Green fingered mathematics

There has always been a close link between plants and mathematics. The simple counting of petals can reveal the number sequence that was identified by Fibonacci: lilies have 3 petals, buttercups 5, delphiniums 8 and ragwort 13 onto michaelmas daisies and sunflowers with 34, or even 55 petals. Similar patterns can be seen in seed heads (sunflowers) and tree branches.

The National Numeracy Strategy framework for teaching mathematics identifies "the need to look for opportunities for drawing mathematical experiences out of a wide range of children's activities". As an example it cites the growth of a plant and acknowledges that almost every scientific investigation or experiment is likely to require a mathematical skill. It also states that "… better numeracy standards occur … where teaching … links mathematics and other subjects". This is application. Its importance has been discussed by Hughes (2000), and the link between numeracy and plant science has been explored by Braund (2000), both in the Times Educational Supplement (TES).

So does applying maths to novel or authentic (reference) situations enhance the pupil's understanding? Perhaps the incorporation of plant material in numeracy lessons will address the issue of application and maybe help children to solve number problems in a variety of contexts. It could also be a way of introducing pupils to plants and plant science. Examples of opportunities include graphical terminology (median, mode, range) that can be introduced while making a prickly pictogram from holly leaves when investigating the spines on leaves (*OSMOSIS 20, 2001*). Another idea would be to make daily recordings of the growth of a fast plant (rapid cycling brassicas).

Here we describe an activity (How tall are you in leaves?) that can be used as an example of making non-standard measurements and hence illustrating the importance of using standard measurements. This is part of the new Green Fingered Mathematics workshop that has been developed for primary teachers (*see below for contact details*).

Green Fingered Mathematics Workshop - for further details, contact SAPS Head Office
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For references, please see page 2.

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Update on the SAPS website

We hope you are finding your way around the new website structure and that you can now navigate more easily from one part to another.

The back page of this *OSMOSIS* gives you a snapshot of the "trees and shrubs website". This includes a wealth of information that can be used in different ways by pupils and in your teaching.

Have you used our Curriculum Links section? It now covers Key Stages 1 and 2, and, through either the National Curriculum statements or QCA Schemes of work, you can find links to suitable materials on the SAPS website. Why not have a try and see if you pick up some fresh ideas! Links with the Scottish primary curriculum will be added soon.

Under Curriculum support (Go from the SAPS Home page to Publications and Resources) you will now find the "Teachers'" pages to support the FSC fold out chart - *A guide to fruits and seed dispersal*". Again, you will find lots of ideas and activities you can do in your teaching of this topic, mainly for primary pupils. More primary materials are being prepared and will be added when ready.

Teacher's page

How tall are you in leaves?

This exercise is intended to make pupils realise the importance of standard measurements by introducing the idea of a non-standard measuring device. Here they use a leaf. By putting the pupils into a conflict situation they should resolve the problem of the necessity of standard measuring tools.

Resources

You will need some leaves from trees or shrubs. There must be two sets of leaves that are of distinctly different sizes. Ideally, for large leaves use those from a horse chestnut tree and for the smaller leaves use a willow tree. In winter months laurel bushes and ivy leaves are suitable. Alternatively you can photocopy or scan one of each leaf onto card, reproduce a class set, and cut them out. The advantage here is that they will all have leaves of the same size. Actual leaves can be preserved by soaking in glycerine (from the home cooking aisle in supermarkets) and then coating in PVA glue. The glycerine replaces the water in the leaf and stops it from becoming too brittle. You can omit this step and just paint with the glue and leave to dry. On drying, this is clear and you will have a preserved leaf.

Activity

Pupils work in pairs. Give the pupils a leaf each and try to give the taller of each pair the smaller of the two leaves. They then measure the height of each other using their leaf only. It helps if the pupils can either lean on a wall or lie down flat. They then record their heights in leaves. Because the taller pupils are using the smaller leaves, the shorter pupils will have a height of more leaves than their actual taller partner.

Now discuss the results as a class and find out whose height has the smallest number of leaves. Start a line at the front of the class with this pupil. Then line up the rest of the pupils in leaf height order, finishing with the pupil who is apparently the tallest because their measurement was the greatest number of leaves. Of course the line will not look like the expected pattern. You can now draw out the idea of why we have not got a line that starts with the shortest in height and ends with the tallest.

Extension and application work

They will probably soon suggest that you must use one leaf size and you can repeat the exercise to see the difference.

Land used to be measured in "foot sizes" (hence the unit). Suppose you were selling a piece of land - would you measure it using someone with large or small feet? Conversely if you were buying some land what size foot would you now measure it with?

References

Braund M. (2000) *Green shoots of discovery* Curriculum Specials 05/05/2000 TES
Braund M. (2001) *Primary Plants - A handbook for teaching plant science in the primary school*
  Questions Publishing
Fibonacci Numbers in Nature: www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html
Hughes M., Desforges C. and Mitchell C. (2000) *Welcome to the real world* Curriculum Specials
  22/09/2000 TES
Townsend C. (2001) Holly leaves - themes and variations *Osmosis no 20*

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How tall are you in leaves?

Today we are going to measure the height of everyone in the class. But we are not going to use rulers. You are going to make the measurements with leaves from different trees.

- Work in pairs.

- Your teacher will give you and your partner a leaf each.

- Find out how tall your partner is by measuring him or her with your leaf. (You may find this easier to do if you stand straight against a wall.)

- Let your partner measure your height using their leaf.

Record your answers here

I am .... leaves tall.

My partner is .... leaves tall.

Now try to answer the following questions about your class.

1. Who is the tallest in leaves? How many leaves high is this classmate?

2. Is this really the tallest person in your class?

3. Who is the smallest in leaves? How many leaves high is this classmate?

4. Is this really the shortest person in your class?

5. What could you do to make this a better way of measuring the height of everyone in your class?

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A glimpse into ... A key for identifying British trees and shrubs

Identifying a plant (more simply, just giving it a name) is often the first step in knowing more about the plant - understanding how it relates to other similar plants, what it is used for or where it grows. Giving a name to the plant, helps you talk to other people about it!

A new part of the SAPS website enables you to do just that. The 'Key for identifying British trees and shrubs' has been developed by SAPS in collaboration with BSBI (Botanical Society of the British Isles). It provides the route to the identification of 80 trees and shrubs, commonly found growing wild in Britain and Ireland. The key is based on the arrangement of the leaves and twig. You are taken step by step through different stages, matching your specimen with the simple line diagrams and with brief questions that give you a choice to go to the next stage. Species descriptions are supported by a wealth of background information, photographs of living specimens and distribution maps. A glossary gives explanations of the botanical terms used in the key. You will find it suitable for use with different age ranges - from primary through to enthusiastic adults.

Identify an unknown leaf – in five quick steps

1. Are the leaves *Simple or Compound?*
**2. Leaf shape?** *Linear, Roundish or Lobed*

3. Leaf arrangement? *Opposite or Alternate*
**4. Choose from a few alternative pictures...*

5. My tree is a Sessile Oak
(Quercus petraea)

This chart gives you just a glimpse of what this website offers. To find it on the SAPS website, go through the SAPS Home page, then follow links to *Publications and Resources* then *Identification Guides.*

Glossary of Botanical Terms
Defines botanical terms (in green)
Call them up at the click of a mouse
(some have a helpful image)
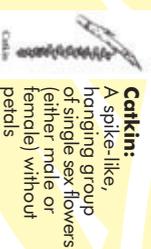
Catkin:
A spike-like, hanging group of single sex flowers (either male or female) without petals

Catkin

Distribution maps

Quercus petraea

Find out more about a species

Description
The alternate leaves, 5-12 cm long, have 5-6 various sized lobes on either side, and no ears at the base, which narrows gradually into a leaf stalk 10-25 mm long. The leaves have persistent hairs at the base of the midrib beneath.

Identification Details (ID Check)
Sessile Oak is a deciduous tree with a narrower crown and more upright branching than Pedunculate Oak. However, it is also up to 30 m high: the bark too is deeply fissured with age. It is native in woodlands especially on acid soils, in the west of Britain and in Ireland.

The green male and female flowers are in separate clusters on the same tree (monoecious), and appear with young leaves in May.

The male flowers with stamens in whorls form drooping catkins 2-4 cm long. The female flowers are clustered close together on short stalks.

The dark brown acorns, ripe in October, are clustered together on short stalks less than 10 mm long, and are rounder than those of Pedunculate Oak.

Interesting Facts
· Sessile Oak was much used to make charcoal for smelting iron in N and NW Britain.
· 'Sessile' means unstalked and refers to the clustered acorns.
· Oak bark contains tannin, which was needed in the past for making leather from hides.