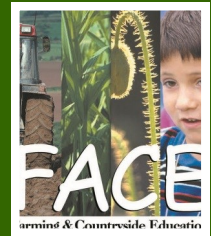
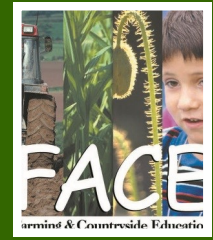


Science Skills Sharing



Farming & Countryside Education
Stoneleigh Park, Warwickshire, CV8 2LG
www.face-online.org.uk

Science Skills Sharing



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Science Skills Sharing



Introduction

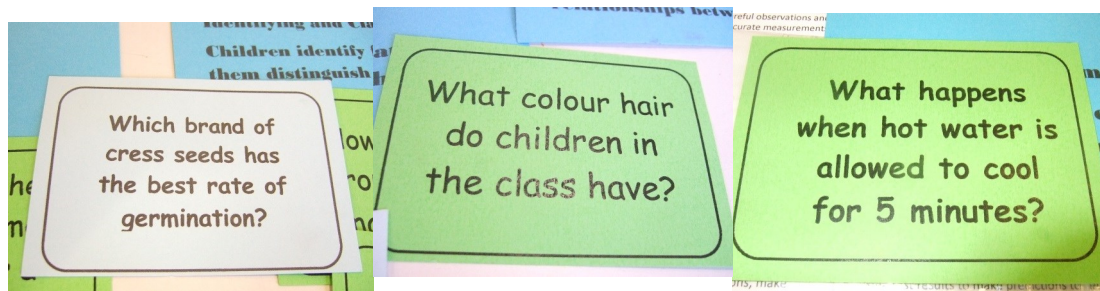
Following on from the success of the Geography Skills Sharing publication, we decided to use the same format to record and present ideas for Science activities. Once again, this began with an event hosted by Longshaw Discovery Centre in the Peak District where a group of almost thirty outdoor educators met. We comprised Peak District Rangers, Derbyshire Environmental Studies Service, National Trust staff, Wildlife Trust educators, farmers who offer educational visits and, of course, Farming & Countryside Education (FACE) representatives.

We spent the morning being introduced to the new science national curriculum by Nicola Beverley of the Association of Science Educators (ASE) and we looked at ways of delivering it through outdoor activities.

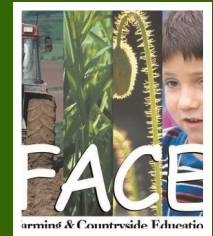
Nicola's Powerpoint presentation and further detailed helpful outlines and ideas for working with the new science curriculum can be found at <http://www.face-online.org.uk/science/beyond-the-classroom-new-national-curriculum-science-ks1-2>

Then in the afternoon, group members demonstrated particular activities which are reproduced here for you to try with groups of children. Some require specific equipment but others are based on simple principles.

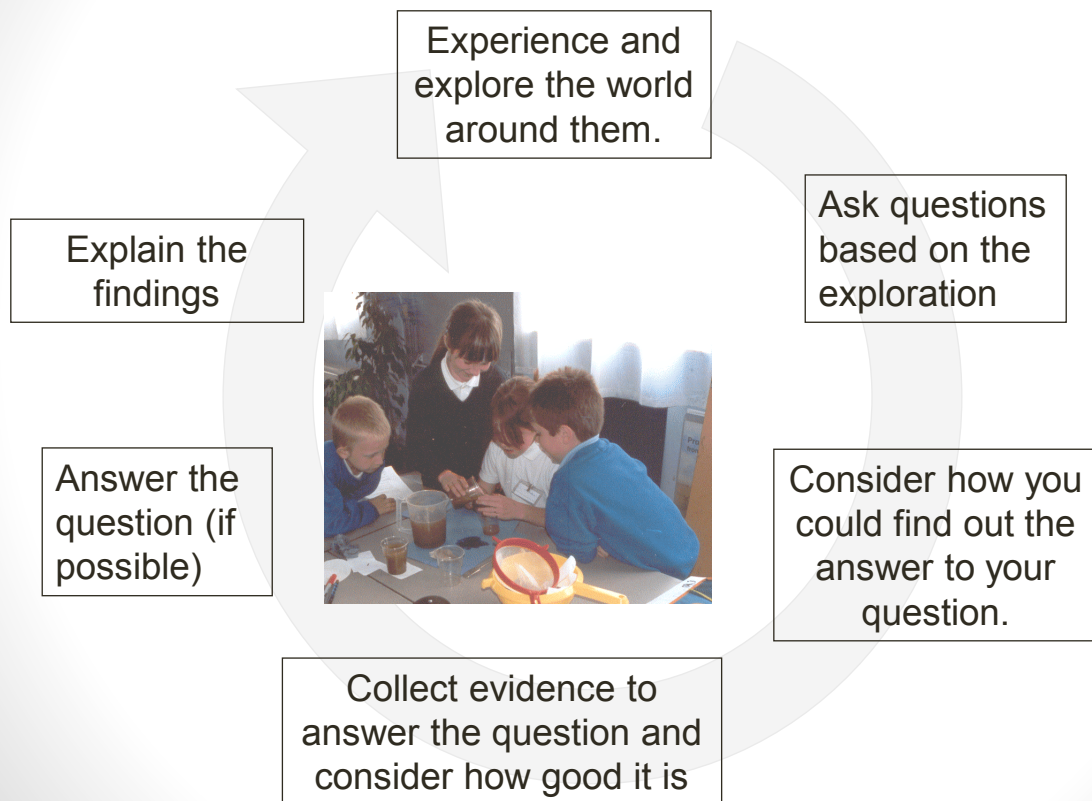
The key to the new curriculum seems to be to encourage children to take a questioning approach so try these activities to stimulate their enquiring minds!



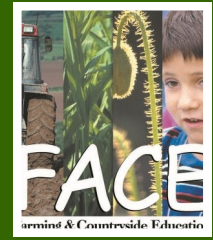
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The scientific enquiry process...



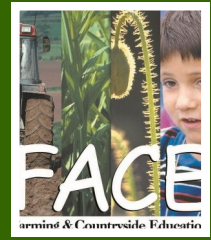
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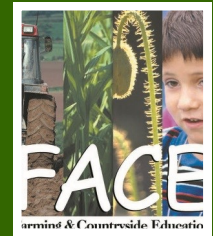
Hedgerow Birds Game

Resources required	Some pipe cleaners to be worms/caterpillars. Some bright colours, others browns and greens.
Space required	A hedgerow with flat area to run about on.
Instructions	<p>Split the group into two teams and stand them by the hedge. Explain that they are little birds that live in the hedgerow. Scatter the caterpillars about 10m from the hedge, making sure they are well spread out. The teams then have a relay race: one child runs out, grabs a caterpillar and runs back; the next team member goes and so on, until one team wins. You should find that the brightly coloured caterpillars have been “eaten” more than the camouflaged ones.</p> <p>Replace the caterpillars and run the race again, this time with a sparrowhawk to catch the sparrows as they fly out of the hedge. When a child is tagged by the sparrowhawk they drop out of the game and their next team member goes.</p>
Comments	<p>Fun way to introduce concepts of camouflage, food chains, predator prey relationships and the importance of habitat management to support food chains.</p> <p>Caterpillars could be hidden in the hedge to change the game. Hanging up all the captured caterpillars in a line would show the colour variations clearly.</p>
Suggested by	Bobbie Harvey

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Human Line Graphs

Resources required Two ropes, numbers from one to ten on cards (preferably laminated to reuse them), bean bags or stones to weight cards down, rulers, 20 twigs and people

Space required Anywhere approx 5m squared.

Instructions Primary students often struggle with drawing graphs and this method seems to help them to visualise what a graph should look like.

A simple investigation can be considered looking at leaves and predicting whether the longer the leaf, the wider it will be. Get them to measure the width and length of one leaf each (same plant though). Construct a graph on the ground with ropes, and add twigs and numbers at equal distance along each axis - measured with one person's paces.

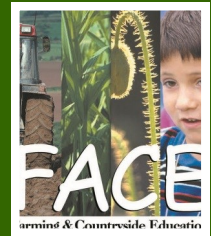
Keep referring to how this would look on a graph on a piece of paper. It is good practice to also add the axes' titles, and the graph title.

Get them to stand at the point on the graph that represents their leaf. Do one demonstration first.

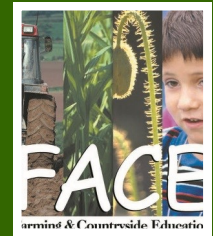
Get them to consider whether there is a relationship. If they can't see it whilst in the graph, let individuals come to the base of the graph to look at it.

Suggested by Kim Hudson, Inspiring Outdoors

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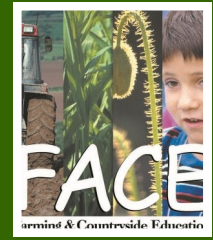


Bashing Leaves

Resources required	Cloth squares (old white sheeting fabric is ideal) Hammers with small heads Flat surface to hit on or small boards
Space required	Enough space to use hammers safely.
Instructions	Choose a leaf, fold the fabric over it and place the fabric on a flat surface. Hit it with the hammer. Keep working over the surface of the leaf until the pattern of the leaf appears.
Comments	Works well with herb leaves as you also get a smelly picture!
Suggested by	Sheffield Wildlife Trust (via Bobbie Harvey)



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Build a Tree!

Resources required

None

Space required

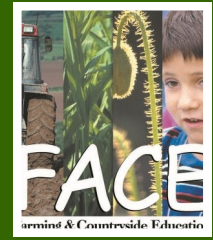
Flat area of dry ground

Instructions

This activity works well for groups between 15 and 35. The activity is all about how trees work, make food and grow. The aim is to make the group into a functioning tree, building outwards from the centre of the tree to the bark



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Build a Tree! continued

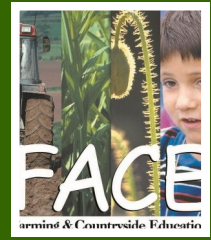
- **Bark** The bark protects the tree from disease, desiccation and attack by animals and fungi. The leader can then make the whole tree work by shouting out the commands and maybe pretending to attack the tree as a wood boring beetle.
- **Heartwood** Gives the tree strength and support. The heartwood is old and dead but well preserved. For this you need, tall, strong people.
- **Taproots** Anchor the tree to the earth. The taproot burrows deep into the ground and holds the tree upright. You need one person to sit at the base of the heartwood and face outward.
- **Lateral roots** Draw water from all around the tree up fine capillary tubes. The roots must cover as wide an area as possible. Need people with long hair. Lay them on the ground around the heartwood with hair at the edge of the circle. Spread out their hair so it covers as much ground as possible.

Roots draw up the water. When the tree starts "working" you repeatedly say "SLURP!"

- **Sapwood** Lifts the water from the roots to the rest of the tree. Lifts hundreds of gallons of water a day by capillary action. For this you need people to form a circle round the heartwood, facing inwards. (Make sure they do not tread on the roots.)

When the tree starts "working" you say "whoosh!" with a pumping action of the arms.

Science Skills Sharing



Build a Tree! continued

- **Live wood (cambium/phloem)**

The cambium is the growing part of the tree, just outside the sapwood,. The phloem, inside the bark, carries the food made by the leaves to the rest of the tree. Stand in a circle facing inwards around the sapwood.

When the tree is "working" put arms in the air and flutter fingers like leaves. Bring down the food repeatedly saying "whoo!"

Suggested by Bobbie Harvey, FACE East Midlands, based on Joseph Cornell activity.

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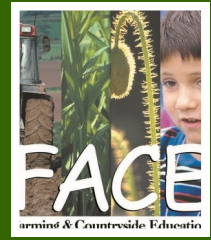


Climate Change Simulation

Resources required	<p>An 'Earth' (Large Earth balloon, a globe, circle drawn on the playground)</p> <p>A sun 'leader' (represented by a teacher / assistant)</p> <p>Pupils to represent the sun's energy (about 12 pupils - yellow). To represent the atmosphere (about 10 pupils - blue). To represent atmospheric pollution (about 8 pupils - red)</p> <p>Labels/Badges or coloured bands / bibs (yellow, blue and red) for pupils to hold or wear</p>
Space required	Large outdoor playground, field or large hall.
Instructions	<p>Aim:</p> <p>To physically represent the Earth, its atmosphere and pollution and understand the link between atmospheric pollution and climate change.</p> <p>To understand that 'climate change' is different from the 'greenhouse effect' and understand some of the basic scientific principles of climate change.</p>
Timing	20 to 30 mins for a whole group
Suggested by	<p>Georgina Greaves, Derbyshire Environmental Studies Service, Derbyshire County Council Tel: 01629 533439</p> <p>Email: georgina.greaves@derbyshire.gov.uk or website www.derbyshire.gov.uk/environmentalstudies</p>

See Instructions and diagrams below for 'how to'.

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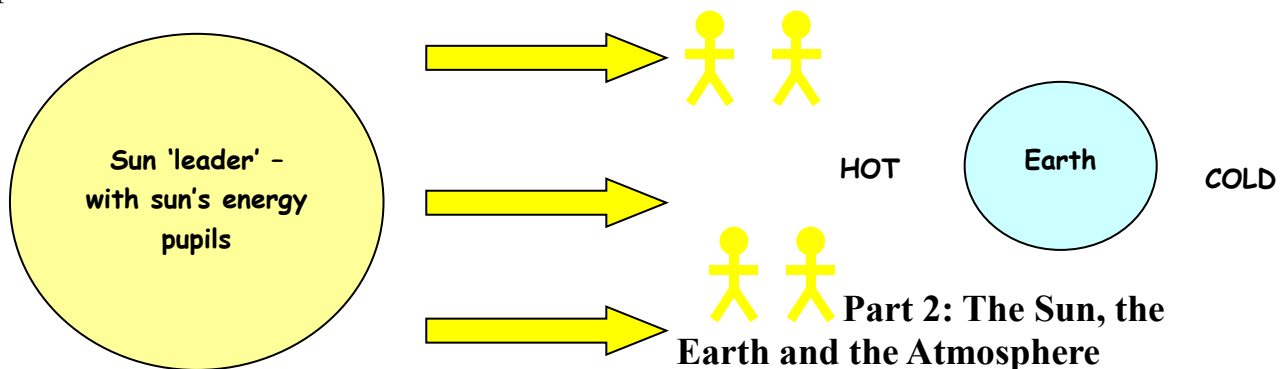
Method:

Part 1: The Earth and the Sun

The 'sun' sends some of its sun's heat and energy (some of the 'sun's energy' children) to the Earth.

Teacher's Notes:

Discuss what the planet would be like. No atmosphere means that there are extremes of temperature from VERY hot to VERY cold. No life on earth would be possible.



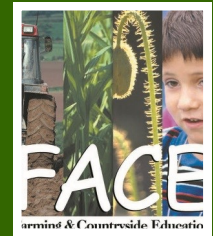
KEY:

Children representing 'sun's energy' - yellow

Children representing 'the atmosphere' - blue

Children representing 'atmospheric pollution' - red

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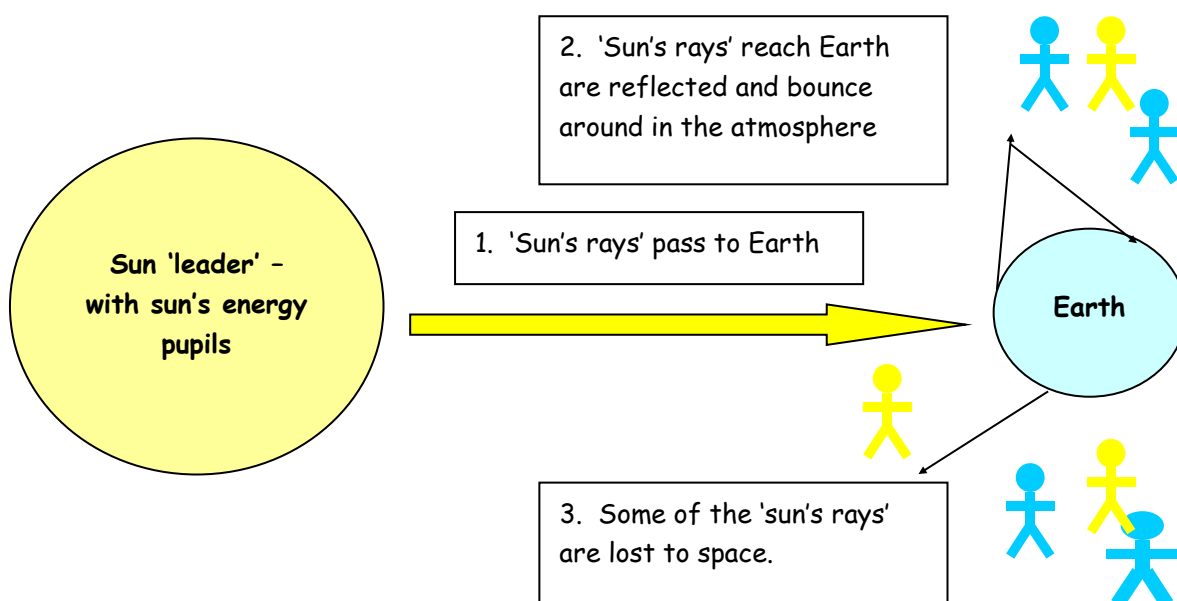
Part 2: The Sun, the Earth and the Atmosphere

Arrange the children who represent 'the atmosphere' in a circle around the Earth about 3 metres away.

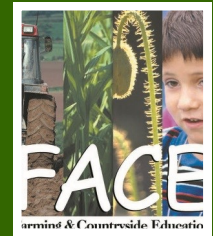
Send some of the 'sun's energy' children from the Sun to the Earth. The sun's rays pass through the 'atmosphere' (between the gaps in the 'atmosphere' children) then 'bounce' off the Earth's surface. Some of the sun's rays are trapped between the earth and the atmosphere and a few are 'lost' back out to space.

Teacher's Notes:

Explain to pupils what the 'atmosphere' is (the layer of gases surrounding the planet). The sun's rays reach the Earth's surface where they can be absorbed or reflected back. The atmosphere 'protects' Earth because the atmosphere can trap the sun's energy and can retain heat even when facing away from the sun. This regulates the heat and gives our planet the temperate climate which provides the conditions for life on Earth (this is the Greenhouse Effect).



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Part 3: The Sun, the Earth, the Atmosphere and Pollution

Discuss what pollution might be introduced to the 'atmosphere' and where these come from. (Mention Carbon Dioxide from burning fossil fuels, Nitrous oxides from cars etc.)

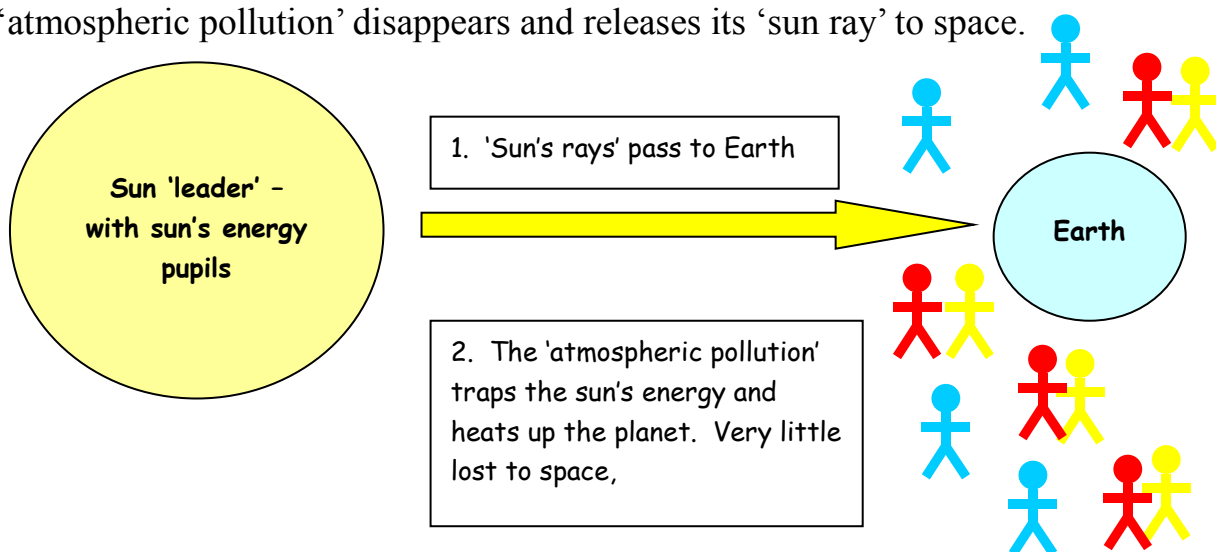
Add the 'atmospheric pollution' pupils into the atmosphere.

Send in some more 'sun's rays' – The atmospheric pollution pupils 'catch and trap' the sun's energy that comes to them. The end result being more 'sun's rays' are trapped in the atmosphere.

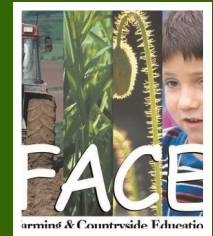
Teacher's Notes:

Some pollution (the Greenhouse gases) trap heat energy in the atmosphere and this increases the temperature of the planet. This is climate change. The atmosphere becomes warmer and more changeable the more pollution there is. Some pollution also destroys the ozone layer and allows harmful rays to reach the Earth. Discuss who or what causes pollution. Is climate change bad for everyone?

A final addition can be the 'save the Earth' option. Pupils suggest ways to reduce pollution (e.g. turn off lights, ride a bike etc.) – for each suggestion an 'atmospheric pollution' disappears and releases its 'sun ray' to space.



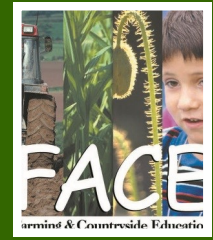
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Comments This activity is one of a range of activities developed for the teaching and learning elements of the 'Everybody's Talking About Climate Change' project and now form part of a free to loan box of Climate Change resources available from Derbyshire County Council's Eco-Schools Officer. Contact Anne.Welch@derbyshire.gov.uk if you are a Derbyshire school wishing to loan the Climate Change resource box.



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Demonstrating the Greenhouse Effect

Resources required

2 small glass tumblers
1 large clear glass or plastic bowl
Water
Lots of sunshine!

Space required

Bench, table or flat floor space on a sunny day

Instructions

Half fill the glass jars with water

Put the jars somewhere sunny such as outside or next to an open window on a hot day. (This could be done with a hot lamp to represent the sun if necessary)

Put the clear bowl over one of the jars, leave the other jar open

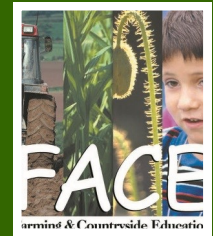
Leave the jars for an hour

Remove the bowl from the covered jar

Dip your finger into each jar and compare the temperature



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Comments

A thermometer could be used to compare the start and finish temperatures if desired.

Results could be graphed or recorded in table format

Encourage pupils to explain and discuss verbally and record in written form why the water in the covered jar would be warmer

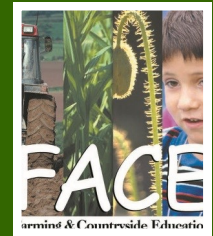
The bowl is a heat trap, like our atmosphere, letting in light energy but trapping the heat (infrared) energy. This is what the carbon dioxide and gases in our atmosphere do keeping the Earth warm and in balance (this is the **Greenhouse Effect**).

Discuss with pupils what would happen if they left the water for a long time. This can link the experiment to the water cycle and evaporation. The open jar would evaporate and demonstrates 'a dry inhospitable planet'. The bowl would 'trap in' the water; it would condense on the sides of the bowl and fall back into the jar. This demonstrates our clouds and rain showing how our atmosphere and the water cycle protects our planet. As water heats it will expand (probably not visible but is an issue in terms of sea level rise)

Suggested by

Georgina Greaves, Derbyshire Environmental Studies Service

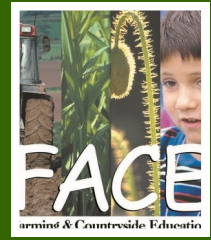
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Demonstrating Climate Change

Resources required	2 thermometers 2 small containers $\frac{1}{4}$ cup of vinegar $\frac{1}{4}$ cup of water 2 glass jars with sealing lids 1 teaspoon baking soda (5ml) 1 '5 minute' egg timer or clock Record sheet (see attached) Labels for jars A sunny spot!
Space required	Bench, table or flat floor space on a sunny day.
Instructions	Mix the vinegar and water together Half fill the 2 small containers with this mixture Put a container inside each glass jar Put a thermometer inside each glass jar Add the baking soda to one of the small containers. Put the lid on the glass jar STRAIGHT AWAY. Label this jar "with CO ² " Put the lid on the other jar and label this one "no CO ² " Read the temperatures and write these down on your record sheet Put the jars in a sunny space Record the temperatures every 5 minutes for $\frac{1}{2}$ hour Compare the temperatures of the "with CO ² " and "no CO ² " jars, what do you notice?

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Demonstrating Climate Change

- Comments

The reaction of the vinegar, water and baking soda releases CO₂ into the jar (like releasing CO₂ into the atmosphere). This CO₂ traps more of the heat that passes into the jar and causes this jar to heat up more.

This is like **Climate Change**; the more gases released, the more heat will be trapped over time.

Discuss the chemical names of Carbon Dioxide and other greenhouse gases and where they come from (e.g. burning fossil fuels, cutting down trees).

Discuss how important plants are as ‘stores’ of Carbon Dioxide

What would happen if more baking soda were added?

Link to real life – What will happen if we keep releasing Carbon Dioxide?

Graph the results manually or using an IT package

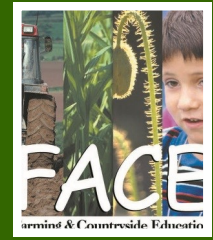
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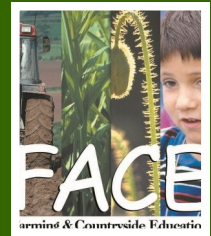
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Food Web

Resources required	Pictures (ideally laminated) of creatures to be found in your setting e.g. fox, blackbird. Add the words “Take this picture to the habitat where you think I might hunt for food. What do you think I eat? What do you think might eat me?”
Space required	A designated area of your farm/setting.
Instructions	<p>Split the children into pairs or groups of three and give each a picture card. Ask them to walk around the area you have designated (remember to give them boundaries) and to decide where the creature in their picture lives.</p> <p>When the class comes together again, discuss their findings and see if you can place the pictures to form a food web or food chain.</p>
Comments	Another fun way to introduce concepts of camouflage, food chains, predator prey relationships and the importance of habitat management to support food chains.
Suggested by	Helen Rhodes, New Hall Farm, Barnsley

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Fox

Take this picture to the habitat where you think I might hunt for food.

What do you think I eat?

What do you think might eat me?



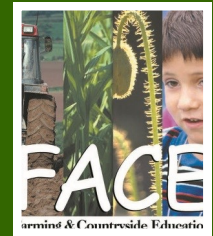
Magpie

Take this picture to the habitat where you think I might hunt for food.

What do you think I eat?

What do you think might eat me?

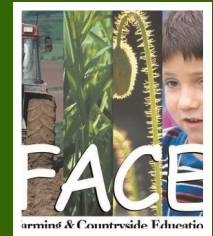
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Listening to Trees

Resources required	Stethoscope and trees
Space required	Large outdoor playground, field or large hall
Instructions	In the spring it is possible to hear the sap moving inside trees using a stethoscope.
Comments	This doesn't work with all trees, you may have to experiment to find the best ones. Usually a hard wood, not too big or too small and with thin bark. You will need to hold the stethoscope very still to hear the tree rather than just the crackle caused by the stethoscope moving.
Suggested by	Bobbie Harvey, East Midlands FACE

Science Skills Sharing



Walk Through Keys

Resources required Four animal/plant pictures clearly showing their anatomical features, A4 print outs of questions to form a key, stones or bean bags to weight the print outs to the ground.

Space required Anywhere approx 3m squared plus viewing area .

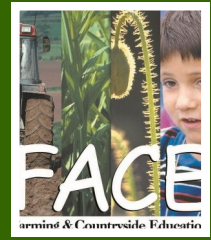
Instructions Children often struggle to use the branching keys that we ask them to use - they may look good but they just guess the animal/plant which vaguely looks right.

Find four photos of animals or plants within the habitat you are studying. These should clearly show certain features.

Make up a question which can be answered yes for two of the organisms and no for the other two. Print this on an A4 card and create yes and no A4 cards with arrows on to go underneath them, leading to two more questions. These questions should decipher between each pair of animals as in a branching key.

These should all be laid out on the floor in front of the class. One person should hold up one photo for all to see, then others read out the first question in the key, then the next, and the next. That person can physically walk to the next question if you want them to. By doing this very brief activity before giving them a key to use makes it much easier for them to follow it.

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Comments

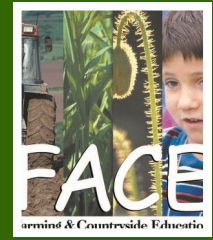
In addition, you, or the students, should create keys which are site specific. The aidgap keys are fabulous but have a lot of content and can be confusing for young primary age students. Photos for homemade keys can be downloaded, subject to copyright, from www.arkive.org

Suggested by

Kim Hudson, Inspiring Outdoors



Science Skills Sharing



Footprint Stamps

Resources required	Wood, broom handle, camping mat material and glue.
Space required	An area of flat dry concrete, or large pieces of paper (the back of old rolls of wall paper work well).
Instructions	Use the foot print stamps with just water on dry concrete or with muddy water onto paper to make animal tracks.
Comments	<p>To make the stamps you will need to cut up a broom handle into short lengths and screw these to a flat piece of wood to make the stamp. (Photo on next page.)</p> <p>You can find lots of outlines of animal tracks using an internet search. Print out and use as a template.</p> <p>The footprints are made from dense foam camping mat material cut into the various shapes and attached to the wooden base using a water proof glue (“evo-stik” is ideal) You can also use rubber backed carpet to cut the foot print shapes out of but this will not be as durable.</p>
Suggested by	Bobbie Harvey, East Midlands FACE

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