of putty were put at the top of the sheet and allowed to run down. The result (see Figure 1) shows clearly that the blue wins. Ask the children to handle samples of the three putty colours and describe any differences in

how they feel to the touch. The blue putty contains a high proportion of water and will feel soft by comparison to the others.

Upside-down test - Using the cups the putty is stored in can provide another version of this activity. After the putty has settled in the cups turn them upside down at the same time. Figure 2 shows the position of the putty a few minutes later.

Putty circles - A slightly more complex test may be carried out using a board (a laminated sheet with pairs of concentric circles on it). Again there is a need to ensure that any tests are fair as the time taken for the putty to extend from the inner circle to the outer circle is measured. With the putty recipes shown in Table 1 we found that the circle sizes shown produce results in a reasonable time for all the putties being tested (see Figures 4, 5 & 6). A template can be found on the science3-18.org website – just search for “putty circles”.

Health and Safety Considerations

A risk assessment should be undertaken before doing these activities. Borax, sodium tetraborate, is a cleaning agent and can be obtained from school chemical suppliers. It is an irritant to some people and should be used with care. Children should not be permitted to make the solution and close supervision of children using the solution is necessary. Eye protection should be worn and contact of the solution with the skin should be avoided. Hands should be washed thoroughly with copious amounts of water if there is any contact with the solid or the solution. Borax and borax solution should be securely stored to prevent unauthorised use. A complete risk assessment can be found on www.science3-18.org. See also “Be Safe” [3] for further information.

References

- [1] <http://www.nesarnold.co.uk/first-2-learn-supplies/art/adhesives/nes-pva-medium-glue/?ev=search>
- [2] teresa.mcerlean@sserc.org.uk
- [3] Be safe!, ASE Publications (available from SSERC at £6)



Figure 1 - A fair test set-up to compare putty runniness.



Figure 2 - Another variation to compare runniness

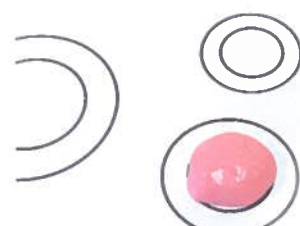


Figure 3 - Putty circles.



Figures 4, 5 & 6 - Putty circles in action.