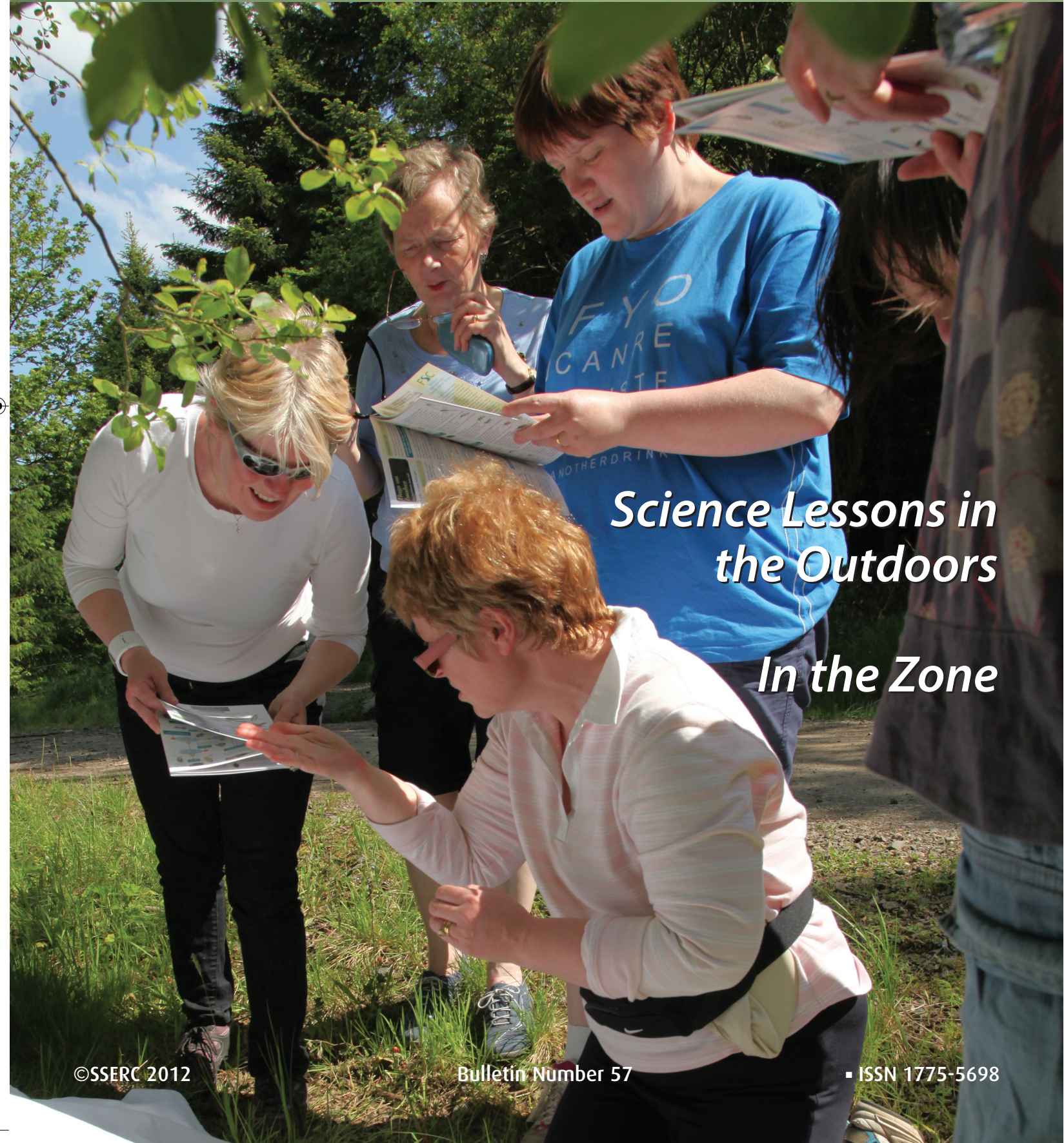




Primary Science & Technology Bulletin

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



*Science Lessons in
the Outdoors*

In the Zone

'Learning in science will enable me to develop curiosity and understanding of the environment and my place in the living, material and physical world' – [1]

What better way to enhance learners' natural curiosity than to incorporate activities and challenges that involve getting out into the great outdoors.

SSERC has been developing a number of activities to incorporate aspects of observing, counting and sampling in the environment. These are skills which many "real-life" scientists rely upon to gather meaningful data in the field. Indeed the RSPB's annual Big Garden Birdwatch [2] is a prime example of sampling in the real world, one in which citizen scientists (i.e. everyone) can play a valuable part.

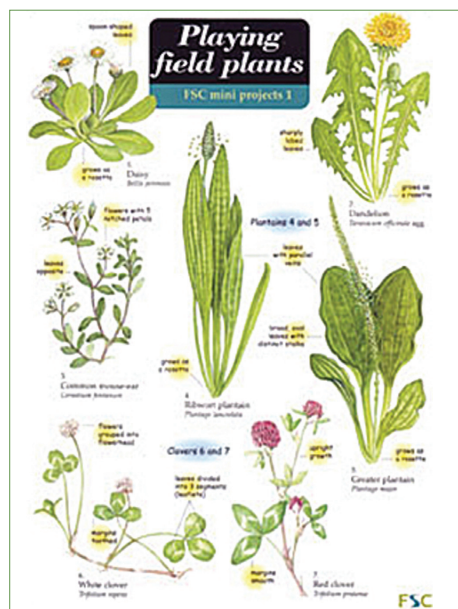


Figure 1 - FSC Guide for playing field plants.



Figure 2 - Using a quadrat and random sampling technique to estimate the population of daisies on a playing field.

Exploring the local environment around your school

No matter how much of an urban jungle your learning environment may seem at first glance identifying plants and animals is a great way to start exploring the local environment. A good range of Field Studies Council Guides Figure 1 [3] is available to get learners out and beginning to make observations. Different colours and textures can be explored at early level as well as simplified, home-made guides.

Sampling is a technique routinely used in scientific fieldwork to provide an estimate of the population of a particular organism. Faced with a challenge along the lines of "Can you tell me how many daisies there are on the school playing field?", learners will come to the conclusion that it would be very arduous (and actually unnecessary!) to count each one individually. Learners' ideas for providing an accurate estimate can be explored. In practice learners tend to come to the conclusion that only relatively small areas need be examined in detail (or sampled) and a fairly accurate estimate can be worked out from this using some simple multiplication skills. How many samples should be taken to give an accurate estimate? Should the area to be sampled be chosen at random? Learners should be encouraged to think about different conditions that may exist on a playing field e.g. shade from overhanging trees, goal mouths, paths etc. A grid system could be devised for the playing field and a random series of co-ordinates generated to decide where to sample. Not surprisingly this method is termed random sampling.

Random sampling involves the use of a piece of equipment called a quadrat (Figure 2). This can be a square made of lollysticks, a wire coat hanger bent into a square (tape over any sharp edges) or a purpose made quadrat made of four

equal lengths of wood fastened together (we used 25 cm lengths of baton pre-drilled and fastened with wing nut and bolts). It doesn't really matter what the quadrat is made of as long as it is securely and safely constructed and its area easily calculated. The purpose of the quadrat is to focus the sampling within a known area. Now learners can place their quadrat in the randomly selected position and count how many daisies are present in the quadrat.

Using the data obtained can provide learners with the opportunity to explore a variety of numeracy & mathematics experiences and outcomes [4]. It is essential to know how many times one quadrat can fit into the entire area being sampled. You may wish to limit the area sampled to make this slightly easier to work out. For instance if you can fit 100 quadrats into your sample area and you took one sample which had 3 daisies in it you *could* estimate that there are 300 daisies in the whole area (one quadrat is 1/100 of the whole area). Is one sample going to provide an accurate estimate? A glance at the distribution of daisies should get the learners suggesting their reasons for wanting to take more samples.

So now we take 10 samples from the same area, pool the data and get a combined total of 50 daisies. We know that we sampled 1/10 of the area this time so a more accurate estimate of 500 daisies for the total area is obtained. If appropriate the idea of averages could be introduced or reinforced. Learners pool their data to work out the average number of daisies in one quadrat and multiply that number by the total number of quadrats that could fit into the area. This may take them into the realms of decimals so there is lots of scope for challenging learners at second level and beyond.

A second technique useful for field studies is called line sampling or a line

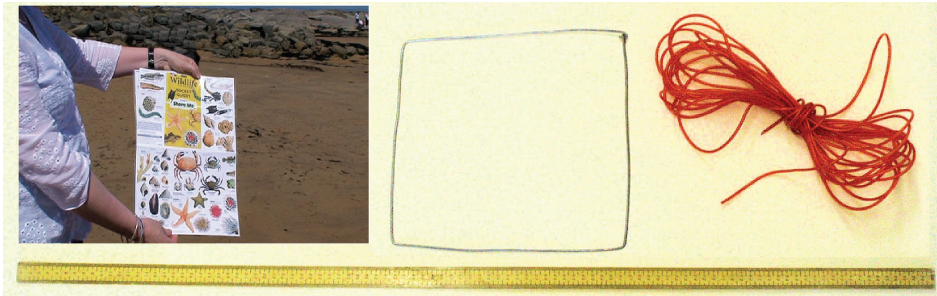


Figure 3 - Equipment for line sampling: field guide, quadrat, washing line, rope & metre stick.



Figure 4a & 4b - In small groups learners can put out their sample line and identify and record what they find in their quadrat.

transect. All that is needed is a metre stick, quadrat and washing line. The technique is used to study changes in plant/animal species linked to environmental factors e.g. light, moisture, grazing or irregular mowing. Line sampling involves laying a washing line or rope across a section of habitat and taking a sample at regular intervals (usually every metre) using a quadrat. A note of the animals and plants found in the quadrat, its position along the transect, and the conditions are recorded (Figures 4a & 4b).

It is important that in the area being sampled there is some sort of change in conditions. For example if the line transect runs through an area of longer grass and a well-worn area such as a goalmouth in the part of the playing field used regularly for football or by a path worn in the grass then you are more likely to find differences in the distribution of plants and animals that can lead to meaningful discussion. The plants which are most plentiful near such

an area will probably be different from those 2 m or 3 m away. This allows learners to equate different plants species with different conditions. Another interesting area to explore may be to start under the shade of a tree and move out from the tree into a brighter area. Again the plants found in each area are likely to be different. Learners could be encouraged to record their results and explanations via pictures or video reports. The same area could be sampled at different times of the year as an ongoing piece of research.

A visit to the seashore

As well as exploring the local environment, learners also benefit enormously from field trips to more unfamiliar places. Although we are never very far from the sea in Scotland, finding a suitable shoreline can take some careful research. However, the potential reward for the learners will be worth all the effort of obtaining funding, permission and the necessary staffing for such an outing. To prepare them for the visit you might like

to talk about the tides (link this to Earth and space), introduce the wonderful living things they'll see and give a brief outline of the activities. They may well be familiar with the sampling techniques if you have sampled the local environment first. The basic equipment required for identifying plants and animals is a good field guide, a few containers and possibly a net or two to gently catch some of the animals for closer examination (Figure 5). Equipment for carrying out line sampling is the same as for the playing field shown in Figure 3. It is important that all living creatures are disturbed as little as possible and returned to the exact spot where they were caught. Learners should be encouraged to replace rocks and stones gently back where they found them and follow all health and safety advice given e.g. washing hands before eating.

Before going back to school ask each group to collect some sea-water in a plastic bottle and take it back to school. See <http://tinyurl.com/seawater-expts> and SSERC Primary Bulletin 52 for some ideas to support investigations into plant adaptations.



Figure 5 - In small groups learners can observe and identify the inhabitants of the rock pool.



Science Lessons in the Outdoors

SSERC has a range of helpful videos demonstrating how to set out random and line samples. Why not join the SSERC Cookalong Glow Group (see other article in this issue). Once you are a member you can access videos and resources to support many aspects of observation skills and sampling.

SSERC runs an annual Summer School for Primary Teachers, this course includes lots of practical activities based on science and outdoor learning. This year it runs from 7th-9th June 2012. See the www.science3-18.org website for more details.

During this type of activity the following CfE Science Planet Earth experiences and outcomes come alive in a very special way:-

■ I have observed living things in the environment over time and am becoming aware of how they depend on each other. – *Biodiversity & interdependence* - **SCN 0-01a**

■ I can explore examples of food chains and show an appreciation of how animals and plants depend on each other for food. – *Biodiversity & interdependence* - **SCN 1-02a**

This work will also address the following CfE Numeracy & Mathematics experiences and outcomes:-

■ I am developing a sense of size and amount by observing, exploring, using and communicating with others about things in the world around me. - *Number, money & measure* - **MNU 0-01a**

■ I can share ideas with others to develop ways of estimating the answer to a calculation or problem, work out the actual answer, then check my solution by comparing it with the estimate. - *Number, money & measure* - **MNU 1-01a**

■ I can use my knowledge of rounding to routinely estimate the answer to a problem then, after calculating, decide if my answer is reasonable, sharing my solution with others. - *Number, money & measure* - **MNU 2-01a**

References

- [1] <http://www.ltscotland.org.uk/learningteachingandassessment/curriculumareas/sciences/eandos/index.asp>
- [2] <http://www.rspb.org.uk>
- [3] <http://www.field-studies-council.org>
- [4] <http://www.ltscotland.org.uk/learningteachingandassessment/curriculumareas/mathematics/eandos/index.as>

In the Zone

What better way to celebrate the forthcoming 2012 Olympic and Paralympic Games than to introduce learners to a range of science activities linked to the human body? In the Zone is a major UK initiative by the Wellcome Trust providing free science investigation kits for all Primary and Secondary schools in the UK.

Characters *Fizzy Cole* and *Dizzy the Stopwatch Dog* guide primary learners through a range of experiments and investigations using the equipment provided in the kit. Learners are encouraged to engage in practical science activities exploring the mind and body linked to sport, performance and dance.

Although this is a UK wide initiative we can see numerous links to CfE experiences and outcomes (link?) in Science, Health & Wellbeing and Numeracy & Mathematics. The pack includes a

guide and suggests an engaging range of activities suitable for all levels. Using stopwatches and simple equipment learners are encouraged to take a variety of measurements e.g. leg length and make comparisons and predictions based on the information gathered.

■ I can recognise that we have similarities and differences but are all unique HWB 0-47a

■ I am aware of my growing body and learning the correct names for its different parts and how they work HWB 0-47b

■ By researching, I can describe the position and function of the skeleton and major organs of the human body and discuss what I need to keep them healthy SCN 1-12a

As every secondary school will also be provided with a kit aimed at 11-19 year olds there may be scope for a number of Transition projects within a learning community this summer.

Look out for your free In the Zone experiment kit, due to arrive in February or March 2012. This initiative is part of Get Set+, the official London 2012 education programme run by the London Organising Committee of the Olympic Games (LOCOG) and is endorsed by Sir Steve Redgrave.

As the Commonwealth Games will be held in Glasgow in 2014 there will be scope for continuing to use the resources in the future.

See www.getinthezone.org.uk

