Collins

SNAP SCIENCE

SNAP SCIENCE EVALUATION PACK

DEVELOPED FOR THE NEW 2014 CURRICULUM

WRITTEN BY A TEAM OF CURRICULUM EXPERTS

TRY SNAP SCIENCE WITH YOUR CLASS TODAY

WHAT WILL I FIND IN MY SNAP SCIENCE EVALUATION PACK?

Complete lesson plans for the Year 3 Plants module : How does your garden grow?

Lesson 1: What do we know about plants?

Lesson 2: What do we know about leaves?

Lesson 3: What would happen if a plant lost its leaves?

Lesson 4: Are all roots the same?

Lesson 5: Where does the water go?

Lesson 6: Why do plants need stems?

Lesson 7: Where do new plants come from?

Lesson 8: What do flowers have in common?

Lesson 9: What do the bees do?

Lesson 10: How are seeds dispersed?

Lesson 11: Can plants survive without leaves?

Lesson 12: Am I the perfect plant?

Enrichment lesson 13: How amazing are some plants?

Enrichment lesson 14: Why are some flowers brightly coloured?

Enrichment lesson 15: How can we save the bees?

Access free sample resources for Snap Science on Collins Connect.

Visit connect.collins.co.uk/primary-teaching-resources to find all the digital resources you need to deliver this module. These include:

- videos
- animations
- interactive activities
- resource sheets
- writing frames
- slideshows
- challenge slides

INTRODUCTION

WELCOME TO SNAP SCIENCE

Welcome to Snap Science – your toolkit for the new curriculum.

Written by a team of leading experts, Snap Science has been created to help you develop a high-quality scheme of work for your school, which covers the aims, knowledge, conceptual understanding and full range of scientific enquiry types from the new Programme of Study.

WHAT IS SNAP SCIENCE?

Snap Science comprises of two main elements for each year group:

- a printed Teaching Framework with sequenced lesson plans for each topic in the new Programme of Study
- an online resource kit with a flexible planning tool, editable lesson plans, integrated assets for every lesson (including videos, animations and slideshows), as well as support for assessing and tracking children's progress.

WHAT IS THE APPROACH TO TEACHING AND LEARNING IN SNAP SCIENCE?

Snap Science has been developed in line with the latest research in pedagogical best practice, as well as being based on the classroom experience of the author team, who have spent many years working closely with children to develop successful strategies for teaching and learning in science.

Snap Science has been built on a series of core principles:

- Every science lesson needs to be purposeful and meaningful, with children genuinely motivated to find answers to questions about the world around them both in and outside of the classroom.
- It is through working scientifically, testing ideas against evidence, that children develop an understanding of the nature and processes of science, including key scientific knowledge and concepts.
- A good science curriculum is progressive, so children can systematically build their understanding of key ideas and their scientific skills.
- Children learn best when they are actively involved in their own learning, so learning intentions and the criteria for success must be shared and understood.
- Every child can achieve, so activities should be differentiated to provide access and challenge for all.
- Assessment for Learning is an integral part of every lesson, as it provides information that can be used to help further learning.

Every lesson in Snap Science helps you to fulfil these core principles and to create exciting, engaging science lessons where children have the opportunity to ask questions, explore and discover more about the world around them in an authentically scientific way.

RESOURCE FEATURES

THE FRAMEWORK

The printed Teaching Framework is organised into a series of modules, based on the topics in the new Programme of Study. Each module begins with an introduction that provides background information on the topic as well as advice on the common misconceptions children might hold. Each module then contains a sequence of lesson plans.

A SNAP SCIENCE LESSON

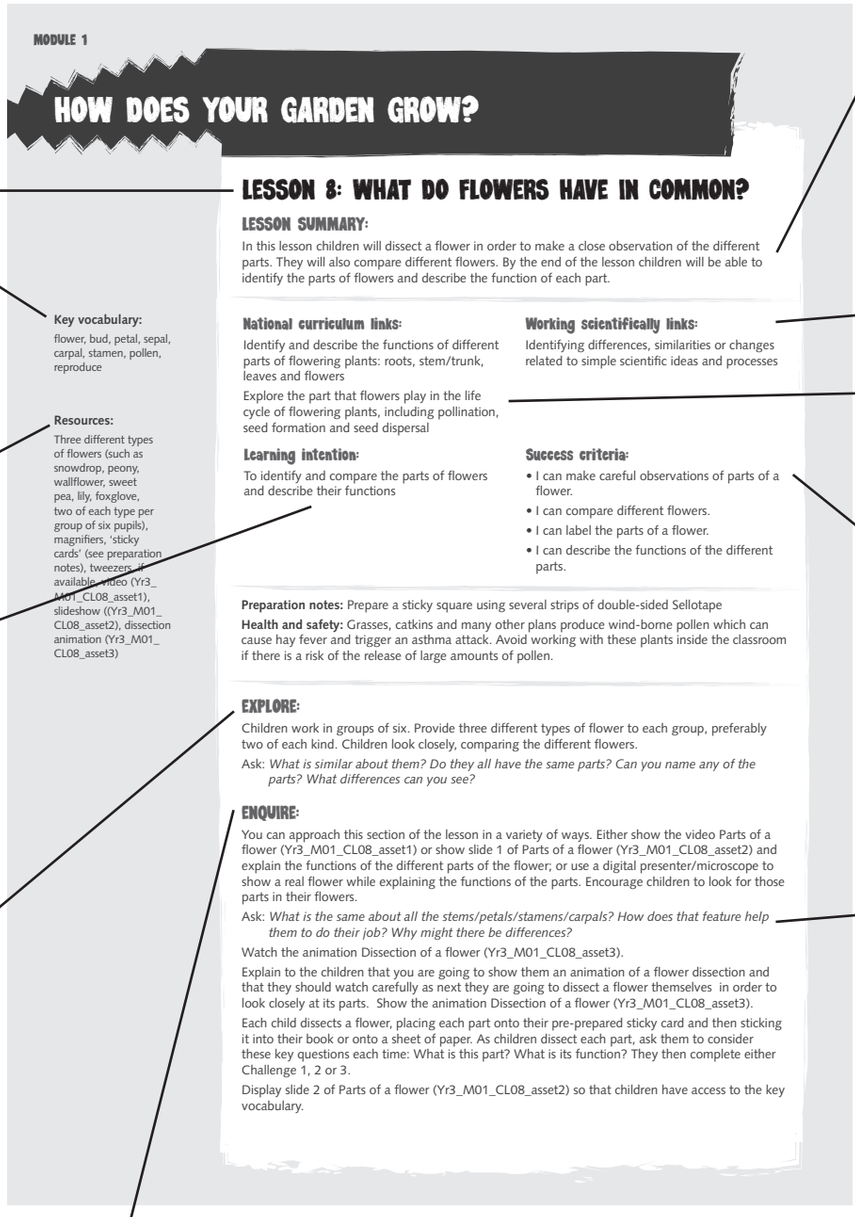
Every lesson begins with a question – providing a focus for children to explore and think about.

Key vocabulary highlights important technical and descriptive language that should be used as part of the lesson.

Resources lists all the materials you will need.

The **Learning intention** establishes a clear aim for what children should learn over the course of the lesson.

The **Explore** section begins the lesson. It introduces the science phenomena, sparking curiosity and enabling children to share their previous understanding and generate questions to investigate.



MODULE 1

HOW DOES YOUR GARDEN GROW?

LESSON 8: WHAT DO FLOWERS HAVE IN COMMON?

LESSON SUMMARY:

In this lesson children will dissect a flower in order to make a close observation of the different parts. They will also compare different flowers. By the end of the lesson children will be able to identify the parts of flowers and describe the function of each part.

Key vocabulary:

flower, bud, petal, sepal, carpal, stamen, pollen, reproduce

Resources:

Three different types of flowers (such as snowdrop, peony, wallflower, sweet pea, lily, foxglove, two of each type per group of six pupils), magnifiers, 'sticky cards' (see preparation notes), tweezers, if available, video (Yr3_M01_CL08_asset1), slideshow ((Yr3_M01_CL08_asset2), dissection animation (Yr3_M01_CL08_asset3)

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Working scientifically links:

Identifying differences, similarities or changes related to simple scientific ideas and processes

Learning intention:

To identify and compare the parts of flowers and describe their functions

Success criteria:

- I can make careful observations of parts of a flower.
- I can compare different flowers.
- I can label the parts of a flower.
- I can describe the functions of the different parts.

Preparation notes: Prepare a sticky square using several strips of double-sided Sellotape

Health and safety: Grasses, catkins and many other plans produce wind-borne pollen which can cause hay fever and trigger an asthma attack. Avoid working with these plants inside the classroom if there is a risk of the release of large amounts of pollen.

EXPLORE:

Children work in groups of six. Provide three different types of flower to each group, preferably two of each kind. Children look closely, comparing the different flowers.

Ask: *What is similar about them? Do they all have the same parts? Can you name any of the parts? What differences can you see?*

ENQUIRE:

You can approach this section of the lesson in a variety of ways. Either show the video Parts of a flower (Yr3_M01_CL08_asset1) or show slide 1 of Parts of a flower (Yr3_M01_CL08_asset2) and explain the functions of the different parts of the flower; or use a digital presenter/microscope to show a real flower while explaining the functions of the parts. Encourage children to look for those parts in their flowers.

Ask: *What is the same about all the stems/petals/stamens/carpals? How does that feature help them to do their job? Why might there be differences?*

Watch the animation Dissection of a flower (Yr3_M01_CL08_asset3).

Explain to the children that you are going to show them an animation of a flower dissection and that they should watch carefully as next they are going to dissect a flower themselves in order to look closely at its parts. Show the animation Dissection of a flower (Yr3_M01_CL08_asset3).

Each child dissects a flower, placing each part onto their pre-prepared sticky card and then sticking it into their book or onto a sheet of paper. As children dissect each part, ask them to consider these key questions each time: What is this part? What is its function? They then complete either Challenge 1, 2 or 3.

Display slide 2 of Parts of a flower (Yr3_M01_CL08_asset2) so that children have access to the key vocabulary.

The **Enquire** section is where children will answer these questions. It is divided into three levels of differentiated challenge to ensure all children can access and master the lesson's learning intention.

The **Lesson summary** gives a quick overview of the main activity in the lesson, so you can see at a glance what you will be covering.

Each lesson links directly to the **Programme of Study** and the Working Scientifically criteria.

The **Success criteria** are written in child-speak. They exemplify what successful attainment of the learning intention looks like.

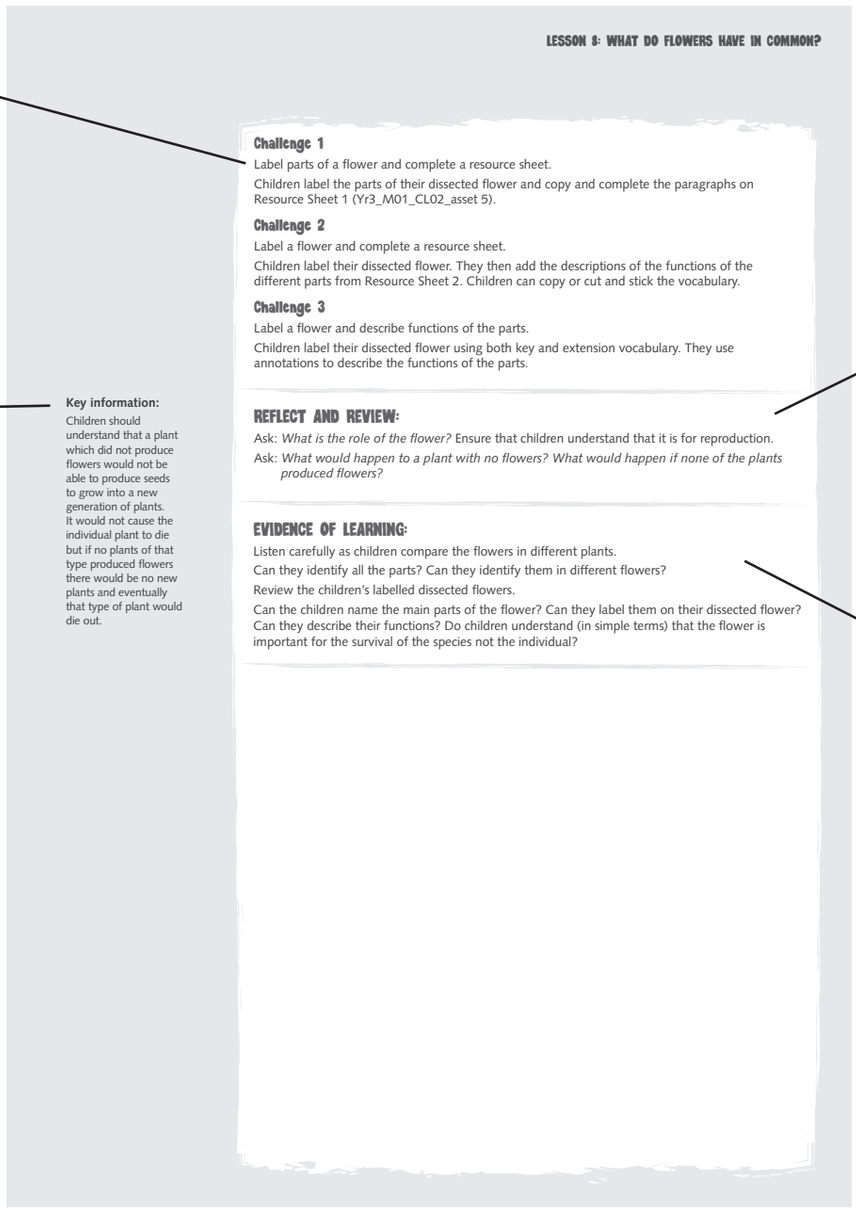
Prompt questions are included throughout as ways of eliciting or developing children's understanding.

Prompts are provided throughout the lesson plan to highlight when there is a related asset for you to use.

Key information is provided throughout, providing helpful tips and scientific background knowledge.

The **Review and Reflect** section provides the opportunity for children to consolidate the key learning from the lesson.

Evidence of Learning provides assessment guidance for teachers, indicating the kinds of things children might say, write, draw or do to demonstrate they have achieved or exceeded the learning intention.



LESSON 8: WHAT DO FLOWERS HAVE IN COMMON?

Challenge 1

Label parts of a flower and complete a resource sheet.

Children label the parts of their dissected flower and copy and complete the paragraphs on Resource Sheet 1 (Yr3_M01_CL02_asset 5).

Challenge 2

Label a flower and complete a resource sheet.

Children label their dissected flower. They then add the descriptions of the functions of the different parts from Resource Sheet 2. Children can copy or cut and stick the vocabulary.

Challenge 3

Label a flower and describe functions of the parts.

Children label their dissected flower using both key and extension vocabulary. They use annotations to describe the functions of the parts.

Key information:

Children should understand that a plant which did not produce flowers would not be able to produce seeds to grow into a new generation of plants. It would not cause the individual plant to die but if no plants of that type produced flowers there would be no new plants and eventually that type of plant would die out.

REFLECT AND REVIEW:

Ask: *What is the role of the flower?* Ensure that children understand that it is for reproduction.

Ask: *What would happen to a plant with no flowers? What would happen if none of the plants produced flowers?*

EVIDENCE OF LEARNING:

Listen carefully as children compare the flowers in different plants.

Can they identify all the parts? Can they identify them in different flowers?

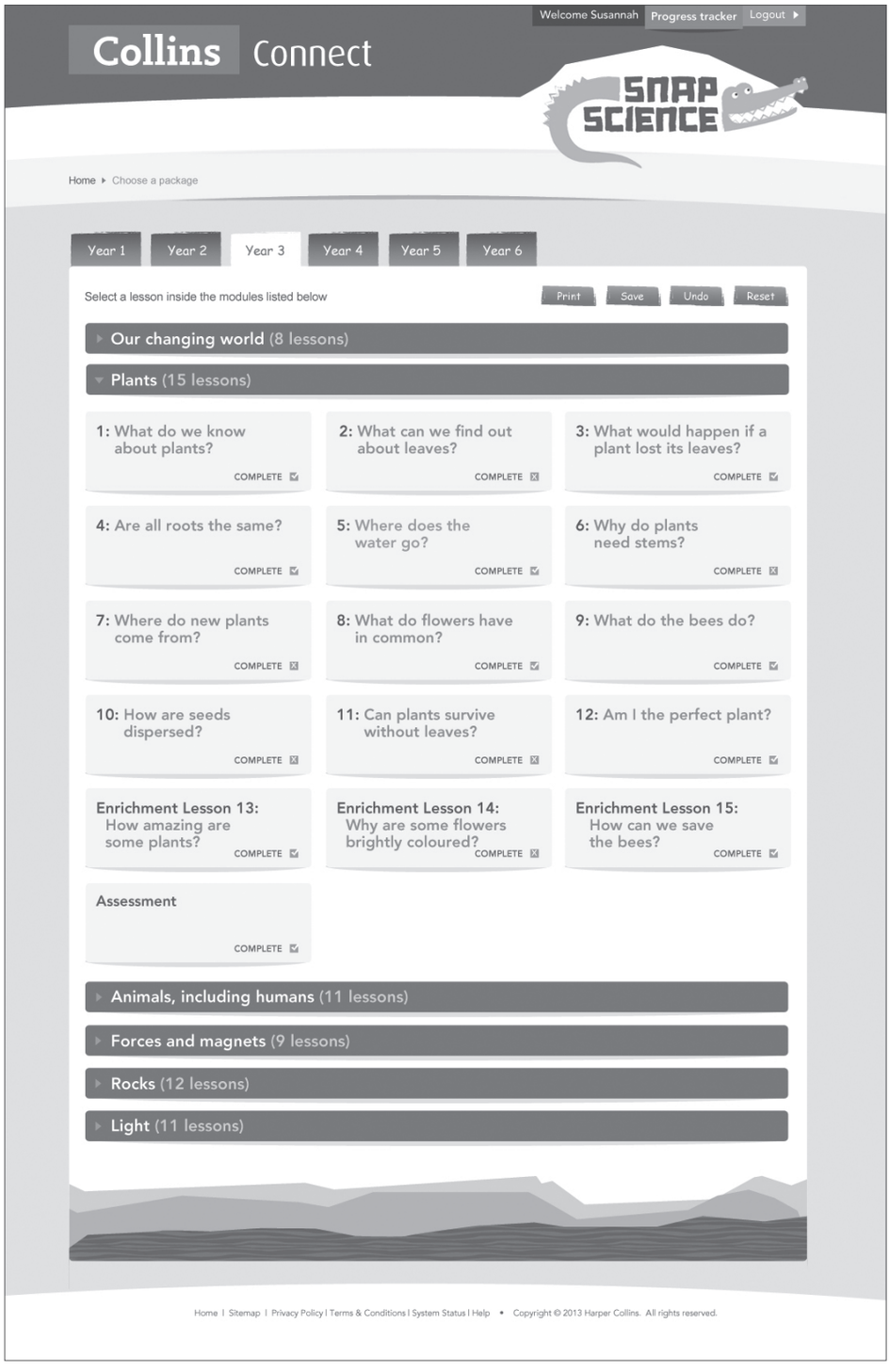
Review the children's labelled dissected flowers.

Can the children name the main parts of the flower? Can they label them on their dissected flower? Can they describe their functions? Do children understand (in simple terms) that the flower is important for the survival of the species not the individual?

THE ONLINE TOOLKIT

You can access all of the lesson sequences, lesson plans and related assets online via the Collins Connect platform. There is a discrete area for each year group, with support for planning, teaching and tracking progression. You can easily access the assets for each lesson using the flexible planning tool.

Simply select your year group using the tabs along the top. Using the drop-down lists, choose the module you would like to teach and then a lesson from the sequence. Click on the lesson to reveal the lesson plan and related assets.

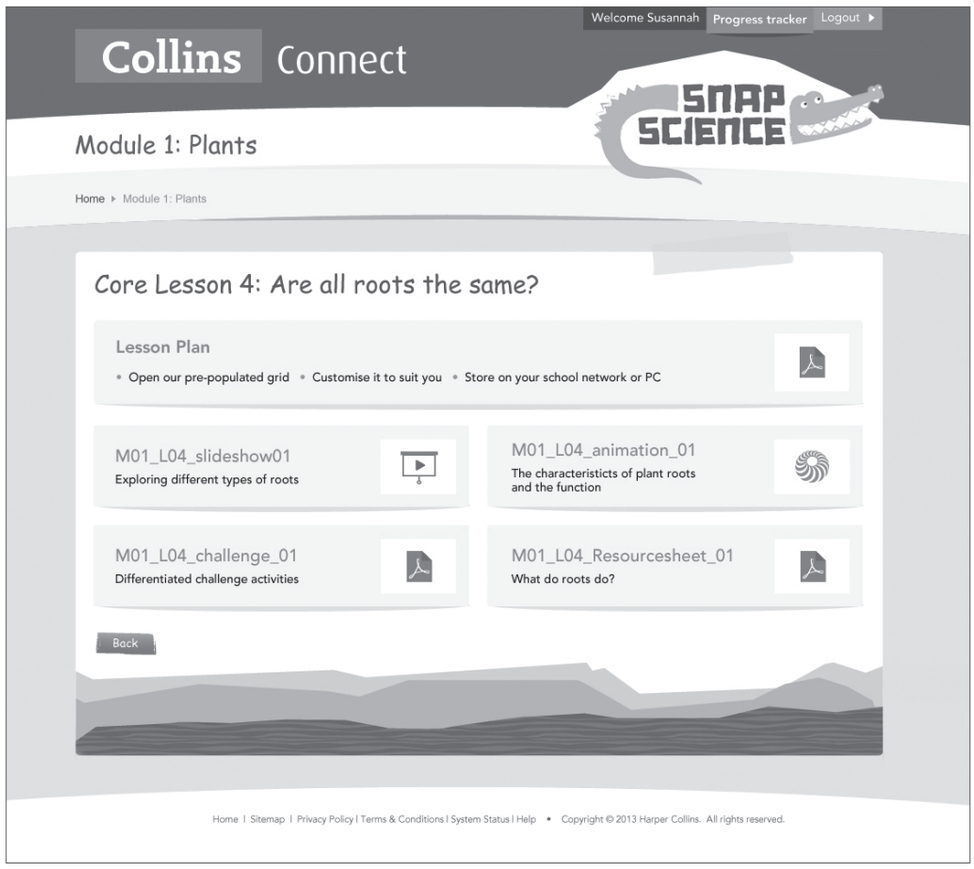


THE DIGITAL ASSETS

A range of digital assets are provided for each Snap Science lesson, so they are rich, lively and engaging.

The assets include:

- Videos enable you to make real-world links and to show children environments and activities that cannot be easily accessed from the classroom.
- Animations help to model and explain abstract concepts.
- Interactive activities engage children and provide opportunities for them to express their ideas in response to a stimulus, such as by sorting, selecting or labelling.
- Slideshows with high-quality images and text provide a focus for talking through key ideas.
- A range of resource sheets accompany the lessons, including activities, instructions and identification sheets.
- Writing frames provide a structured template to help children record what they have learned, so the focus of the lesson remains on the science.



HOW DOES YOUR GARDEN GROW?

INTRODUCTION

In this module children will build on their experiences of identifying and growing plants in Key Stage 1. They will revise the names of the main parts of a plant (root, stem/trunk, leaf and flower) introduced in Year 1, learning their functions and how these relate to their appearance and structure.

They will learn about the absorption and transport of water and nutrients and the role of the leaf in making food for the plant (knowledge of the process of photosynthesis is not required at this stage). They will also learn about the parts of the flower, their roles in plant reproduction and the stages of the life cycle of a flowering plant, building on observations of growth of seeds and bulbs in Year 2. They will learn more about different types of plant reproduction in year 5. The content of this module will complement the lessons in the Our Changing World module where children study plants in their natural habitats, identifying their parts and observing the stages of their life cycles and the effect of seasonal change. In the Our Changing World module children will also investigate the requirements for healthy growth.

WORKING SCIENTIFICALLY

When working scientifically children will ask and answer their own questions about plants through classifying, observing over time, conducting fair test investigations and using secondary sources. They will have opportunities to make and record detailed observations using labelled and annotated diagrams.

Key vocabulary:

plant, roots, stem, trunk, leaf/leaves, flower, leaflet, stalk, veins, surface, edge, lobes, tip, food, root hair, nutrients, anchor, support, seed, germination, seedling, growth, mature plant, flowering, pollination, seed formation, bud, petal, sepal, carpal, stamen, pollen, reproduce, nectar, seed, fruit, dispersal, animal, wind, water, self-dispersal, explosion, sprinkling, competition, air, light

Extension vocabulary:

stigma, style, ovary, anther, filament

Vocabulary for Working scientifically:

observe, question, investigation, fair test, change, measure, predict, prediction, explanation, observations, draw conclusions

FACT FILE:

The two main functions of roots covered in this module are to absorb water and dissolved nutrients and to secure the plant in the ground. Branching of roots and the presence of root hairs increases the surface area for absorption. Branching, the spreading of fibrous roots and deep taproots provide greater anchorage in the soil. Roots can also act as a store of food and some roots have a role in vegetative (asexual) reproduction (see year 5).

The root is the first part of the plant to grow when a seed germinates.

The stem, also known as the trunk in trees, supports the parts of the plant which are above ground and enables water and nutrients and other substances to be transported throughout the plant.

Within some stems children will be able to see columns of reinforced hollow cells that transport the water. This is the xylem, but children do not need to be introduced to that term in this module.

The main function of the leaves is to make food for the plant by the process of photosynthesis. Light acts on the chlorophyll pigments, which give plants their green colour, and triggers a series of chemical reactions that enable plants to synthesise sugar from carbon dioxide and water. At this stage children do not need to know about the process of photosynthesis, only that plants can make their own food and so do not need to eat. Most leaves have a large surface area and are arranged in a way that provides maximum exposure to light and air. Plants which are adapted for very hot or dry conditions, such as cacti, often have very small leaves and photosynthesis occurs in cells in their stems.

The function of the flower is sexual reproduction. Flowers may have only male parts, only female parts, or both. The flower consists of:

- sepals, which protect the flower bud as it develops
- petals, which are coloured and shaped to attract insect pollinators
- stamens, each made up of an anther and a filament. These are the male parts where pollenis produced. Pollen is transferred to the female parts of the flower during the process of pollination. Transfer can be by wind or animals (usually insects); in this module the focus will be on insect pollination.
- carpals, consisting of stigma, style and ovary. These are the female parts.

After the stigma receives the pollen a pollen tube grows down to the ovary enabling the pollen and ovum to join in fertilisation (not a key concept for this module). A seed will then form. In many plants the ovary develops into a fruit surrounding the seed.

Seeds develop from the fertilised ovum and the ovary becomes the fruit which take different forms. The most obvious are those such as apples in which the seeds are surrounded by a fleshy wall.

The main stages of the life cycle of a flowering plant are:

Germination:
the seed first grows a root and then a shoot to become a seedling

Growth:
the plant increases in size, number of leaves and so on until it is a mature plant and flowering occurs

Pollination is followed by seed formation (see above)

Seed dispersal:
the seeds are distributed away from the parent plant to avoid competition for light, space and water. The main methods of seed dispersal are:

Wind: seeds are light and blow away from the parent plant or have wing-like structures to allow them to drift as they fall from the plant

Animal: fruits are eaten and seeds dispersed in animal droppings; fruits and nuts are carried away and may be dropped or stored; seeds are adapted to cling to animal fur and be carried away

Water: method of dispersal for water plants; land plants may produce seeds which float and can be carried away by water

Self-dispersal: this may simply be by gravity with the fruit falling from the plant; it may then be further dispersed by animals, wind or water. More elaborate examples include seed heads adapted to sprinkle seeds around the plant ('pepperpots') and fruits such as pods exploding, catapulting the seeds away from the parent plant

HOW DOES YOUR GARDEN GROW?

LESSON 1: WHAT DO WE KNOW ABOUT PLANTS?

Key vocabulary:
plant, roots, stem, trunk, leaf/leaves, flower, function, question

Resources:
A flowering plant in a pot, such as a geranium, sticky notes or index cards

LESSON SUMMARY:

In this lesson children will be able to share what they have previously learned about the parts of flowering plants and their different functions. This builds on the work in the Year 2 Plants module and links with the ongoing Our Changing World module. By the end of the lesson children will have gathered questions to explore during the remaining lessons.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Working scientifically links:

Asking relevant questions and using different types of scientific enquiries to answer them

Learning intention:

To describe what we know about the different parts of plants and to ask questions about plants for further investigation

Success criteria:

- I can identify the parts of a plant.
- I can describe some of the functions of those parts.
- I can ask questions about plants.

Scientific enquiry type:

Exploration

EXPLORE

Show the children a potted plant with roots, stem, leaves and flowers and talk about the different parts. Show slide 1 of Slideshow 1, which shows images of six different flowering plants.

Ask children to discuss the images in pairs.

Ask children: *What do all the plants have in common? What differences are there between them? What do the plants need in order to grow and stay healthy?* Collect key words that they use and write them on the board.

Key information:
It is important for children to recognise that they are all examples of flowering plants and that part of the plant is hidden below the ground. It is not necessary for them to know all the functions of the different parts of the plant. The purpose of the discussion is to elicit children's current knowledge, so do not offer information beyond that provided by the children.

ENQUIRE:

Tell the children that they will be carrying out a challenge to demonstrate what they already know about the different parts of flowering plants. The challenges are differentiated by outcome, with Challenge 2 requiring greater detail than Challenge 1. Explain that they are drawing a diagram to show what they know about plants. They do not need to include colour, background and so on.

Challenge 3 requires children who know about the function of some of the main parts of a plant to apply their understanding to the whole organism. They do this by completing a whole-parts relationship graphic organiser. They will need copies individually or to share Resource sheet 1. A graphic organiser is a visual framework that helps children to identify functional relationships within a system, in this case a flowering plant.

Tell the children that they will need to think about what plants need to grow in order to help them work out what the different parts do.

Key information:
In Year 2 children will have learned that plants need water, light and a suitable temperature to grow. They may need to be reminded of this.

Challenge 1 Children draw a diagram of a flowering plant and label all the parts they know.

The children draw a diagram of a flowering plant with labels to show which parts they know. Question children about their drawings.

Ask children: *What is this part called? What do you think this part does to help the plant to grow and stay healthy?*

Challenge 2 Children draw a diagram of a flowering plant with labels to show all the different parts they know and to explain what they do.

The children draw a diagram of a flowering plant with labels to show all the different parts they know and their functions.

Ask children: *What other plant parts can you name? What do you think this part does to help the plant to grow and stay healthy?*

Challenge 3 Children complete the whole-parts relationship graphic organiser for a flowering plant.

Give children copies of the Flowering plant graphic organiser (Resource sheet 2) a visual framework which helps children to identify functional relationships within a system. The children complete the graphic organiser, considering the four main parts: root, stem, leaf and flower. Children who know about additional parts such as petal, leaf and stalk can be given a second graphic organiser to complete. If children have not used a graphic organiser before, work with them to model completing the information for one part of the plant.

Ask children: *What is the function of this part of the plant? Does this help you to think about what would happen if it was missing?*

REFLECT AND REVIEW:

Ask the children to look at each other's diagrams and graphic organisers.

Ask children: *What are the names of the four main parts of flowering plants? What do they do? What would happen if the part was missing? Can you explain why? What other things do you know about flowering plants?*

Show the children a large blank KWL (What we **K**now, **W**ant to know and have **L**earned) grid. (You can use Resource sheet 2 as a template.) Tell them that you are going to use this display to find out what they already know about plants and what more they want to find out.

Show slide 1 of Slideshow 1ww again and ensure that all the children can identify the root, stem, leaf and plant on the different images and agree that this knowledge can be entered into the KWL grid **KNOW** section, e.g., I know which part is the stem.

Show slide 2 and talk about the images.

Ask children: *What more would you like to find out about flowering plants? In pairs, write questions you would like to ask on sticky notes or small index cards.* If children find this difficult, use the question prompts on slide 3 to support them. Encourage children to make their questions scientific, that is, questions that can be answered by scientific enquiry.

Ask children to share some of the questions and add them all to the KWL grid under Want to know.

During the module refer back to these questions, transferring them to the What we have learned category as they are answered. Encourage children to add to the list of questions and find answers to those which will not be investigated in class as homework.

EVIDENCE OF LEARNING:

Look at the children's labelled diagram and graphic organisers. Listen to them carefully during the Reflect and review session.

Can they name the root, stem, leaf and flower and were they able to identify these parts on the living plant and the images of different plants? Can they label additional plant parts? Do they understand that a tree trunk is a stem?

Did they describe the function of the different parts of the plant? Do they refer to: the roots taking in water and nutrients and anchoring the plant; the stem transporting nutrients and water and supporting the plant; the leaves needing to be in the light and making food for the plant; the flower attracting/feeding insects and being needed for reproduction/making fruits and seeds?

Can they ask relevant questions using a range of question words such as what, why, how, when, and are they scientific (able to be answered factually through enquiry rather than being a matter of opinion)?

HOW DOES YOUR GARDEN GROW?

LESSON 2: WHAT DO WE KNOW ABOUT LEAVES?

Key vocabulary:
leaf/leaves, features, function, leaflet, stalk, veins, surface, edge, lobes, tip, food, serrations

Resources:
Mini-whiteboards, pens, flip chart or large whiteboard, sets of leaves (different sizes, colours, textures and shapes with 10–12 per set), a class set of one type of leaf, such as oak, sycamore, beech or birch, magnifying glasses (one per child), digital camera(s), the KWL grid from lesson 1

Key information:
It is necessary at this stage for children to recognise that there are many shades of green, but that not all leaves are green, a common misconception for some. They should notice that the upper surface is often a darker green than the lower surface, the reasons for which will be considered later in the lesson. You should also tell them that for plants to grow, they need to use sunlight to make their own food. This happens in the leaves and the green pigment is needed for this. Photosynthesis is a very abstract idea which will need to be revisited regularly. At this stage, however, children do not need to know the term nor understand how it happens.

LESSON SUMMARY:

In this lesson children will make close observations of a variety of leaves, using manual and digital magnifiers. By the end of this lesson children will be able to describe the different features of leaves and know that the leaf is where the plant makes its food.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Working scientifically links:

Identifying differences, similarities or changes related to simple scientific ideas and processes

Learning intention:

To make detailed observations of the similarities and differences in a variety of leaves, and relate these to the function of leaves

Success criteria:

- I can make observations about leaves.
- I can describe similarities and differences in leaves.
- I can describe the function of a leaf.

Scientific enquiry type:

Grouping and classifying

Health and safety: Teach children to avoid touching their eyes whilst handling plants. Always wash hands after handling plants, seeds or soil. Warn children about attractive-looking fruits and seeds, especially those that look like edible ones that might be poisonous.

EXPLORE:

Give each child a mini-whiteboard. Distribute the class set of leaves (one each or one between two if they are large leaves) and the magnifying glasses. If possible display the leaf using a digital presenter. Ask children to make a list on their whiteboards of all the things they notice about the leaf including colour, shape, texture, size and smell.

Ask children to work in pairs to write a definition of a leaf on their mini-whiteboards, and then share this with another pair. Collect common words and ideas on a flip chart or large whiteboard.

Show slide 1 of Slideshow 1, which shows images of six very different leaves. Confirm that they are all leaves.

Ask: *What do you notice? Do you want to change your definition? Why?*

ENQUIRE:

Organise children into groups and tell them that their challenge is to make close observations of some more leaves, and to notice how they are the same and how they are different. The challenges are differentiated by the level of observation and knowledge required, with Challenge 2 requiring a broader vocabulary than Challenge 1. Challenge 3 requires children to identify features common to all leaves and to begin to relate these to function. The challenges are presented on Exploring Leaves Slideshow 2 to be displayed on the board, or printed out and placed in the centre of the table.

Provide each group with a set of leaves and magnifying glasses. Children doing Challenge 1 will need two identical sets of leaves. The real leaves can be supplemented with pictures but first-hand experience is essential.

Challenge 1 Children compare and identify leaves.

Children use observations to compare and identify leaves. Ensure children look at each of the leaves very carefully.

Ask: *What colour is it? What shape is it? How does it feel? What else do you notice about it?*

Ask one child to pick a leaf and describe it to the others in the group without showing it to them.

Ask: *Can you work out which leaf is being described?*

Challenge 2 Children sort and classify leaves.

Children sort the leaves according to their different features. Children make close observations of the leaves, identifying the key features. Ask them to choose one feature, such as colour, serrations, texture, whether there are lobes or leaflets, and sort the leaves into groups using these criteria.

Ask: *What criteria have you chosen? Which group does this leaf go into? Why?*

Tell children to label the groups, such as rough, smooth, and record their sorting using a camera. Then sort again according to different criteria, and record. They can compare their photographs later to see how the sets were different for the different criteria.

Challenge 3 Children observe features of leaves.

Children find out which features all leaves have and think about why. Tell children to make close observations of the leaves, identifying the key features. Ask them to make a list of features which all the leaves have and a list of features which only some leaves have.

Ask: *Why do you think all leaves have this feature? What do you think it is for? Do you think there are any plants whose leaves do not have one of the features that all the leaves you have observed have?*

REFLECT AND REVIEW:

Talk about the different features of leaves that the children have noticed. Remind the children that the leaf's function is to make food for the plants using sunlight.

Ask: *How do the features of the leaves that you have observed (flat, thin, large surface area, leaf stem, veins) help them to do their job? What helps the leaf to stay spread out? Why do you think many leaves are darker on top?*

Ask the children, in pairs, to think of a statement about leaves for the What we have learned section of the KWL display (Lesson 1, Resource sheet 2). Agree a class statement and add it to the display. Move any questions which have now been answered from the What we want to know section.

Key information:

The veins on the leaf help it to stay spread out as well as transporting water and other substances. The darker upper sides of leaves contain more green pigment as they face the sun.

EVIDENCE OF LEARNING:

While the children are working, consider the following. Are children using the magnifying glass correctly? Can they describe what they are observing? Do they recognise similarities and differences? Are they choosing suitable criteria and using them to sort the leaves?

Look at their What we have learned statements.

Do they know the features of a leaf? Can they state that leaves make food for the plant? Can they relate some features of a leaf to their function in making food?

HOW DOES YOUR GARDEN GROW?

LESSON 3: WHAT WOULD HAPPEN IF A PLANT LOST ITS LEAVES?

Key vocabulary:
investigation, question, fair test, change, measure, leaf/leaves, features, function, leaflet, stalk, veins, surface, edge, lobes, tip, food

Resources:
KWL grid from lesson 1, plants, e.g. busy lizzie, geranium or primula (two plants for Challenge 1; three plants for Challenge 2 and four for Challenge 3)

LESSON SUMMARY:

In this lesson children will set up a fair test investigation to find out the effect of removing the leaves from a plant. They will make observations over the next few weeks and summarise their findings in lesson 11. By the end of these lessons children will know about the importance of leaves for plant growth. In the ongoing Our Changing World module children learn about plants that lose their leaves naturally as part of their seasonal growth cycle.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Working scientifically links:

Setting up simple practical enquiries, comparative and fair tests (lesson 3); gathering, recording, classifying and presenting data in a variety of ways to help in answering questions (by end of lesson 11)

Learning intention:

To plan and set up a fair test investigation to find out the effect of removing the leaves from a growing plant

Success criteria:

- I can help to plan an investigation to answer the question: What happens if a plant loses its leaves?
- I can decide what to observe or measure to collect my results.
- I can recognise when a test is fair.

Scientific enquiry type:

Carrying out comparative and fair tests

Health and safety: Teach children to avoid touching their eyes whilst handling plants. Always wash hands after handling plants, seeds or soil. Warn children about attractive-looking fruits and seeds, especially those that look like edible ones that might be poisonous.

EXPLORE:

Show the children the KWL grid (Lesson 1, Resource sheet 2) including the information and questions about leaves from the last lesson.

Ask: *What features do leaves have? What do leaves do?*

Show children the plants that will be used for the investigation. Ensure that children know that these plants are growing and that there are at least two of each type of plant.

Ask: *What do you think would happen to a plant if it lost all of its leaves? What if it lost some of its leaves?*

Capture children's ideas on the whiteboard.

Ask: *How could we find out?*

ENQUIRE:

Tell the children that in their groups they will be carrying out a challenge to plan a fair test to answer the question: What happens to a plant if it loses its leaves? The challenges are differentiated by complexity and the number of variables to manage and record.

Tell them that every group will use the fair test interactive planning tool to turn their ideas into an investigation plan. Show them all how to do this by creating an example plan by selecting responses to the following questions:

1. *What will you change about the plants?* It is important that they recognise that it must be the number of leaves.

2. *What changes do you think might happen to the plant that you could observe or measure?* Using children's ideas from the Explore discussion, identify and note some possible measurements or observations that could be made, such as the appearance of the plant (colour, wilting), whether the plant grows taller, whether it grows new leaves. If the plants are in flower then children can also make observations of what happens to the flowers.
3. *How often will you make your observation or measurement?* Every other day or twice a week should be sufficient – it may depend on the type of plant.
4. *What will you do with your plants during the investigation to make sure that it is a fair test? What else will the plants need to keep them alive? What would happen if you didn't water them?* (They would all die whether they had leaves or not.) *Would it be fair if we put the plant with no leaves on the windowsill and the plant with all its leaves in the cupboard?*

Challenge 1 Children investigate how removing all the leaves affects plant growth.

Children investigate the question: How does removing all the leaves affect how a plant grows? The investigation will compare plants with all their leaves and with no leaves. Provide each group with two similar-sized plants of the same type and an investigation diary Resource sheet 1. Support the children with identifying and recording what they will change, measure and keep the same. Children record their results using photographs or drawings with simple descriptions or labels, e.g., wilted, flowers dead, growing taller.

Ask: *What are you changing? Would it be fair if ...?*

Challenge 2 Children investigate how removing some leaves affects plant growth.

Children investigate the question: How does removing some of the leaves affect how a plant grows? The investigation will compare plants with all their leaves, plants with some leaves and plants with no leaves. Provide each group with three similar-sized plants of the same type and an investigation diary Resource sheet 2. Children will record their results using photographs and drawings with more detailed observations and some quantitative data, e.g., the number of new leaves that have grown.

Ask: *What are you changing? What are you observing? What are you keeping the same?*

Challenge 3 Children investigate how removing different amounts of leaves affects plant growth.

Children investigate the question: How does removing different amounts of leaves affect how a plant grows? This investigation will compare plants with all their leaves, some leaves removed, most leaves removed and all leaves removed. Provide each group with four similar-sized plants of the same type and an investigation diary (Resource sheet 3). Children will record their results using photographs and drawings with descriptions and quantitative data, e.g., height, number of new leaves.

Ask: *What are you changing and measuring? How will you make your investigation fair?*

Ensure all children complete the front page of their investigation diary and record their initial observations/measurements of the plants.

REFLECT AND REVIEW:

Ask a child from each group to share their work.

Ask: *What do you think will happen to your plants? Why? Who is going to water your plants and when? What observations or measurements are you going to make? When will you do this?*

Ask the other children whether they think the test is fair.

EVIDENCE OF LEARNING:

Listen to the children as they are planning their tests and look at the planning in their diaries.

Did they make suggestions to help to plan the investigation – what we could do, what we could observe/measure, and so on? Can they state what they are changing and measuring? Can they recognise an unfair test? Can they state what they are keeping the same to make the test fair?

Observe and listen to the children during the Reflect and review discussion.

Can children say what they think will happen to a plant if all/some of the leaves are removed? Can they give a reason why they think this?

HOW DOES YOUR GARDEN GROW?

LESSON 4: ARE ALL ROOTS THE SAME?

Key vocabulary:
root, root hair, water, nutrients, anchor, support

Resources:
A plant, in a pot, which has had its roots removed, a range of seedlings, such as peas, broad or runner beans (one set per group with a minimum of one seedling between two pupils), magnifiers (one per child), other examples of plant roots, a pot-bound plant, KWL grid from previous lessons

LESSON SUMMARY:

In this lesson children will make close observations of a variety of roots using manual and digital magnifiers. By the end of this lesson children will be able to describe the different features of roots and explain that the root's function is to anchor the plant in the soil and take in water and nutrients.

Preparation required: One to two weeks before this lesson you will need to remove the roots from a flowering plant and replace the cut off base of the stem in the pot of wet soil. Seeds will need to be germinated to provide seedlings with root systems for observation and drawing. The length of time this takes will depend on the plant.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Working scientifically links:

Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables

Learning intention:

To describe in detail the similarities and differences in a variety of roots, and to relate these to the function of roots

Success criteria:

- I can make detailed observations about the roots of a plant.
- I can record observations and information in drawings and writing.
- I can describe similarities and differences in roots.
- I can describe the function of a root.

Scientific enquiry type:

Grouping and classifying

Health and safety: Teach children to avoid touching their eyes whilst handling plants. Always wash hands after handling plants, seeds or soil. Warn children about attractive-looking fruits and seeds, especially those that look like edible ones that might be poisonous.

EXPLORE:

Show the plant, in its pot, to the children.

Ask: *Does the plant look healthy? What do you think might have caused it to look like this? What might it need?* Note suggestions from children on the board. You can use targeted questioning to assess whether children who were not sure about what plants need in lesson 1 are now more secure in their knowledge.

Confirm that the plant appears to be lacking in water but that the soil is damp so there must be some other problem. Remove the plant from its pot.

Ask: *What parts can you see and what is missing? What does this tell you about the function of the roots? What difference has the removal of the roots made to the plant?* Confirm that the plant is lacking in water because it is unable to absorb water due to the lack of roots.

Provide children with seedlings and magnifying glasses and encourage them to observe the roots of each seedling in turn.

Ask: *What can you see? What else do you notice?* Draw their attention to the root hairs and the branching of the roots on more mature seedlings. Use a digital presenter or microscope to draw attention to the important details or use slide 1 of Slideshow 1.

Ask: *How do you think the root hairs and branching help the plant to absorb water?* If some of the seedlings are in pots, ensure that the children observe how the roots anchor the plant as they remove it from the pot. They will also have noticed how easily the plant without roots could be separated from the soil.

ENQUIRE:

Tell the children that they are going to complete a challenge to observe and draw the different features of roots and through this observation learn what the different features are for and what roots do. Refer to any relevant statements or questions on the KWL display. The challenges are differentiated by the level of understanding and detail required to relate feature to function. Present the challenges as cards on the tables.

Provide other examples of roots, such as vegetables, weeds or grasses for children to observe and handle, supplemented as necessary by the images on slide 2 of Slideshow 1.

Ask: *How are they similar and different? How can you tell they are roots?* Encourage children to think beyond 'they grow under the ground' by reminding them of other plant structures they are familiar with from KS1, such as bulbs that are also found under the soil.

Show Animation 1 which shows how a root anchors a plant in the ground and takes in water and nutrients. Talk about these functions, relating them to the features they have observed. Draw on any experiences they may have had of plants being anchored in the ground, such as digging up root vegetables or pulling up cabbages or weeds, and of how they water plants, e.g., the soil rather than the leaves.

Key information:

It is important that children understand that nutrients are substances, dissolved in the water that plants take in, which they need to make their food and stay healthy; the plant is not eating like animals do or feeding on the soil. Refer back to what they learned in lesson 2, that plants make their own food in the leaves.

Challenge 1 Children draw and label a seedling root and write about root function.

Children will make a drawing of a seedling root and label the root hairs. Children will write about the function of the roots.

Ask: *What do roots do?* Children make an observational drawing of the root of the seedling. If you have more than one type of seedling, give them a different type from the one they observed earlier in the lesson. They should label the root hairs and write about the function of roots, using Resource sheet 1 for support.

Challenge 2 Children make a drawing of a seedling root, label and write about the parts.

Children will draw a root, label the parts of the root and write a paragraph on the features of the root.

Ask: *How are roots suited to what they do?* Children make observational drawings of the roots of one example from those provided. Children should label the root hairs and the primary or tap root (depending on the example chosen) and the secondary roots. Then ask them to write a paragraph explaining how the features of this type of root help it to perform its functions.

Challenge 3 Children draw different roots and make notes on them.

Children will make drawings of contrasting roots and make notes on their similarities and differences.

Ask: *How are roots similar and different from each other?* Children should make observational drawings of two contrasting examples of roots from the real examples provided. Ask them to use sentences and/or annotations on the drawings to show how the roots are similar and different, and describe how both types of root perform their functions.

REFLECT AND REVIEW:

Remove the pot-bound plant from its pot and tease out the roots to show how long they are and how they branch like the stems of the plant above ground.

Ask: *What do you think will happen if the plant is put into a larger pot or a flowerbed outside? How does having long, spread-out roots help the plant?*

Agree a class statement about roots for the What we have learned section and add it to the KWL display. Move any questions that have now been answered.

EVIDENCE OF LEARNING:

Look at the children's observational diagrams and labels/annotations.

Did they make observations and record them in detailed drawings? Can they use information and observations to answer a question?

Do they know the functions of the root? Can they describe how the features of a root that they have observed help it to perform those functions? Can they compare different roots and explain how they know they are roots by referring to the functions of roots? Do they know that other plant parts can also be found under the soil?

HOW DOES YOUR GARDEN GROW?

LESSON 5: WHERE DOES THE WATER GO?

Key vocabulary:
root, stem, petals, trunk, predict/prediction, water, nutrients

Resources:
Prepared carnations and celery, one white carnation, magnifying glasses (one per child), red and blue food colouring, containers, celery with leaves, carnations (one carnation and one stalk of celery both with the stem divided per group)

Key information:
It is important for children to notice that the colour is contained within the coloured strands or tubes, the xylem, which are columns of reinforced hollow cells that transport the water. Children do not need to know the word xylem. They do need to know that water has to be transported to all parts of the plant for the plant to survive.

LESSON SUMMARY:

In this lesson children will observe the transport of coloured water in carnations and celery and will set up an observation over time to investigate this in more detail in lesson 6. By the end of these two lessons children will know that water is transported in a plant and understand the function of the stem.

Preparation needed: Stand carnations and celery in red-coloured water for 1–2 days prior to the lesson – this preparation could be done by the children. The coloured water will be taken up faster if the celery and carnations are allowed to wilt a little before they are put in the water. Cut the celery into both cross sections and lengthways strips, with enough for one of each kind per pair.

National curriculum links:

Investigate the way in which water is transported within plants

Working scientifically links:

Using results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests

Learning intention:

To explain observations of water being transported in plants and make predictions based on observations

Success criteria:

- I can make observations.
- I can describe what happens to water in a plant.
- I can make predictions based on what I have observed.

Scientific enquiry type:

Observing over time

EXPLORE:

Show the children one of the coloured carnations and one that is still white. If children were not involved in the preparation of the carnation:

Ask: *What do you think happened to the coloured one?* Distribute the prepared carnations and tell the children to look closely at the petals, leaves and stem.

Ask: *What do you notice?*

Show the time-lapse video (Video 1) of the carnation in coloured water. Explain that the video shows what has been done to the carnations. If children were involved in the preparation of the carnations, this will act as reinforcement of the process.

Ask: *What does this tell you about what the stem does?*

Distribute the prepared celery. Ensure that each pair has both a piece that has been cut lengthways and a cross section. Tell children to look closely at the celery.

Ask: *What can you see? What are the coloured dots on the slices and at the ends? What are the coloured strands in the pieces cut lengthways? Pull one out. What does this tell you about the transport of water in plants?* If necessary use a digital presenter or microscope or show the images on slide 1 of Water transport in plants Slideshow 1 to draw attention to the details.

ENQUIRE:

Show slide 2 of Slideshow 1, which features the following statement: Water goes up the left of the stem to the left-hand side of the plant, and the right of the stem to the right-hand side of the plant.

Ask: *Do you think the statement is true or false? Why?* If they all agree, challenge children by disagreeing with the statement. Encourage children to refer to their observations of the carnation and the celery to support their decision.

Ask: *How could we find out?* If necessary prompt children by showing a carnation with a split stem.

Tell the children that their challenge is to work in small groups (ideally in fours) to set up an observation-over-time investigation to find out if the statement is true or false. Groups completing challenge 1 or 2 need a carnation and a stick of celery, each with the stem divided, four containers

and food colouring (red and blue). There will be a better result if the carnations are left in a warm, sunny spot. Those completing challenge 3 need a second stick of celery instead of the carnation. The challenges are differentiated by the level of detail and explanation required.

Challenge 1 Children draw and label a diagram.

Children draw and label a diagram to show what they think will happen to the carnation and the celery.

Ask: *Why do you think this will happen?*

Challenge 2 Children draw an annotated diagram.

Children draw an annotated diagram to show what they think will happen to the carnation and the celery and explain what this shows about the transport of water in plants. It should include a cross section of the celery.

Challenge 3 Children investigate the role of leaves in the movement of water through celery.

Children investigate the role of leaves in the movement of water through celery, drawing and labelling diagrams.

Work with this group. Show the children an additional statement: The leaves help plants to take up water.

Ask: *How can we adapt the investigation to find out if this is correct? What will we need to do? What will happen if it is correct? Do you think it is correct? Why?* Support the children in setting up an investigation where the leaves are removed from some of the split celery sticks before they are placed in the different colours of ink. This group will need to check their celery at intervals to establish how quickly the coloured water is taken up. Ask them to draw and label diagrams showing what they think will happen and what this shows about the transport of water in plants. It should include a cross section of the celery.

REFLECT AND REVIEW:

Share some of the predictions.

Ask: *What do you think will happen? How will this show that your ideas are correct? What would happen if the statement was true/false?* Discuss any differences in what children expect to happen. Encourage children to justify their predictions by referring to their earlier observations of the celery sections and carnations.

EVIDENCE OF LEARNING:

Look at the children's diagrams. Do the children relate their earlier observations to water being carried in tiny tubes from the roots through the stem to the leaves and flowers? Is their prediction consistent with this? Can they explain their prediction? Can they describe evidence for the statement being true/false? Do they understand that all parts of the plant need water in order to survive?

HOW DOES YOUR GARDEN GROW?

LESSON 6: WHY DO PLANTS NEED STEMS?

Key vocabulary:
root, stem, trunk, leaf, predict/prediction, water, nutrients, explanation

Resources:
Celery, carnations and challenge diagrams from lesson 5, magnifiers, sharp knife (teacher use only), large paper, pens, pencils, scissors, glue, camera, KWL grid from previous lessons; access to computers would be helpful

LESSON SUMMARY:

In this lesson children will use the results of the observation-over-time investigation that they set up in Lesson 5 and information from a video to produce information texts to explain the function of stems. By the end of the lesson they will know that the stem transports water from the roots to the leaves and flowers and holds the leaves and flowers up to the sun and air.

National curriculum links:

Investigate the way in which water is transported within plants

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Working scientifically links:

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Learning intention:

To present information about the functions of the stem

Success criteria:

- I can describe the results of my investigations.
- I can explain what these show about the way in which water is transported in plants.
- I can present my findings, from secondary sources and investigations, about how water is transported in plants.

Scientific enquiry type:

Observing over time and using secondary sources of information

EXPLORE:

Remind children about the statement they are investigating: Water goes up the left of the stem to the left-hand side of the plant, and the right of the stem to the right-hand side of the plant. Ask them to look closely at their celery and carnations.

Ask: *What has happened? Was your prediction correct?*

When children have observed the whole carnation and celery, cut slices of the celery above and below the split so that they can see where the different colours are. Ask children to compare what they can see with the diagrams they made in lesson 5.

Ask: *What is the same? What is different?* The carnations and celery could be photographed to become part of the presentation of findings. Show carnations from children in challenge groups 1 and 2 to the children who completed challenge 3.

Share the additional statement for challenge group 3: The leaves help plants to take up water. Discuss the findings from this group about how quickly the water was taken up. Observe that the coloured water has been drawn into the leaves.

ENQUIRE:

Show the animation What does a stem do? (Animation 1) which explains the different functions of a stem, to transport water from the roots to the leaves and flowers and to hold them up to the air and sun.

Ask: *How does the animation help to explain what you have observed in the carnations and celery about the way water is transported in plants? How does it help to explain the observations of celery with and without leaves? What else does the stem do?*

Tell the children that their challenge is to present their findings about plants, their stems and water transport. The challenges are differentiated by the method of presentation. For all challenges there should be an emphasis on children demonstrating how they have learned about stems as well as what they have learned.

Ask: *How do you know this? What did you do to find this out? What do your findings show?* Allow children to choose which challenge to complete, then group them (mixed ability).

Show the challenge slide (Slideshow 1). Discuss the different ways the information could be presented.

Challenge 1 Children produce a page about plant stems for a children's website.

Children work in pairs, ideally using a computer, to produce a page about plant stems for a children's website about plants. The page must include:

- labelled photographs
- descriptions of the functions of the stem
- a summary of what the children found out about stems from their investigations.

Challenge 2 Children produce a poster titled 'Why plants need stems'.

Children produce a large information poster for children their age, entitled 'Why plants need stems'. It must include:

- labelled drawings or photographs and diagrams
- annotations describing the functions of the stem
- a summary of what they found out about stems from the investigations.

The children work in groups of two to four.

Challenge 3 Children prepare a short presentation.

Children prepare a short presentation suitable for an assembly or for showing to another class describing the functions of the stem.

The presentation can use PowerPoint slides but must also include:

- demonstrations of the results of their investigations
- oral explanations of what they learned about the functions of stems from their investigations
- use of drama or props to show the functions of the stem.

These children will work in groups of three to five.

REFLECT AND REVIEW:

Children carrying out Challenge 3 make their presentations to the rest of the class. These could be videoed. Ask children to identify strengths (or 'stars') and an improvement point (or a 'wish'). Tell children that the posters and web pages will be displayed for the rest of the class to look at. Identify a time, when all the class have had chance to look at them, when peer feedback on these can be discussed.

Agree a class statement about stems for the What we have learned section of the KWL display. Move any questions that have now been answered.

EVIDENCE OF LEARNING:

Review children's website pages, posters or presentations.

Can the children describe their observations? Have they related their observations to their predictions? Can they state what their observations show about the way in which water is transported and about the involvement of the leaves in this process? Do the different presentations of the investigations include the information that the stem holds the leaves up in the air and it moves water from the roots to the leaves?

HOW DOES YOUR GARDEN GROW?

LESSON 7: WHERE DO NEW PLANTS COME FROM?

Key vocabulary:
seed, germination, seedling, growth, mature plant, flowering, pollination, seed formation, fruit

Resources:
Apple, sharp knife (teacher use only), scissors, glue

LESSON SUMMARY:

In this lesson children present the main stages in the life cycle of a flowering plant as a sequenced diagram. By the end of this lesson children will be able to name the stages in the life cycle of a flowering plant and the order in which they occur.

National curriculum links:

Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Working scientifically links:

Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables

Learning intention:

To name the main stages of a flowering plant's life cycle and present them in a sequenced diagram

Success criteria:

- I can name the main stages in the life cycle of a flowering plant.
- I can put the stages in order.
- I can present them in a sequenced diagram.

Scientific enquiry type:

Using secondary sources of information

EXPLORE

Read the poem 'Growing Apples' by Michael Rosen (Slideshow 1). Pause before the girl is about to answer and ask children what they think she is going to say. Show the children an apple.

Ask: *Where did it come from? How can I get more apples from it?* Cut the apple open to show the seeds. Establish that the seeds will grow into an apple tree that will produce more apples.

Use slide 2 (Slideshow 1) to remind children about familiar animal life cycles. Use slide 3 to record what children already know about the life cycle of an apple tree. Brainstorm together what words they will need to label the diagram.

Discuss what happens when a seed germinates (revision from KS1).

Ask: *Why does the root grow first? Why does the plant not need leaves straight away?* (The seed provides food for the germinating plant.) *What does the seed need in order to germinate?*

ENQUIRE:

Watch Video 1. Focus on the vocabulary or the life cycle stages that the children were least confident about in the introductory activity.

Explain to the children that their challenge is to present the life cycle of a plant in a diagram. The first two challenges are differentiated by the support provided. In the third challenge children apply what they have learned about apple trees to a different flowering plant.

Challenge 1 Children complete the life cycle of an apple tree.

Using Resource sheet 1, children sequence and complete the stages of the life cycle of an apple tree. Children cut out and stick the vocabulary into the correct places.

Challenge 2 Children sequence and complete the life cycle of an apple tree.

Using resource sheet 2, children will sequence and complete the life cycle of an apple tree. They annotate their diagram to add any other information they remember from the video.

Challenge 3 Children sequence and complete the life cycle of a runner bean.

Using Resource sheet 2, children use their knowledge of the life cycle of an apple tree together with information provided to sequence and complete the life cycle of a runner bean.

Ask: *Where would you put the label 'fruit'?*

Key information:
The fruit is the part of the plant that grows from the ovary and contains the seeds, so the bean pod is the fruit of the bean plants. Fruit is a scientific term for a plant part; vegetable is a category of food.

REFLECT AND REVIEW:

Ask children to share their life cycle diagrams. Compare diagrams for the apple tree and the runner bean.

Ask: *What is the same about them? What is different? How long do you think each life cycle takes to complete?*

EVIDENCE OF LEARNING:

Look at children's completed life cycle diagrams. Look and listen carefully as they compare their diagrams with others.

Do the children understand the convention of a life cycle diagram? Can they name the main stages of the life cycle of a specified plant? Can they sequence them on the diagram? Can they label them correctly? Can they recognise that this is a general sequence that applies to all flowering plants? Can they add further information? Do they recognise that plant life cycles (like animal ones) are of different lengths?

HOW DOES YOUR GARDEN GROW?

LESSON 8: WHAT DO FLOWERS HAVE IN COMMON?

Key vocabulary:
flower, bud, petal, sepal, carpal, stamen, pollen, reproduce

Resources:
Three different types of flowers (such as snowdrop, peony, wallflower, sweet pea, lily, foxglove, two of each type per group of six pupils), magnifiers, 'sticky cards' (see preparation notes), tweezers, if available

Preparation notes:
Prepare a sticky square using several strips of double-sided Sellotape

LESSON SUMMARY:

In this lesson children will dissect a flower in order to make a close observation of the different parts. They will also compare different flowers. By the end of the lesson children will be able to identify the parts of flowers and describe the function of each part.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Working scientifically links:

Identifying differences, similarities or changes related to simple scientific ideas and processes

Learning intention:

To identify and compare the parts of flowers and describe their functions

Success criteria:

- I can make careful observations of parts of a flower.
- I can compare different flowers.
- I can label the parts of a flower.
- I can describe the functions of the different parts.

Scientific enquiry type:

Grouping and classifying

Health and safety: Grasses, catkins and many other plans produce wind-borne pollen which can cause hay fever and trigger an asthma attack. Avoid working with these plants inside the classroom if there is a risk of the release of large amounts of pollen.

EXPLORE:

Children work in groups of six. Provide three different types of flower for each group, preferably two of each kind. Children look closely, comparing the different flowers.

Ask: *What is similar about them? Do they all have the same parts? Can you name any of the parts? What differences can you see?*

ENQUIRE:

You can approach this section of the lesson in a variety of ways. Either show the video Parts of a flower Video 1 or show slide 1 of Slideshow 1 and explain the functions of the different parts of the flower; or use a digital presenter/microscope to show a real flower while explaining the functions of the parts. Encourage children to look for those parts in their flowers.

Ask: *What is the same about all the stems/petals/stamens/carpals? How does that feature help them to do their job? Why might there be differences?*

Explain to the children that you are going to show them a slideshow of a flower dissection and that they should watch carefully as next they are going to dissect a flower themselves in order to look closely at its parts. Show Slideshow 2.

Each child dissects a flower, placing each part onto their pre-prepared sticky card and then sticking it into their book or onto a sheet of paper. As children dissect each part, ask them to consider these key questions each time: What is this part? What is its function? They then complete either Challenge 1, 2 or 3.

Display slide 2 of Slideshow 1 so that children have access to the key vocabulary.

Challenge 1 Children label parts of a flower and complete a resource sheet.

Children label the parts of their dissected flower and copy and complete the paragraphs on Resource sheet 1.

Challenge 2 Children label a flower and complete a resource sheet.

Children label their dissected flower. They then add the descriptions of the functions of the different parts from Resource Sheet 2. Children can copy or cut and stick the vocabulary.

Challenge 3 Children label a flower and describe functions of the parts.

Children label their dissected flower using both key and extension vocabulary. They use annotations to describe the functions of the parts.

REFLECT AND REVIEW:

Ask: *What is the role of the flower?* Ensure that children understand that it is for reproduction.

Ask: *What would happen to a plant with no flowers? What would happen if none of the plants produced flowers?*

EVIDENCE OF LEARNING:

Listen carefully as children compare the flowers in different plants.

Can they identify all the parts? Can they identify them in different flowers?

Review the children's labelled dissected flowers.

Can the children name the main parts of the flower? Can they label them on their dissected flower? Can they describe their functions? Do children understand (in simple terms) that the flower is important for the survival of the species, not the individual?

Key information:

Children should understand that a plant which did not produce flowers would not be able to produce seeds to grow into a new generation of plants. It would not cause the individual plant to die but if no plants of that type produced flowers there would be no new plants and eventually that type of plant would die out.

HOW DOES YOUR GARDEN GROW?

LESSON 9: WHAT DO BEES DO?

Key vocabulary:
bee, nectar, pollen, pollination, reproduce, sepal, petal, carpal, stamen (anther, filament, stigma, style, ovary for Challenge 3)

Resources:
Props for pollination role play: cut out petal, sepal and antennae card shapes attached to cardboard headbands, containers for the pollen grains, such as a plastic bottles or yoghurt pots for the stamen, small circular objects or spheres to act as pollen grains, such as ping pong balls, Styrofoam balls, Velcro dots, milk bottle lids, woolly hats for the stigma, video camera (optional)

LESSON SUMMARY:

In this lesson children model the process of insect pollination. By the end of this lesson they will know that pollen needs to be transferred from flower to flower and that bees play a vital role in that process.

National curriculum links:

Explore the part bees play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Working scientifically links:

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Learning intention:

To describe and model the process of insect pollination

Success criteria:

- I can describe how pollen is transferred between flowers.
- I can explain what the different parts of the flower do.
- I can explain why bees and pollination are important.

Scientific enquiry type:

Modelling

EXPLORE:

Watch the video clip of bees pollinating flowers (Video 1) or look at the images on slide 1 of Bees and other insects at work (Slideshow 1).

Ask: *What do you think the bees are doing? Why do they visit the flowers? Why are the petals brightly coloured? Why do they need to attract insects?* Encourage children to think about how the answers to these questions link with what they saw when they looked closely at the flower parts in Lesson 8.

Show the animation of insect pollination (Animation 1) and discuss.

Ask: *What does the bee do? Why does the bee visit the flowers? Where is the pollen produced? What happens to it? What happens after the pollen is transferred to another flower? What would happen if no pollen was transferred?*

ENQUIRE:

Tell the children that their challenge is to model the process of insect pollination through role play. Organise children into different roles: at least three children per flower to be either petals or sepals and at least three to act as stamens, holding the containers of 'pollen grain'. For each flower, there will need to be one child acting as the stigma. The rest of the children can be the bees wearing the antennae headbands. The children arrange themselves into flowers and the children representing bees fly from flower to flower. When they land on a flower some of the pollen is transferred to their legs and body (via the Velcro dots). When they visit the next flower some of this pollen sticks to the carpal. The flower has been pollinated.

Through questioning, ensure that the children direct the role play as far as possible.

Ask: *How will you represent the flower? Where will you need to stand? Do the petals go inside or outside the sepals? Where is the pollen produced? Which part of the flower collects the pollen? What will happen when the pollen has been transferred to the stigma/carpal? Why are bees so important?* Children may wish to add to the role play, e.g. by finding a way to represent the nectar.

If possible, video the role play. This can be used later or played back to support any groups that need a reminder during the challenge activity.

Key information:
Establish that bees visit flowers to collect nectar to take back to the hive. The bees transfer some of the pollen from one flower to another as they feed. Some plants rely on the wind to blow the pollen from flower to flower but many need insects to do this. The transfer of pollen leads to seed formation. This is a method of plant reproduction.

Following the role play, children then work individually or in pairs to write a voiceover to help someone watching the role play to understand what it shows. These challenges are differentiated by the amount of support and guidance given to the children.

Challenge 1 Children write a voiceover.

Children write a voiceover using Online resource sheet 1 to support with sequencing, sentence starters and vocabulary. As a minimum the voiceover should describe what is happening at each point. Ask them to think about the following questions: What is the bee doing? Where is the pollen? Where does the bee go next?

Challenge 2 Children write a voiceover.

Children write a voiceover using Resource sheet 1 to support them with sequencing and vocabulary. The voiceover is to include some explanation of what is happening. Children should think about: What is the job of the petals? Why does the bee visit the flower? How does the bee transfer the pollen?

Challenge 3 Children use a writing frame.

Children use Resource sheet 2. They will include more detailed explanation and may name the parts of the carpal. Key vocabulary to be included is provided. Encourage children to think about the following questions: How does the flower attract the bees? How is the bee suited to pollinating flowers? What will happen after pollination? What would happen if there were no bees? Why is pollination important?

REFLECT AND REVIEW:

Share some of the scripts. You could repeat the role play with the voiceovers, if there is time, or children could read them whilst watching the video. Do they describe what is happening? Do they explain the process and why it is important?

EVIDENCE OF LEARNING:

Review children's scripts.

Can the children recognise and represent the different elements in the role play? Can they describe where they go and what they do? Can they sequence the events in the role play? Can they explain the part the different parts of the flower and the bee play in pollination? Do they understand the importance of pollination and its role in the life cycle of a plant?

CROSS CURRICULAR OPPORTUNITIES:

Computing – using digital devices to present information. As an additional activity, linked to computing, children could record their voiceover and add it to the video clip.

HOW DOES YOUR GARDEN GROW?

LESSON 10: HOW ARE SEEDS DISPERSED?

Key vocabulary:
seed, fruit, dispersal, animal, wind, water and self-dispersal, explosion, sprinkling, competition

Resources:
Collection of seeds, range of reclaimed and modelling materials which may include small boxes, yoghurt pots and other containers, tubes, a range of papers and card, components for technology projects such as wheels, gears, cotton reels, polystyrene balls, fabric, feathers and other trimmings, pipe-cleaners, hooks, Velcro, balloons, plastic bags, bubble wrap, tape, glue, string, scissors and other tools as required

LESSON SUMMARY:

In this lesson children use their observations of seeds to make model seeds suited to different methods of dispersal. By the end of this lesson children will know the different methods of seed dispersal, how seeds are adapted for them and the reasons why seeds need to be dispersed away from the parent plant.

National curriculum links:

Explore the part flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal

Working scientifically links:

Identifying differences, similarities or changes related to simple scientific ideas and processes

Learning intention:

To demonstrate understanding of methods of seed dispersal by designing a seed

Success criteria:

- I can make careful observations of seeds.
- I can describe different methods of seed dispersal.
- I can match features of seeds to their method of dispersal.
- I can explain why seed dispersal is important.

Scientific enquiry type:

Technology

EXPLORE:

Ask: *What would happen if all the seeds from a plant stayed in the space around the parent plant?* Model, with children acting as the seeds around you. As they grow they are crowded and compete with each other and the parent plant for water, light and space. Establish that seeds need to be dispersed away from the parent plant to reduce competition.

Discuss with children how seeds can be carried away from the parent plant. What examples do children already know? If a school collection of fruits and seeds is available, identify seeds that the children mention and look at them closely. Use children's observations of the seeds to prompt other ideas about how they may be dispersed.

Watch the video Seed dispersal (Video 1) showing methods of seed dispersal and then use the interactive (Interactive 1), supported by real examples if available, to match the seeds to their method of dispersal.

ENQUIRE:

Tell the children they are naturalists discovering the seeds of unknown plants. Their challenge is to draw and then make a model of the seed from a new type of plant. Their fellow naturalists will have to decide how they think the seed is dispersed. Children could work individually or in pairs.

Challenge 1 Children design and draw a seed.

The children choose a seed and use it to help them to design and draw their own seed dispersed by the same method. They make a model of it which shows features linked to how it is dispersed.

Challenge 2 Children design a seed and label its features.

The children choose two or three seeds that have the same method of dispersal and consider how, in their different ways, they are suited to this method. They then design their own seed, labelling the features that make it suited to this method of dispersal and make models of them.

Challenge 3 Children draw, label and make a model of a seed.

The children draw a seed which makes imaginative use of ideas from seeds they have seen and label or annotate the features which make it suited to how it is dispersed. They make a model of it.

REFLECT AND REVIEW:

Remaining in their groups, ask children to present their seeds to each other. They peer assess according to how well the seed shows features linked to its method of dispersal. (If time permits this could be carried out as a whole class.) The seeds could also be made into an interactive display where children can guess and then reveal the method of dispersal.

Review children's drawings and models of seeds. Listen to the groups as they peer assess each others' design.

EVIDENCE OF LEARNING:

Can the children identify the different methods of dispersal? Can they match seeds to those methods? Can they design a seed which is suited to a specific method of dispersal? Can they explain, either orally or in writing, the features that make it suited to its method of dispersal? Can they recognise which method of dispersal another child's seed was designed for?

HOW DOES YOUR GARDEN GROW?

LESSON 11: CAN PLANTS SURVIVE WITHOUT LEAVES?

Key vocabulary:
leaf, food, water, air, light, observations, draw conclusions

Resources:
Coloured pens/pencils/highlighters (two colours per pair), the plants from the investigations set up in lesson 3. What would happen if a plant lost its leaves? Children's logs of observations, KWL display

Key information:
This activity is not about identifying the correct answers. The focus is on deciding which statements can be judged as likely to be correct or incorrect based on the evidence the children have collected. It may be the case that we cannot be sure about some statements or that further evidence is required to be sure.

LESSON SUMMARY:

This is the second part of a two-part lesson. In this lesson children will use their ongoing observations from the investigation started in lesson 3 to draw conclusions. By the end of the lesson they will be able to write a conclusion which uses their evidence and other information to answer the question: Why do plants need leaves?

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers

Working scientifically links:

Using results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests

Learning intention:

To evaluate features of a good conclusion and draw their own conclusions from their observations of their investigation into the effect of removing the leaves from a growing plant

Success criteria:

- I can use observations to decide which statements are true.
- I can use my observations to answer my question about whether plants need leaves.
- I can write a conclusion that:
  - describes what my observations show
  - uses my observations to answer my question
  - uses what I know to explain my observations
  - uses what other people know about this question.

Scientific enquiry type:

Carrying out comparative and fair tests

EXPLORE:

Review what children know about the functions of a leaf. Use pair-share questioning depending on how secure the children's knowledge is and refer to the What we know section of the KWL display.

Look at the plants and records of observations for each challenge from lesson 3.

Ask: *What has happened to the plants?* Show the statements on slide 1 of Can a plant survive without leaves? (Slideshow 1).

Ask: *Which of the statements are most likely to be correct? What evidence from your investigations supports this judgement?* Discuss the evidence shown on slide 2 as well as highlighting children's own investigations.

ENQUIRE:

Show slide 3. Use pair-share discussion to establish what the slide shows. Explain that drawing a conclusion actually involves writing. Use the success criteria to remind children that a conclusion should describe what happened, what the observations show, answer the investigation question and explain why they think it happened. Provide each pair with a copy of the two conclusions. Pair the children so that less confident readers are supported by partners who can read more fluently. Ask children to decide which is the better conclusion and use coloured pens, pencils or highlighters to identify good points and where improvements are needed. Using slide 4, or children's work on a digital presenter, identify why the second conclusion is better than the first.

Explain to the children that their challenge is to write a conclusion to their investigation into what would happen to a plant if it lost its leaves.

Challenge 1 Children write a conclusion to an investigation.

Children write a conclusion to their investigation using their observations to decide whether a plant can survive without leaves and explaining why plants need leaves.

Ask: *What do your observations show? Did the plant without leaves survive? What do the leaves do to keep the plant alive?*

Challenge 2 Children write a conclusion to an investigation.

Children write a conclusion to their investigation using their observations to decide whether it makes a difference how many leaves a plant loses and explaining why plants need leaves.

Ask: *What do your observations show? Did all the plants survive? Which plants look healthiest? What do the leaves do to keep the plant alive and healthy?*

Challenge 3 Children write a conclusion to an investigation.

Children write a conclusion to their investigation using their observations to decide whether it makes a difference how many leaves a plant loses and explaining why plants need leaves.

They also decide whether their conclusion is supported by evidence from other groups in the class and perhaps what they have read elsewhere.

Ask: *What do your observations show? Did all the plants survive? Which plants look healthiest? Do your observations show the same as those from other groups? What do the leaves do to keep the plant alive and healthy?*

REFLECT AND REVIEW:

Children peer assess each other's conclusions. What is good about them? What could be improved?

EVIDENCE OF LEARNING:

Listen carefully during the pair share session and review children's conclusions.

Can the children describe what happened to their plants? Can they give reasons from their observations when deciding whether statements are true? Does their answer to their investigation question match their observations? Does their explanation refer to the role of the leaf in making food for the plant? Can they recognise the features of a good conclusion? Can they include them in their writing? Can they make suggestions about how a conclusion could be improved?

HOW DOES YOUR GARDEN GROW?

LESSON 12: AM I THE PERFECT PLANT?

Key vocabulary:
plant, root, stem, trunk, leaf, flower, leaflet, stalk, veins, surface, edge, lobes, bud, petal, sepal, carpal, stamen, pollen, function, water, nutrients, anchor, support, germination, seedling, flowering, pollination, seed formation, reproduce, dispersal

Resources:
KWL display, large piece of paper, coloured pens and pencils, sticky notes, collage materials (optional)

LESSON SUMMARY:

This lesson provides an opportunity to assess whether children know what parts a plant has, can name them and can describe their functions. In this lesson children will design flowering plants, labelling and annotating their drawings. By the end of this lesson children will have demonstrated what they have learned about the parts of a flowering plant.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers

Working scientifically links:

Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions

Learning intention:

To demonstrate what children have learned about plants by designing a flowering plant

Success criteria:

- I can design a flowering plant.
- I can label its parts, features and functions.

Scientific enquiry type:

Technology

Note: This lesson can be done simply with drawings or could be extended over two lessons to allow children to produce 3D posters and to provide more time for peer assessment. This would also permit revisiting of learning if the activity shows knowledge to be not yet secure.

EXPLORE:

Before the lesson, encourage children to look at the KWL display. Reflect on what has been learned. What did they know at the start of the module? Have they changed their mind about anything they thought they knew? What have they learned? Which of their questions do they now know the answers to? Draw attention in particular to information about the key features plants need in order to survive and reproduce. If there are questions that have not been answered, decide whether they can be used for enrichment lessons, covered in the ongoing 'Our Changing World' module, researched outside school or be answered during modules in later year groups.

ENQUIRE:

Explain that for this challenge, children should draw on what they have learned to design a plant. Using the seed they designed in lesson 10 as a starting point, challenge them to imagine and draw the plant that it would grow into. They will name it, if they did not choose a name when they designed the seed, and present it as a picture or collage with labels and annotations. Through pair-share or group discussion, draw up success criteria against which the designs will be evaluated. These would be based around the results of the challenges.

Challenge 1 Children imagine, draw and label plant.

All main parts of the plant are shown. Most parts should be labelled by name and some information included about function.

Challenge 2 Children imagine, draw and label a plant with annotations.

Children imagine, draw and label a plant using annotations. All parts (including parts of flower) should be drawn and named, with annotations to describe functions

Challenge 3 Children imagine, draw and label a plant with descriptive details.

These children will present their work with more descriptive detail (drawn and written), for example, for flower and leaf as in an identification guide. All parts (including parts of flower) should be drawn and named with annotations to describe functions. Annotations include information about how those parts are suited to their functions.

REFLECT AND REVIEW:

You may wish to use video, interactive activities or images from previous lessons as a reminder before the review of the posters if they show gaps in children's knowledge.

Display the posters on tables or walls. Each group moves to another group's posters and peer assesses them against the agreed success criteria. Working in pairs they write comments on sticky notes and stick them to the posters. Repeat for another group if time permits.

EVIDENCE OF LEARNING:

Review children's posters.

Can the children identify what they have learned? Can they design a plant which has all the main parts, correctly named? Can they include details such as the parts of the flower? Can they describe the functions of the parts – main ones/all parts? Do they describe any adaptations, such as colouring and patterns on the flowers, large leaves to get lots of sunlight, juicy fruits to attract animals?

HOW DOES YOUR GARDEN GROW?

E

LESSON 13: HOW AMAZING ARE SOME PLANTS?

Key vocabulary:
stem, roots, leaves, flower, seeds, nectar, pollen

Resources:
No additional resources

LESSON SUMMARY:

In this lesson children will research some more unusual plants. By the end of the lesson they will have learnt some facts about amazing and unusual plants and presented these in different ways.

National curriculum links:

Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers

Working scientifically links:

Reporting on findings from enquiries, including oral and written explanations

Learning intention:

To research facts about unusual plants

Success criteria:

- I can ask questions about unusual plants that can be researched.
- I can find relevant information about plants.
- I can present the researched information clearly.

Scientific enquiry type:

Using secondary sources of information

EXPLORE:

Display Interactive 1. Explain to the children that you would like them to discuss the statements as to features that all plants have. Allow time for children to discuss their ideas. Listen to their discussions and note any examples where they contradict a statement by giving an example, such as not all plants have leaves because a cactus has none. As children are discussing, use the interactive display to move the statements around according to the flow of discussion. Where possible, encourage the children to think of examples of plants that do not have the common features of plants. Later in the lesson some children will be researching unusual plants.

Show the World Record Breakers photo gallery Slideshow 1, which introduces the children to some world record animals. Ask the children to think of five categories for world records that are related to plants, such as 'What is the tallest plant in the world?' Ensure they realise that they do not need to know the answer but are simply generating questions that some children will research later.

ENQUIRE:

Tell the children that their challenge is to carry out research about some unusual plants that they will need to present to the class at the end of the lesson.

Challenge 1 Children create a PowerPoint presentation.

Ask children to research the winners of the world record-breaking categories that were devised with the whole class. Ask them to create a PowerPoint presentation that they can share where each slide has an image and the facts for one world record-breaking plant. Ask children to self assess their presentation.

Ask: *Does each slide show clearly why the plant is a record-breaker? Is your information reliable?*

Challenge 2 Children draw a plant and label its features.

Provide children with Resource sheet 1. Ask them to research each of the plants to find out about their leaves, stems, roots and flowers. Ask the children to draw one of the plants and label it to show its features.

Ask: *If a plant doesn't have leaves, where does it get its nutrients? If a plant doesn't have roots, where does it get its water from?*

Challenge 3 Children carry out internet research and write some explanatory text.

Ask these children to use the internet to find plants that do not have each of these features: leaves, stems, roots and flowers. Ask the children to write a piece of explanatory text explaining what the function of each part of the plant is and how some plants have adapted to survive without certain parts. You could provide these children with Resource sheet 2 to plan their writing.

Ask: *If a plant doesn't have leaves, a stem, roots or a flower how does it survive?*

REFLECT AND REVIEW:

Share some examples from each of the learning challenges. A good homework activity could be to make some trump cards for different plants using some of the ideas from Challenge 1. Revisit Interactive 1 and discuss examples of plants that they found that do not have these common features. Discuss how each survives.

EVIDENCE OF LEARNING:

Listen carefully to children when they discuss the different parts of plants.

Do the children know the role of the leaf, stem, roots and flower? Can they give examples of plants that do not have one or more of these common features? Can they explain how these plants survive?

Review children's presentations. Have they been able to research different plants? Have they been able to present their research clearly?

HOW DOES YOUR GARDEN GROW?

E

LESSON 14: WHY ARE SOME FLOWERS BRIGHTLY COLOURED?

Key vocabulary:
flowers, flowering, insects, colour, pollination, attract, identify

Resources:
Wool of 6 different bright colours (1m per group), scissors, A4 card, glue or double sided sticky tape

LESSON SUMMARY:

In this lesson children will explore why some flowers are brightly coloured and others are not. By the end of this lesson the children will understand that plants that are pollinated by insects are brightly coloured to attract the insects whereas other plants such as grasses that are wind pollinated do not need to be brightly coloured.

National curriculum links:

Explore the part that flowers play in the life cycle of flowering plants, including pollination

Working scientifically links:

Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions

Learning intention:

To investigate and then explain why some flowers are brightly coloured and others are not

Success criteria:

- I can explain why some flowers are brightly coloured.
- I can identify different flowers.
- I can explain why some flowers are brightly coloured.
- I can investigate which colours are more attractive to insects than others.
- I can describe other ways that flowers attract insects

Scientific enquiry type:

Grouping and classifying

Preparation required: Before the lesson cut 1m of six different coloured wools (include brown, green and four bright colours) into 5cm pieces. Outside sprinkle these around in a defined area. Prepare a collection board by sticking on rows of double-sided sticky tape.

Health and safety:

Ensure the children are aware of the boundaries that they must stay within. Ensure the area is clear of glass and other dangerous items.

Key information:
They may suggest the grass is the odd one out as it does not have any flowers. If this is the case, show slide 2 which shows a close-up image of the flower of the grass.

EXPLORE:

Show slide 1 of Slideshow 1. Ask the children to think, pair, share which plant they think is the odd one out and the reason why. Ask some children to share their ideas with the class.

Remind the children that the role of the flower is to produce seeds for new plants. In order for this to happen they must be pollinated. This can be done by insects that visit different flowers, picking up pollen and taking it to other flowers.

It is not necessary at this stage for children to understand that grasses are wind pollinated.

Take the children outside to the area where you have placed the wool. Explain that they are 'insects' and they are going to gather pollen from flowers. Explain that they are to go and find one piece of wool as quickly as possible and bring this back to the collection board. Ensure they only bring one piece of wool at a time and then go back for another.

When no more wool can be found show the children the collection board. Ask the children to look for any patterns in the colours. Were some colours found first and others later? It is likely that the green and brown were found later than the other bright colours. Flowers that are insect pollinated are not likely to be these colours. Explain that grasses and other such plants with green or brown flowers are usually wind pollinated.

ENQUIRE:

Tell the children that their challenge is to explore what colours wild flowers are to help them determine which colours are most attractive to insects.

Challenge 1 Children complete a table by drawing flowers and create a bar graph.

Take the children outside to an area that has wild flowers growing. Provide them with Resource sheet 1. Ask them to look for different flowers and draw them carefully on the table. Ask them to choose the colour that matches most closely and record this in the table also. Back in the classroom ask these children to use Interactive 1 to create a bar graph of their results.

Ask: *Which was the most common flower colour? Which was the least common flower colour? How many more yellow flowers did you find than blue?*

Challenge 2 Children complete a table by drawing flowers, identify the flowers and create a bar chart.

Take the children outside to an area that has wild flowers growing. Provide them with Resource sheet 2. Ask them to look for different flowers and draw them carefully on the table. Ask them to choose the colour that matches most closely and record this in the table also. Ask the children to use an identification chart (Online resource sheet 1) to try and name each flower. Back in the classroom ask these children to create a bar chart to show their results.

Ask: *Which was the most common flower colour? Which was the least common flower colour? What other features besides colour did you use to identify the flower? Have you labelled your bar chart appropriately?*

Challenge 3 Children record flowers they find on a resource sheet and use ICT to create a graph.

Explain to children that they are going to survey the colour of wild flowers. Take the children outside to an area that has wild flowers growing. Provide them with an identification chart and colour chart Online resource sheets 1 and 2 and ask them to record what flowers they find and their colour. Ask these children to use a spreadsheet or suitable ICT package to create the most appropriate graph to show their results.

Ask: *Have you recorded your results clearly? Which was the most common flower colour? What other features besides colour did you use to identify the flower? What type of graph did you choose to use?*

Key information:

Very few wild flowers are red in colour as insects cannot see red well. If you are not able to look at wild flowers and you look at cultivated flowers they may be red in colour. These have often come from abroad and are not pollinated by insects but by birds. Cultivated plants have also been bred to give different colours.

REFLECT AND REVIEW:

Ask the children to look at their results. Ask them to share them with each other. What was the most common colour flower? What was the least common colour flower?

Ask the children to think about other ways that plants can attract insects; for example, they are often scented and contain sweet nectar.

EVIDENCE OF LEARNING:

Observe children as they carry out their investigation. Review the data that they present in their bar charts.

Can the children explain that flowers that are insect pollinated are often brightly coloured whereas those that are wind pollinated are not? Were the children able to record the wild flowers that they found either in a prepared table or by devising their own method of recording? Were the children able to use the identification chart to name the flowers? Could they say what feature they used to identify the flower, for example 'I looked at the shape of the petals'? Were the children able to present their findings using a bar chart either with support from the animation or independently? Did the children using ICT software choose an appropriate graph form?

HOW DOES YOUR GARDEN GROW?

E

LESSON 15: HOW CAN WE SAVE BEES?

Key vocabulary:
bees, pollen, nectar, pollination

Resources:
internet access, video camera

LESSON SUMMARY:

In this lesson children will explore why bees are important and how we can help to protect them. By the end of this lesson the children will understand the important role that bees play in the reproductive cycle of plants and how we can help to encourage more bees into the area.

National curriculum links:

Explore the part that flowers play in the life cycle of flowering plants, including pollination

Working scientifically links:

Reporting on findings from enquiries, including oral and written explanations

Learning intention:

To determine and explain why bees are important and how we can protect them

Success criteria:

- I can explain why bees are important for plant reproduction.
- I can give reasons why the bee population has decreased.
- I can give ways to encourage bees into an area.

Scientific enquiry type:

Using secondary sources of information

Health and safety: If you are going out to look for bees, check for children that have allergic reactions and take necessary precautions. Talk to the children about staying still and not aggravating the bees.

Key information:
It is important that children understand that the bees visit the different flowers to collect nectar which they use to make honey to feed on during the winter. Many flowering plants rely on insects such as bees for pollination. Whilst they visit a flower they also pick up pollen which they then carry to another flower in order for pollination to take place.

EXPLORE:

You may wish to show the children the film Bee Movie which will demonstrate the importance of bees for the reproduction of flowering plants. Alternatively you could show the trailer to the movie which is available online. Ask the children to think, pair share their ideas about how the bees benefit from the flowering plants and how the flowering plants benefit from the bees.

This would be an opportunity to go out and look for bees in an area where there are flowering plants. You can provide Resource sheet 1 for the children to identify any bees that they find. Ask them to look carefully to see if there is any pollen attached to the bee. Also encourage them to look closely at the flower that it was visiting.

Ask: *How is the flower attracting the bee? Is it brightly coloured? Does it have a smell? Can you see any nectar? Where is the pollen?*

Back in the classroom use Slideshow 1 so that the children are clear about what they need to research. This can be set up as a jigsaw activity. Put the children into groups of four. This is their presentation group. They then work with a partner in another group to carry out the research. Provide books or internet access. A good website to start is The Bumblebee Conservation Trust http://bumblebeeconservation.org/about-us/. Both children need to take notes of their research to take back to their original groups. They can then pool their learning to produce their presentation. The research pairs can be mixed ability.

ENQUIRE:

Tell the children that they will be presenting the information that they have researched in different ways.

Challenge 1 Children use a video camera to produce a television news report.

Provide children with a video camera and ask them to produce a television news report that explains why bees are important and what we can do to help.

Ask: *Why are bees important? What can we do to help? Which flowers attract bees?*

Challenge 2 Children produce an explanatory poster.

Ask these children to produce a poster that explains why bees are important and what we can do to help. Ask them to include some interesting facts to attract the reader's attention.

Ask: *Why are bees important? What can we do to help? What interesting facts have you learnt about bees?*

Challenge 3 Children produce an information leaflet.

Ask these children to produce an information leaflet about bees. In their leaflet they should include why bees are important and what we can do to help. Ask them to also include some interesting facts and some background information about bees, for example their life cycle and the roles of bees in a hive.

Ask: *Why are bees important? What can we do to help? What interesting facts have you learnt about bees? What is the life cycle of a bee? What are the roles of the bees in a hive?*

REFLECT AND REVIEW:

Allow time for the children to look at the presentations of other groups. Provide them with sticky notes so that they can leave a comment on the presentations that they look at. Ask them to write two things that they like about the presentation and a suggestion for improvement.

EVIDENCE OF LEARNING:

Review children's news reports, posters or information leaflets.

Do the children understand the role the bee plays in the reproductive cycle of flowering plants? Do the children understand how the flowers benefit the bee? Can they explain ways in which flowers attract bees? Can the children explain why the bee population is decreasing? Can they give suggestions of how we can help to conserve bees? Can they give suggestion of plants that attract bees? Were they able to research relevant information? Were they able to present this information clearly?

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- ✓ Progression for every child
- ✓ Effective assessment
- ✓ Supports the development of your school curriculum