In today’s electronic age, suburban and city children are increasingly disconnected with the natural world. Studying trees allows children to learn about the world they live in and can teach a variety of useful topics contained within the National Curriculum in England (DfE, 2013). Knowledge of trees is specifically required in the science curriculum at key stage 1 (ages 5–7) under the topic ‘Plants’. Trees are mentioned again at key stage 2 (ages 7–11), in particular in year 3 (ages 7–8) when knowledge of plant or tree structure is required. However, looking at trees can also be used to cover a range of geography, mathematics and citizenship topics.

Trees are often the most visible aspect of the natural world available

Mark Walker shares his ideas for teaching city children about urban trees, an ideal approach to teaching a range of geography, maths and science topics at primary level, while helping to reconnect children with the natural world around them.

Key words: Urban science ■ Outside the classroom ■ Trees ■ Cross-curricular
Box 1 Activities for teaching about city trees

Choosing
An understanding of the children’s natural human and physical world is required by the National Curriculum in England geography syllabus at key stage 1. By choosing a tree, children are making a personal connection to nature. Trees are important symbols and way markers in our lives: they act as meeting places, they commemorate events such as the Millennium, or just have personal meanings as when providing shelter from rain! Ask children to choose a tree they know, ideally one that is special to them. Ask them why it is special and why they have chosen it. Is it one where they always see a blackbird singing? Do they collect conkers from it in autumn? It should be easily accessible, be on public land and safe to work around. Can children mark their trees on a large map? Can they find a satellite image on Google? Describing physical locations and using the main compass points is required at key stage 1, with an ability to use more detailed compass directions and physical features needed at key stage 2.

Describing
Having chosen a tree, the children need to ‘get to know it’. They work in pairs, with one being blindfolded: can they describe the tree just by touch? Drawing the shape of the tree and describing it helps with classification: different trees have different shapes; pines are pyramidal, poplars columnar and oaks ovoid. Which shape is the child’s tree? Can they group them? The ability to identify and describe shapes is also supportive of key stage 1 mathematics. Buildings, traffic, or pruning may influence shape. Can children spot this? Understanding how humans influence the natural world is another important teaching aim.

We probably all remember taking bark rubbings using tracing paper and crayons; the learning potential of this is rather limited, but can be extended by asking children to describe the texture. Can they find trees with other types of bark (Figure 2)? Children should decide what type of tree theirs is. Identification guides, such as the Forestry Commission web-based Tree Name Trail site, the Woodland Trust’s Discover British Trees site and OPAL’s Tree Guide (see Websites), are fun ways of doing this.

In addition, studying how leaves change at different times of the year helps introduce the idea of seasons. Trees have a lot going for them already ... but there are more activities.

Measuring height
Measuring and recording height is required in mathematics at key stage 1 and there are various ways to do this. Holding a pencil vertically stand the distance from a tree where the bottom of the pencil appears to touch the tree base and the pencil tip the tree crown. Swing the pencil horizontally so that it is now laid flat with the bottom of the pencil remaining where it touches the base of the tree. A partner should stand where the tip of the pencil touches the ground. Shout to them where to stand. The distance between the base of the tree and where the partner is stood can then be measured and this is approximately the height of the tree.

Another method involves two people walking 27 paces from a tree. Here one person holds a stick vertically with the base touching the ground. Their partner now walks a further 3 paces and then bends down to ground level and looks back at the tree and their partner holding the stick. They should be able to see the crown of the tree. Where on the stick does the crown of the tree reach? This position should be marked on the stick. You can find the height of the tree by multiplying the distance measured on the stick by 27.

On a sunny day hold a metre stick upright and measure its shadow. Now measure the length of a shadow cast by a tree on the ground. How many metre stick shadow lengths are in the tree shadow length? This is the tree height in metres.

With the ‘Bend Over’ method you bend over and look through your legs so you can see the tip of the tree. This is an angle of 45 degrees. The distance you are from the tree at this point is the same as the height of the tree. These methods vary in accuracy and ease of use. Can children identify problems with them? Maybe they can use all of them and see if they get different results.

Measuring area
Can children measure the size of a tree canopy? The best way is to work out the extent of the canopy at a number of points: south, south-east, east, etc. Markers such as sticks should be placed at the furthest extent. The children can judge this by eye by standing underneath. Then using a tape measure the distance from the trunk of the tree to the markers can be measured.

Back in the classroom, the distances can be plotted on graph paper and then joined to give a rough approximation of the canopy shape. The number of squares...
This deceptively simple challenge ‘Do bigger trees have bigger leaves?’ Challenges: LEAF it out to think and work scientifically.

Calculating and evaluating

Nearly everyone knows that tree age can be found by counting the rings in the trunk. However, an obvious problem with this method is that the tree must be chopped down first! Age can also be estimated from tree girth. The girth is the circumference of a tree trunk, measured at 1.5 metres above ground level. An often-quoted figure is that tree girth expands by 2.5 cm per year. So dividing girth by 2.5 provides the age. Can children spot problems with this method?

Typically trees grow fastest when younger; slowing once they reach 80 years of age. Additionally, where the tree is situated can affect growth, with those growing in shade or around others growing slower than those in the open. Different species grow at different rates. Calculating age helps children practise simple mathematical skills such as addition and multiplication required at key stage 2, year 6 (ages 10–11).

Often leaves are measured across their broadest width. Sycamore leaves are ideal to illustrate the problems involved because of their pinnate shape. How should these leaves be measured? What do students think is the best method? Why might measuring these across the middle not be accurate? Leaf area can be measured using graph paper. The leaf is traced and then the centimetre squares covered counted. Ideally, ten leaves can be measured and the average calculated. Again this allows ‘working scientifically’ skills of accuracy and reliability to be developed. By counting ten leaves students can really learn the value of taking multiple measurements to obtain accurate results. What variables have to be considered? Maybe leaves at the tree tip are smaller than those lower down? Maybe leaf size depends on where trees are located. How can children investigate these problems? Can they design experiments to study them? What things have to be considered? What problems are there?

Calculating age helps children practise simple mathematical skills such as addition and multiplication required at key stage 2, year 6 (ages 10–11). Discussing the reliability of the evidence and the method are good opportunities for older children to develop scientifically’ skills of accuracy and reliability to be developed. By counting ten leaves students can really learn the value of taking multiple measurements to obtain accurate results. What variables have to be considered? Maybe leaves at the tree tip are smaller than those lower down? Maybe leaf size depends on where trees are located. How can children investigate these problems? Can they design experiments to study them? What things have to be considered? What problems are there?

Websites

Forestry Commission, Tree Name Trail: www.forestry.gov.uk/forestry/INFID-5MYDWM
OPAL, Tree Guide: www.opalexplornature.org/identification
The Tree Council, Tree Wardens: www.treecouncil.org.uk/Take-Part/Tree-Wardens
Sheffield City Tree Champions: sites.google.com/site/citytreechampions

we instinctively begin by describing objects, then wishing to learn how large they are, before noticing and examining finer details.

Becoming a Tree Guardian

The National Curriculum in England now emphasises citizenship and that children learn about their role in society. Although this first becomes a requirement at key stages 3 and 4 (ages 11–16), learning about their local trees is an ideal opportunity to introduce these concepts at earlier ages. Children can create an inventory of street trees on the road where they live. Project work can concentrate on finding out how trees are managed, the benefits and disadvantages of trees, and who plants them.

Various organisations run schemes asking for public participation; for example, the Tree Council runs a ‘Tree Warden’ scheme (see Websites). Many local councils have tree officers. Pupils can be asked to find out about the role these officers play. Often there are ‘Friends of …’ groups dedicated to protecting local parks and green spaces and children can investigate what these do and who are members.

The ideas developed in this article are a result of the ‘Sheffield City Tree Champions’ (see Websites) project, started to provide resources to inspire teachers in the teaching of tree-related topics in the city and to help teach young people about the city they live in.

Reference


Mark Walker is a science educator from Sheffield. He studied open forms of science teaching in Germany before returning to the UK to complete his doctoral study in 2011. He currently works for a local educational charity promoting STEM teaching through model cars powered through solar panels. Email: mark_david_walker@yahoo.co.uk