



Free downloadable lesson plan: Exploring (Natural) Materials - Building Structures

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The Forestry Commission (FC) looks after more than 1500 woods and forests in England – together they make up the public forest estate. Forests provide endless learning opportunities, and are great places for finding and collecting natural materials. With very little equipment, you and your class will be able to build some exciting and innovative structures in your local FC woodland.

Curriculum links:

Design and Technology: (KS2) select from and use a range of materials and components, according to their functional properties and aesthetic qualities; evaluate ideas and products against design criteria and consider the views of others to make improvements; apply understanding of how to strengthen, stiffen and reinforce more complex structures.

Before your visit:

Before coming on your school trip, have a discussion with the children:

- What do they think the forest will be like?
- What sort of natural materials would they expect to find in the forest, and how could they be used?
- How would they go about building a nest, a bridge, a tower, using forest materials?
- How many things can the children think of that are made of wood?

Research different structures that are made of wood e.g. log cabins or bridges.



For a great introduction to the forest and how it is cared for by the Forestry Commission, visit www.forestry.gov.uk/england-learning and look at the downloads page, where you will find an informative, child-friendly photo show, with notes and discussion questions. You will also find some useful health and safety advice for your visit.

You will need to bring:

- Tree ID guides
- Flask of hot water
- Thermometers
- Drink bottle full of water
- Small containers with lids (capable of holding hot water) – we suggest yogurt drink pots
- A clipboard, paper and pencil for recording results
- Tape measure
- Egg (or tennis ball)
- String (3 metres per group of 5 children) and bailer twine (3 metres per group of 5 children)

Forest Lesson Plan

Starter activity

Find an area in the forest to sit or stand in a circle. Discuss the children's first impressions of the forest.

**Is this what they were expecting?
Is anything different?**

Explain that they are going to explore the forest to discover what natural materials can be found, and how they can be used to build things.

How to 'Collect with Respect'

- Collect from the forest floor wherever possible
- Spread your load – carefully collect only a few leaves or petals from any particular plant or tree
- Do not disturb wildlife habitats e.g. log piles
- Do not pick berries or fungi as they may be poisonous

Mouse nest game

Explain that trees and forests are really important to people, both in providing timber (wood) to make things, and in offering places for people to enjoy all sorts of outdoor activities. Forests also provide homes and food for a wide variety of wildlife, and many animals and birds use different forest materials to build their homes.

Can the children think of any animals, birds or minibeasts that live in UK forests? Do they know the names given to any of their homes, or where they make their nests?

For example, a squirrel's nest is called a drey, a badger lives in a sett, a fox lives in an earth and rabbits live in warrens etc.

Look around for animal homes – don't forget to look up in the treetops, and down on the ground.

Divide the children into small groups. Their task is to build a warm and cosy nest for a mouse, on the ground.

Encourage the children to think about the properties of the materials they are using. For example, which sticks work best for creating the structure of the nest, and which materials are best for insulating it?

To test the effectiveness of each nest you will need some thermometers, a flask of hot water and some small containers with lids (capable of taking hot water), e.g. yogurt drink pots. When the children have finished making their nests, take the starting temperature of the hot water and write it down.

Give each group a container full of hot water to place in their nest. Leave one container without a nest as a control.

Leave the pots in the nest for 10-15 minutes, then ask each group to take a temperature reading of the water from their nest. The one with the highest temperature is the winner!



Mouse nest game (Continued)

Were all the nests more effective in keeping the water warm compared to the control mouse? Which nests worked best and why?

What insulating materials did the winning group use, and how thick was their layer of insulation?

Extension: Discuss that just as a mouse insulates its nest to conserve heat and keep warm, we need to do exactly the same in our own homes.

Do the children know what type of building materials we use to insulate our homes?

By stopping heat from escaping we need to use less energy to heat our homes. This is good for us in keeping our fuel bills down, but also good for the environment. By reducing the amount of fossil fuels that we burn, we can help to slow down climate change.

Tree identification

(try this activity while the 'mice' are cooling in their nests)

Ask the children to look for different types of trees – they can look for differences in the shape of the tree or its leaves, or differences in the bark colour and texture. Count how many different tree species they find altogether. **Do the children know the names of any of them?** Use the 'Trees in the Forest' explorer sheet from our activity downloads to identify them.

Can they tell if the trees are evergreen or deciduous?

Discuss the differences between evergreen and deciduous trees, and between broadleaves and conifers (see box).

Different species of tree are useful in different ways – their timber has different properties, and some are better for wildlife than others. The Forestry Commission plants and looks after a range of different species of trees, in order to maintain this variety.

Extension: The Forestry Commission also provides facilities for people to use while they are visiting the forest. **Can you see any wooden structures put here for this purpose e.g. trail posts, picnic tables, play equipment? Can you see people doing activities in the forest today?**

Tree words:

Coniferous – trees with cones and needles e.g. Scots pine, Douglas fir; usually evergreen

Broadleaf – trees with broad flat leaves e.g. oak, silver birch; usually deciduous

Evergreen – trees which keep their leaves all year round; mostly conifers (but not all e.g. holly is evergreen, but not a conifer)

Deciduous – trees which lose their leaves in autumn; mostly broadleaves (but not all e.g. larch is a deciduous conifer)



Egg Tower

Tell the children that you are now going to have a competition to see which group can make the tallest, freestanding structure using sticks collected from the forest floor.

Their structure must be able to support an egg at its highest point for a period of ten seconds.

Divide the class into groups. Give each group five minutes planning time to develop and discuss their ideas for the structure that they are going to build.

Remind the children that freestanding means that their structure must stand all by itself; it cannot lean against a tree or be dug into the ground. They may use any materials from the forest floor of a sensible size (no fallen branches or logs).

Demonstrate to the children that they should carry sticks by holding one end in their hand and dragging the other end on the forest floor behind them. In this way they cannot accidentally hit anyone else with their stick.

Give each group about 10 minutes to build their structures, then visit each structure in turn to test it with the egg. Encourage the children to count each ten seconds period aloud, and appoint two adults to measure the structures, and adjudicate as necessary!

Congratulate each group in turn for their efforts and evaluate the success of their designs. Which designs worked best and why?

Please remember to dismantle the structures, leaving the forest as you found it.



Building Bridges

Part 1 – a bridge for a bottle



Divide the children into groups of about 5. Give each group three lengths of string (each about 1 metre). Show the children a drinks bottle (which is full of water). They can hold it if they want to, or measure it, but cannot take it away from the teacher / leader.

The groups are then challenged to build a freestanding bridge using sticks (not tree stumps – that's cheating!) and the pieces of string.

The bridge has to be tall enough for the bottle to be passed underneath standing upright. It also has to be wide enough for the bottle to be passed underneath lying on its side, and strong enough for the bottle to balance on top for 10 seconds.

Hint: decide how much help you want to give the children – you could suggest using three sticks tied at each end, to make tripods (which are strong structures and will support the top of the bridge), OR they could build a tower of sticks at each end of the bridge using the same technique used in the previous activity.

Give the groups 10-15 minutes to build the bridges and then go round as a class to test each bridge for height, width and strength.

Part 2 – a bridge for a child

Working in the same groups, explain that now the children have had a go at building small bridges, they are going to try to build something bigger and stronger. This time, the bridge needs to be high enough for a child to crawl underneath it, and strong enough for a child to sit on top of it.

Give the groups more string – it needs to be thick string this time – we suggest bailer twine.

Health and safety point – children may fall off the bridges, but they are unlikely to be very high – we suggest that when the first child sits on the bridge, they are helped by other members of their team who can hold their hands. Once one child has tried the bridge, it is likely that they will all want to sit on it at the same time, which sometimes works, and sometimes ends up with a heap of children on the floor!

Give the groups 15-20 minutes to build the bridges and then, as before, go round as a class to test each bridge for height and strength.

Extension: Using the same sort of structure, with a tripod at each end (but taller), you can also create a swing that is strong enough for a child. For this, you would need to ensure that the sticks used in the tripods are fresh and strong, not old and rotten or they will break too easily.

Please remember to dismantle the structures and take away the string, leaving the forest as you found it.

Follow up work - back at school

Discuss the reasons why trees are really important to us. Mention that trees provide shade, release oxygen, act as wind breaks, prevent soil erosion and help to reduce flooding, as well as giving us a sustainable source of fuel that is less harmful than burning fossil fuels. Given their importance what can we do to help look after our trees and forests?

Investigate the FSC (Forest Stewardship Council) and find out what sort of products you can buy that have the FSC logo, meaning that they come from a responsibly managed forest.



All Forestry Commission woodlands in England are FSC certified – this means that they are managed carefully and responsibly. This is not the case in all parts of the world. Visit www.fsc.uk to find out more.



Investigate the properties of different types of timber (from different tree species) – which sorts of trees would you grow if you wanted to make cricket bats, or besom brooms? Which type of wood was used for Harry Potter's wand and for an old fashioned water divining rod?

Watch the forest cycle photo show (see 'before your visit' section), and discuss how the Forestry Commission ensures the sustainability of its forests – planting, thinning, felling, replanting...

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what you think...**

We'd like to know what you thought of this Forestry Commission learning resource.

Please visit www.forestry.gov.uk/learning and follow the link to our online questionnaire.

Many thanks for your help.