Name the parts of the tree.

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The Secret Life of Trees
Challenge Cards

**Challenge**

It’s a really hot, dry day in summer.

There’s not enough water for the leaves to make enough food.
What will you do?

NOTES: The tree will start to use its stored food reserves from the big fat roots. Use the food moving cells in the trunk to pass food to the rest of the tree.

**Challenge**

A storm has brewed up. Wind and rain is battering the tree.
What will you do?

NOTES: The bark will protect the outside of the tree. Get the pupils who are bark to look ready for defending the tree. The inside of the trunk pupils and big fat roots need to help the tree from falling over in the high winds. Ask each group to link arms to make them strong against the wind. Release arms when the wind has stopped.

**Challenge**

Oh no, we’re under attack! A group of insects are trying to eat bits of the tree. What will you do?

NOTES: The bark pupils should link arms and defend the tree against the attack. The leaves also have chemical defences against insect attack, for example, to make them taste bitter to insects trying to eat them. The leaves can join in the defence too.
Challenge

It’s a year when the tree makes loads and loads of extra seeds (called a mast year). The tree needs to make new saplings. What will you do?

NOTES: Get the seed pupils to leave the tree and find somewhere new to try and germinate into a new tree. Where would be a good place to do this?

Challenge

It's autumn and it's time to prepare for winter. What will you do?

NOTES: The food production and transport will slow and then stop. The leaves will change colour and then fall off the tree. Water transport will slow.
The Secret Life of Trees
Blank Challenge Cards - make up your own

Challenge

Challenge

Challenge
Investigation 1 - The great celery experiment

Trees are really good at moving water around inside them. They can even get it from their deepest roots to the top of their highest branches. They use special tubes called the xylem to move water around, just like motorways inside the tree trunk.

In this investigation you will actually be able to see how this works just by watching some humble celery.

What you need:
- Sticks of celery - some with leaves on if possible
- Water
- Coloured water (with food colouring in it)
- Plastic cups
- Hairdryer (optional)
- White flower (optional)

How to do it:
1. Label two cups with your team name
2. Half fill a cup with coloured water.
3. Half fill another cup with plain water (this is your control cup)
4. Put a stick of celery in each cup and leave it.
5. Come back the next day. What has happened?
6. You can cut open the celery to see what is happening inside.
7. Write down what you find. You could even take some photos too.
8. Don’t eat the celery! Throw it away or compost it when you’ve finished.

Try something else
The process is made faster when more water evaporates from the leaves. Try setting up an experiment with three cups; one with an ordinary celery stick, one with leaves and one with leaves and you blowing a hairdryer over the leaves. The hairdryer simulates a warm, windy summer’s day.
You can try the first investigation with a white flower too and see if you can change the colour of the petals. You will need to leave the flower a little longer than the celery.
Investigation 2

- Are all leaves the same?

Every tree has thousands of leaves in summer. A fully grown oak tree can have around 250,000! But you’ve probably noticed, not all leaves are the same.

In this investigation you will have a look at lots of leaves and see what you can find out.

What you need:
- Leaf collecting bag from www.naturedetectives.org.uk/download/bag_leaves
- Leaves you collect

How to do it:
1. Download and make a leaf collecting bag
2. Go outside and see how many different types of tree leaf you can find. Collect a sample in your bag.
3. Come back to the classroom and sort your leaves into categories. How could you sort them?
   - What size are they?
   - What shape are they?
   - How thick are they?
   - Do they feel waxy or soft?
   - Are they spiky, furry or hairy?

4. Why do you think they are different? Come up with as many ideas as you can.

! Don’t forget to wash your hands after this activity.

Try something else
Compare your leaves with ones from different parts of the world where it is hotter, or colder, dryer or wetter. Look on the internet at the spikes of cactus from a desert and the leaves of a rubber plant from a rainforest. What are the differences?
Investigation 1 – Scarred?

Adult trees have thousands of leaves in their canopy. A fully grown oak grows - and sheds - roughly 250,000 leaves a year.

Where the leaf stem joins the branch is called the petiole. A scab forms and the leaf drops off. A leaf scar is left on the branch.

What you need:
- A selection of different trees

How to do it:
1. Select a tree and look at one of its twigs. Can you see the tiny scars left when leaves have fallen off?
2. Find another tree and do the same. Are the scars the same size and shape?

Leaf scars on horse chestnut trees look like little hoof prints from miniature horses! See if you can find them.

Don’t forget to wash your hands after this activity.

Investigation 2 – Sweaty trees

Trees ‘sweat’ or give off water through their leaves. This process is called transpiration. Just like sweating, it helps to keep the tree cool on hot summer days. This investigation is an easy demonstration of trees ‘sweating’.

What you need:
- A tree with some low branches you can reach
- Large clear plastic bag e.g. a large sandwich bag
- String or something else to tie your bag with
- Scissors

How to do it:
1. Tie a plastic bag around some leaves and secure it round the branch so it is closed
The secret life of trees
Investigations to try outdoors

2. Leave it and check it in a few hours or the next day. Be patient!
3. What do you find? Can you see any water droplets?

Why else does a tree need water in its leaves?
How does the water get to even the highest leaves on the tallest tree?

Investigation 3 – Listening to trees

Get a really good window in on the secret life of the tree and even hear its ‘motorway’ moving water and nutrients up the tree. This is best in spring or summer on a hot day.

What you need:
- A big tree
- Stethoscope (like the ones used by doctors)

How to do it:
1. Use a stethoscope or make a home made one using a funnel and tube or a glass.
2. Put it to the bark. You may need to try it in a few places but can you hear anything.

Can you hear anything?
This is the sound of the sap rising up the trunk.

Investigation 4 – Hug a tree

What you need:
- A selection of trees
- Tape measure

How to do it:
1. Find a tree to measure—preferably a big fat old one.
2. Measure it in ‘hugs’ ie how many people it takes to hug the tree all the way round or measure it with a tape measure.
3. Record your results and identify it if you can. Don’t worry if you can’t, just collect a fallen leaf from the tree and a nut or seed to identify back in the classroom.

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The secret life of trees
Investigations to try outdoors

Visit the www.ancient-tree-hunt.org.uk website for more help and to work out how old your tree is. You can officially record your tree here too.

Investigation 5 – Bark comparisons

Every species of tree has different shape, colour and texture of bark.

What you need:
- A selection of trees
- Wax crayons (paper covering removed)
- Plain paper
- Camera (optional)

How to do it:
1. Go out and find a tree to start with. Can you identify what kind of tree it is? Put everything in a handy place near you on the ground.
2. Pick a part of the bark you want to do a rubbing of and place your paper on top. Gently rub the long side of the crayon over the bark.
3. Try this again on another tree.
4. Don’t forget to record which rubbing came from which tree!

Don’t forget to wash your hands after this activity.

When you get back to your classroom, make a tree gallery to display your rubbings and make labels so visitors to your gallery will know what came from which tree. Print out pictures of the bark and display with your rubbings.

How do the shape and texture of the bark differ from each other?

Now invite people to visit your tree gallery!
The Secret Life of Trees

Teachers’ Notes

This activity unit is designed to help the class investigate trees and the way they work. It is based both in the classroom and outside in a local woodland.

The activities can be tailored to the amount of time available, the curriculum focus and ability of the pupils. This unit has many possibilities for extension activities.

Background information

Not only are trees the longest living organisms on Earth but they help to purify the air we breathe and are essential for life. They are ‘breathing’, ‘sweating’ and growing all the time.

All looks serene and tranquil on the surface but inside each tree, there’s so much going on. All the time, trees are a hive of activity.

Vocabulary

Cambium - cells that help the tree grow new wood and bark. The cambium helps the trunk grow wider.

Capillary action - the physical process by which water is sucked up the xylem.

Chlorophyll - the chemical that makes leaves green and is vital in the process of photosynthesis.

Petiole - where the leaf stem joins the branch. If a scab is formed the leaf drops off, for example, deciduous trees in autumn.

Phloem - pronounced ‘flow-em’. The inner bark that transports food made in the leaves to other parts of the tree.

Photosynthesis - the chemical process by which trees (and all green plants) make food.

Xylem - the cells that transport water and nutrients from the roots to the rest of the tree.

Transpiration - part of the process by which trees move water all around the tree (even the tops of the tallest trees) and evaporate it from the surface of leaves etc.

Key Stage 2 curriculum links

Science
Sc1 Scientific enquiry
Planning, obtaining and presenting evidence and considering evidence and evaluating.
Sc2 Life processes and living things

Other curriculum links
Cross curricular studies
Children to develop and apply their literacy, numeracy and ICT skills
Introducing the Secret Life of Trees

A PowerPoint presentation is provided to introduce this unit to your class.

Depending on the level of the class, you can include more or less detail as required.

As part of the introduction, pupils can be asked to label the parts of a tree on the blank diagram provided. Depending on their ability, the new vocabulary can be written onto the whiteboard or blackboard as a prompt.

Pupils can use either simple names such as trunk or the more specialist terms such as cambium, phloem and xylem.

Acting it out

To further reinforce the parts of the tree and what each of them does, the class can act out being a whole tree together.

Equipment:
- Secret life of tree cards
- Challenge cards
- A supply of small balls to represent food
- A supply of bean bags to represent water
- Chalk or tape

1. Go out into the playground or other outside area and mark the outline of a tree in chalk or tape on the ground. Include the canopy, trunk and roots.
2. Print and cut out enough secret life of a tree cards for one card per pupil. Print and cut out one copy of the accompanying tree challenge cards.
3. Take the class out to your tree outline and tell them that the class is going to become a tree.
4. Give each pupil a secret life of a tree card. Ask them to stand on the tree outline where they think they should be. Check they're in the right place and get each group to shout out what bit of the tree they are. Give the ‘food’ (small balls) to the leaves and ‘water’ (beanbags) to the root hairs.
5. Practice being a tree. What would happen everyday? For example, the cells in the trunk would move food from the leaves to the big, fat roots and the water from the root hairs to other parts of the tree. Practice passing a few of the balls and beanbags around.
6. Explain that it's not easy being a tree and you have to survive everyday. Pick a challenge card. How will the tree respond to the challenges? Ask the pupils to act it out.
7. Continue until you have finished all the challenges.
Planning your investigations

You can choose as many or as few investigations to undertake as suits the ability of your pupils and the time you have available.

The investigations are designed to be carried out in small teams of pupils. This could be approached in one of two ways:

Approach A: Each team carries out every investigation
Approach B: Investigations are split up between teams (one or two investigations per team) and then each team reports the method and findings back to the rest of the class.

An investigation sheet is provided for pupils for indoor and outdoors.

Investigations to do indoors

- The great celery experiment - to show how the phloem moves water and nutrients from the roots up the tree
- Are all leaves the same?

Investigations to do outside

The Woodland Trust website can help with finding a wood to visit for outdoor investigations. Investigations might include:

- Finding scars - looking for leaf scars
- Sweaty trees - a practical demonstration of transpiration
- Listening to trees - actually hear sap moving up the tree trunk
- Hug a tree - identify and measure the girth of a tree to work out its age
- Bark comparisons - looking at the differences in bark

Additional investigation and activity ideas

There are many other tree based activities available free from the Woodland Trust at www.naturedetectives.org.uk

Try dispersal of the species activities about seed dispersal at http://www.naturedetectives.org.uk/download/worksheet_seeds

Why not plant some trees in your school grounds so you can watch the secret life of trees close up!

Get free advice on growing trees from seed and tree planting at www.woodlandtrust.org.uk/hedge

And seed to tree activities at www.woodlandtrust.org.uk/community

Discussion and reinforcement

Discussion question to finish with could include:

q What happens to the secret life of trees in different seasons? What happens to their leaves? Do they grow as much in each season?

Get a free factsheet on why leaves change colour in autumn at www.naturedetectives.org.uk/downloads/facts_autumncolour

q Why are trees important to us and our lives?

Some ideas:
- Provide oxygen
- Soak up CO₂
- Provide food and clothing
- Provide things we use like paper, furniture, firewood etc
- Habitats for wildlife
- Shelter
- Reduce noise pollution
- Can provide wind brakes and privacy
- Flood prevention
- Enjoyable to look at
- Woods for recreation and health
- Provide shade
- Provide inspiration
- Woods provide jobs
- Prevent erosion on hillsides and banks
- Helps to make soil
- Shelter
- Flood prevention
- Used as Christmas trees and to climb!

Reporting the findings

It is important to report back after any investigation what has been found. Depending on whether you have taken approach A or B, reporting formats will differ.

If you have taken Approach B, you could use ‘science fair’ style reporting. Each team could set-up a display of their work and ‘man’ their stand for other pupils and even parents to come and view what they have done and what they have discovered as a result.
The Secret Life of Trees
Teachers’ Notes

Useful resources

Woodland Trust website
More information about woods and how they are cared for
www.woodlandtrust.org.uk
A comprehensive tree guide from the Woodland Trust
www.british-trees.com

Nature Detectives
For great activity ideas for exploring the outdoors and identification charts
www.naturedetectives.org.uk/schools
Try the tree pack for tonnes of tree resources
www.naturedetectives.org.uk/packs/trees.htm

Ancient Tree Hunt
More information about ancient woodland and trees and activity ideas
www.ancient-tree-hunt.org.uk

Learning Outside the Classroom
Practical help with planning a fieldtrip
www.lotc.org.uk
The Secret Life of Trees

Flowers, fruits nuts and seeds.
Like the hospital maternity ward, they help to make new trees.

Leaves.
Like food factories for the tree, they make food using a process called Photosynthesis.

Inside the tree - xylem, phloem, heartwood
Like motorways in the tree, they transport food, water and nutrients to where they need to go.

Bark.
Like a security team for the tree, bark fends off insects, diseases, injuries and mammals.

Tiny root hairs.
Like thousands of drinking straws, they suck up water and nutrients from the soil.

Big, fat roots.
Like warehouses, they store food for use later.

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