YEAR 3: PLANTS

LINKS TO NATIONAL CURRICULUM

Science

- Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers (Plants, Year 3).
- Explore the requirements of plants for life and growth and how they vary from plant to plant (Plants, Year 3).
- Investigate the way in which water is transported within plants (Plants, Year 3).
- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal (Plants, Year 3).
- Set up simple practical enquiries, comparative and fair tests (Working scientifically).

Key Learning Objectives

1. What job does each part of a plant do?
2. What do plants need to survive and grow?
3. How is water transported within plants?
4. What part do flowers play in the life cycle of flowering plants?

Notes to Teachers

- There is an outline lesson plan covering each of the learning objectives.
- The lesson plans are not intended to be of equal length and can be amalgamated or split to suit timings.
- Activities given are suggestions only. The main purpose of the lesson plans and presentation is to provide key information and visual aids for teachers to adapt to their needs.
- The PowerPoint presentation runs alongside the plans and all slides are referred to in the lesson plans. Please feel free to modify the presentation by adding your own slides or deleting those you don't need.

1. WHAT JOB DOES EACH PART OF A PLANT DO?

SUGGESTED STARTER ACTIVITIES

Plant Safety and Respect

Ask the children to devise a charter for how they handle plants, taking into account their own safety and a respect for living things. It may look something like the example below:

Plant Handling Charter

- Always wash your hands after handling plants, soils, compost etc.
- Remember that plants can be poisonous or cause allergic reactions in some people.
- NEVER eat plants found in the wild or your school grounds, unless you have been given instructions by a teacher that they are edible and you may do so.
- Wild flowers should not be picked. In fact it is illegal for anyone (without permission from the landowner or occupier) to uproot any wild plant.

Why are plants so important?

Ask the children why they think plants are so important to animals, other plants, humans and the planet as a whole. Create a mind map on the board showing all of their ideas.

One of the main differences between plants and animals is that plants make their own food, whereas animals have to eat plants and/or other animals. This ability to make food is why plants are at the start of all food chains.

Question & answer: Parts of a plant

How many parts of a plant do the children already know? They may have learned about them in Key Stage 1, in which case this will be a recap. Show them a real flower or a picture and ask them to identify the different parts. Do they know why each part is important?

TEACHER INPUT

Slide 4: Every plant has four main parts and each one has an important job to do. Can the children label the diagram? The labels will appear as you click (flower, leaf, stem, roots), giving the children the chance to identify them.

1. Roots (Support and Nutrition)

Slide 5: Roots are usually underground but can be seen above ground, particularly tree roots.
Slides 6-7 : There are different types of root. If possible, show children a plant with many roots (fibrous) and one with a large tap root e.g. carrot.

If possible, ask the children to pull up a weed in the school grounds - they will feel resistance as one function of the roots is to anchor the plant in the soil, so that it doesn't blow over.

The second function of roots is to collect water and nutrients from the soil. Plants can spread roots over a wide area to collect as much water as possible, and tap roots can grow down a long way into the soil. The roots act as pipes to take water and nutrients to the rest of the plant.

Slide 8: Some roots actually store food for the plant e.g. carrots, turnips, radishes and swedes. That is why they are called root vegetables.

2. Leaves (Nutrition)

Slides 9/10: Leaves can convert sunlight into food for the plant in a process called photosynthesis. To do this they need 3 things:
Carbon dioxide - this is a gas that is found naturally in the air around us. It passes through tiny little holes in the leaves.
Water - this is absorbed by the roots and passes through the stem on its way to the leaves.
Sunlight - this is absorbed by the leaves.
So without leaves, a plant cannot produce food - they are the food factory for a plant!

Slide 11: Sometimes a tree can get a disease which means its leaves become infected - they then turn brown and die. This means the tree can't get any food and whole branches of the tree can die.

3. Stem/Trunk (Nutrition and Support)

Slides 12-14: There are many different types of plant stem.

The stem is like a straw - it carries water and minerals from the roots to all the other parts of the plant. It also carries food from the leaves to all the other parts of the plant.

The stem also provides support for the plant as the shoots, new leaves and sometimes the flowers grow from it.

4. Flower (Reproduction)

Slide 15: Flower petals are often brightly coloured as their main job is to attract insects e.g. bees and butterflies into the flower. Insects pick up pollen from the flower and carry it to the next flower they visit. This is how most flowers are pollinated. This is explored in more detail in the Upper Key Stage 2 lesson plan.

SUGGESTED ACTIVITIES

Experiment: How do leaves help plants grow?

1. Try to find 2 plants that are as near the same size as possible. Good plants to use include the tomato and geranium.
2. Measure the heights of the plants and record in an observation table.
3. Remove the leaves from one of the plants (but not the growing tip).
4. Discuss fair testing with the children - e.g. do the plants need to be watered the same amount for the test to be reliable?
5. Ask the children to predict what will happen to the two plants.
6. You may need to remove further leaves during the week to ensure the test works.
7. Can the children explain why the plants have grown different amounts? The test should show that plants need leaves in order to grow properly. Without leaves, photosynthesis cannot take place which means the plant cannot produce food for itself.
8. Results could be displayed as photos, drawings or graphs (e.g. height of plant, number of new leaves).

This experiment could be extended by using 4 plants (similar in size). The first plant should keep all its leaves, the second have some leaves removed, the third have most removed and the fourth plant should have all its leaves removed. Children can observe changes in the plants over a period of around 4 weeks.

Design your own plant

Ask the children to design and draw their own plant. They will need to label the main parts and annotate their drawing with the functions of each part.

Creative: Make a plant

Using a variety of materials, ask the children to create their own plant. It should have the four main parts of a plant. Here are some ideas for materials:
Stem - cardboard tube from foil or cling film roll, straws
Roots - long pipe cleaners, wool, string
Flower - cake cases, milk bottle tops, paper plates
Leaves - card/paper

2. WHAT DO PLANTS NEED TO LIVE AND GROW?

SUGGESTED STARTER ACTIVITY

Recap quiz on what the children learned in Key Stage 1 about what plants need to grow healthily. Do they have any plants at home that they help to look after or maybe they belong to a gardening club at school?

TEACHER INPUT

Slide 17: Plants all need 5 things in order to stay alive and grow healthily:

1. Suitable temperature **(slide 18)** - a seed will not produce a plant at all if it is kept too cold. Seeds need warmth to germinate and start to grow into healthy plants. Plants tend to grow more quickly when it is warm and slower when it is cold. But temperature can be a matter of life or death for a plant. Cold temperatures can damage plant growth and cause plant death **(slide 19)**. Too much heat can cause flowers to die and leaves to wilt. Different plants need different temperatures to grow well - what might be considered warm conditions for some plants will be considered cold conditions for others.

2. Light **(slide 20)** - the plant's leaves use light from the sun, along with carbon dioxide from the air and water to make their own food. This process is called photosynthesis. A plant grown in a dark place will grow tall and spindly in search of light; it will then become weak and die. Plants vary in the light conditions they prefer - some will do better in full sun whilst others prefer partial sun or light shade.

3. Water **(slide 21)** - a plant that is not watered will have a weak stem and dried up leaves; it will eventually die. But too much water can also cause plants to die. It is important that plants get the right amount of water and some will need more than others. **Slide 22** shows a field of grass that has suffered from a drought (a long period of time when the rainfall is lower than it usually is).

4. Food/nutrients **(slide 23)** - plants need the minerals found in soil for healthy growth; these are taken up through the roots. Different plants need different amounts of nutrients - this means some can grow on soils that lack nutrients, whilst others will not survive. Plants that don't get

the nutrients they need will show slow or no growth, failure to bloom and often pale/discoloured leaves.

5. Air **(slide 24)** - plants need air to stay alive. Their leaves use carbon dioxide from the air to make food. Plant roots need oxygen from the air to stay healthy and do their job of gathering water and nutrients for the plant. Plants prefer clean air - dirty air caused by smoke, gases and other pollutants can be harmful to plants.

So there are 5 factors needed for all plant growth. But some plants need more or less of certain factors than others. **Different plants need different environments and therefore different plants grow in different places.**

SUGGESTED ACTIVITIES

Plant Growth Investigation

The aim of this investigation is to work scientifically by comparing the effect of 5 different factors on plant growth - light, soil, warmth, water and air. The children could be challenged to devise their own methods of testing. Or you may choose to base your investigation on the following suggestion:

You will need:
8 seed trays, rulers, packets of grass seed, soil, seed compost, sand, coir, water, clear plastic bag, a drinking straw, black bin liner.

Test Fairness
It is very important that the children understand the importance of making the tests fair. When one variable is reduced, it is vital that the other variables are kept the same or the test will not be reliable. This should be discussed before the tests begin. For example, the amount of water given to those trays being watered must be the same - this could be measured in spoonfuls, millilitres etc. The trays should also be watered at the same time (not necessarily at regular intervals but whenever the soil is feeling dry).

Measurement Methods
You will need to decide how the children will measure the growth of their grass. This will depend on their age and ability. Possible methods include:

- measuring the height of the tallest blade.
- measuring the heights of the tallest and shortest blades, then dividing by 2 to get the mean.
- measuring 10 blades of grass and calculating the average height.

Carrying out the Tests

1. Divide the class into 8 groups. Each group is allocated a growing condition (see list below) and the equipment they need to carry out their test. You may wish to simplify this activity by testing fewer of the conditions outlined below.
2. Ask the children to predict what they think will happen to the grass in their tray and to explain why.
3. The grass seeds should be planted in rows (this makes it easier to measure the heights).
4. The children should carry out observations and measurements every 2-3 days at roughly the same time. Seed growth may not be seen for several days and perhaps up to a week after planting.
5. Results should be recorded in a table (see page 8 for a suggested format).
6. When the tests are complete, children can produce graphs and write up their results. Were their predictions correct? Can they explain why their grass grew as it did? Results should be shared with the class and children feed back what they have learned from the investigation.

Group 1: Seeds to be grown in **optimal conditions** (all 5 factors present).
Group 2: **No light**. A black bin liner can be used to provide dark conditions for the grass seeds.
Group 3: **No soil** - sand to be used instead.
Group 4: **No soil** - seed compost to be used instead.
Group 5: **No soil** - coir to be used instead (can be bought at garden centres).
Group 6: **No warmth**. An outside protected and shaded area is ideal. Do not use a fridge as this will also be dark.
Group 7: **No water**. This tray should be placed next to tray 1 but not watered.
Group 8: **No air**. The tray should be placed in a transparent plastic bag and the air removed with a straw (place straw to side of tray to avoid sucking up compost). The air will need to be removed after each watering. Water with cooled boiled water as this removes dissolved air.

Design a Poster

Ask children to design and produce a poster showing what plants need to survive and how to care for them.

GROWTH RECORD SHEET

Tray number:_____

Growing conditions: _____

Prediction:_____

_____

Date	Grass blade measurement	What colour are the leaves?	Are leaves strong & upright?

3. HOW IS WATER TRANSPORTED WITHIN PLANTS?

SUGGESTED STARTER ACTIVITIES

Wilting Plants

Slide 26: If possible, show children some wilting plants e.g. celery with leaves. What is wrong? What happens if we water them - do they revive?

Carnation and Celery Experiment

You will need:
2 glasses, red food colouring, water, 1 white carnation, 1 stick of celery, marker, magnifying glass.

1. Fill 2 glasses with water.
2. Add enough red food colouring to each glass of water to turn the water a dark red colour.
3. Cut the bottom 1cm off the stems of the carnation and the celery stick.
4. Place the carnation in one glass and the celery stick in the other.
5. Mark the level of water in each glass using a marker.
6. Leave the glasses for a day or 2 on a shelf (the coloured water will be taken up quicker if the plants are allowed to wilt a little before being put in the water).
7. The children can observe what happens to the plants (the carnation petals turn red, thin red lines can be seen running the length of the celery stalk, red can be seen in the leaves of the celery, the level of water drops).
8. You could cut the celery stick both into cross-sections and into lengthwise strips to show the children - what are the coloured dots on the slices and the coloured strands in the pieces cut lengthways? A magnifying glass will enable the children to examine the plants carefully.

TEACHER INPUT

Begin with some discussion following on from the food colouring experiment. The children should have observed the coloured water moving up through thin tubes in the celery. As the water was transported around the leaves of the celery and the petals of the carnation, they will have seen the colour change. Examination of the celery cross-section will have shown that the inside of the thin tubes were marked red. So what does this tell us?

Slide 27: Here a similar test has been carried out with a cabbage leaf - what has happened and why?

Slide 28: A plant stem contains lots of little tubes which take the water to where it is needed. The experiment showed that the food colouring in the water travelled upward in the stem, as the petals of the white carnation turned red. When the celery was cut into a cross-section, the tube-like structures could be seen as coloured dots in the stem. **This shows very clearly that nutrients and water can travel up the stem to reach all the other parts of the plant**.

SUGGESTED ACTIVITY

Further Investigation

"Water goes up the left of the stem to the left side of the plant and up the right of the stem to the right hand side of the plant".

Ask the children whether they think this statement is true or false. In groups, can they devise an investigation that will help them find out?

4. WHAT ROLE DO FLOWERS PLAY IN THE LIFE CYCLE OF FLOWERING PLANTS?

SUGGESTED STARTER ACTIVITIES

Question & answer

You could begin with a question and answer session recapping on what the children learned in Key Stage 1 about how plants grow.

Plant life cycle worksheet

Please see page 14 for a flow chart of the plant life cycle, but the headings for each box are missing. Can the children fill in the correct headings?

TEACHER INPUT

Slide 30 : This flow diagram shows the different stages in the life cycle of a plant.

Pollination (slide 31)

The petals of flowers are often brightly coloured to attract insects into the flower. These insects pick up pollen from the flower and carry it to the next flower they visit. This is how most flowers are pollinated.

Slide 32: But some plants e.g. many grasses and weeds have small, dull off-white flowers. These plants are not pollinated by insects, but use the wind to blow pollen grains to other plants. At some times of the year, the air can be filled with pollen. Some people react to this and suffer from hayfever - you could ask for children's experiences of this.

Seed Formation (Fertilisation)

To make a seed a flower must be pollinated. Pollen from the male part of one flower travels to the female part of another flower where the seeds are made - this is called fertilisation (and is explained in more detail in the Upper Key Stage 2 lesson plan).

A seed is a small object produced by a plant from which a new plant can grow. A seed contains all the material a plant needs to make more of itself.

Slide 33/34: Seeds come in all shapes, sizes and colours and are often contained within fruits or pods. But some seeds grow on the outside of fruit or vegetables eg. strawberry.

Seed Dispersal

Plants that create seeds need to spread (disperse) them over a wide area. This is so that new plants do not have to compete for light, water and nutrients. Sometimes the pod or fruit containing the seeds is carried away from the parent plant and sometimes individual seeds can be spread. The size and shape of the seedpod, fruit or seeds will influence how they are dispersed. There are a number of different ways in which seed dispersal happens:

- Animal dispersal **(slides 35/36)** - when seeds are moved by animals. Some are used as food sources (juicy fruits and seeds), others have hooks and bristles that get caught in the animal's coat.
- Wind dispersal **(slides 37/38)** - some seeds are tiny and float in the air like dust. They often have weightless additions that enable them to be carried long distances by the slightest breeze. Others have special structures such as wings and parachutes that enable them to fly for long distances.
- Water dispersal **(slide 39)** - this method is important for plants growing in or near water. The seeds need to be able to float.
- Self-dispersal **(slide 40/41)** - this includes "exploders" where seeds are forcibly flung out of the pod when ripe and "pepperpot" types where the seeds are shaken free.

Some of these seeds will start to germinate, so completing the life cycle of a flowering plant.

SUGGESTED ACTIVITIES

Seed Hunt

In late summer and autumn the children could go on a seed hunt. There are seeds to be found everywhere - they will fall from the trees and lots can be found on the ground. Ask the children to keep one example of each seed collected and to try and identify them. Can they work out how they have been dispersed?

Dissection

With help, the children could cut open seeds and fruits that contain seeds. They could use hand lenses or microscopes to look at them in more detail. Can they see any patterns in the structure of the fruits that relate to how seeds are dispersed?

Design a seed

Ask the children to design a new plant and draw a picture of it. Then ask them to think about what this plant's seeds would look like and how they would be dispersed. Can they draw a magnified drawing of the seeds from their new plant and explain the method of dispersal? They could even make an enlarged model of their seed, using junk materials.

Create a Game

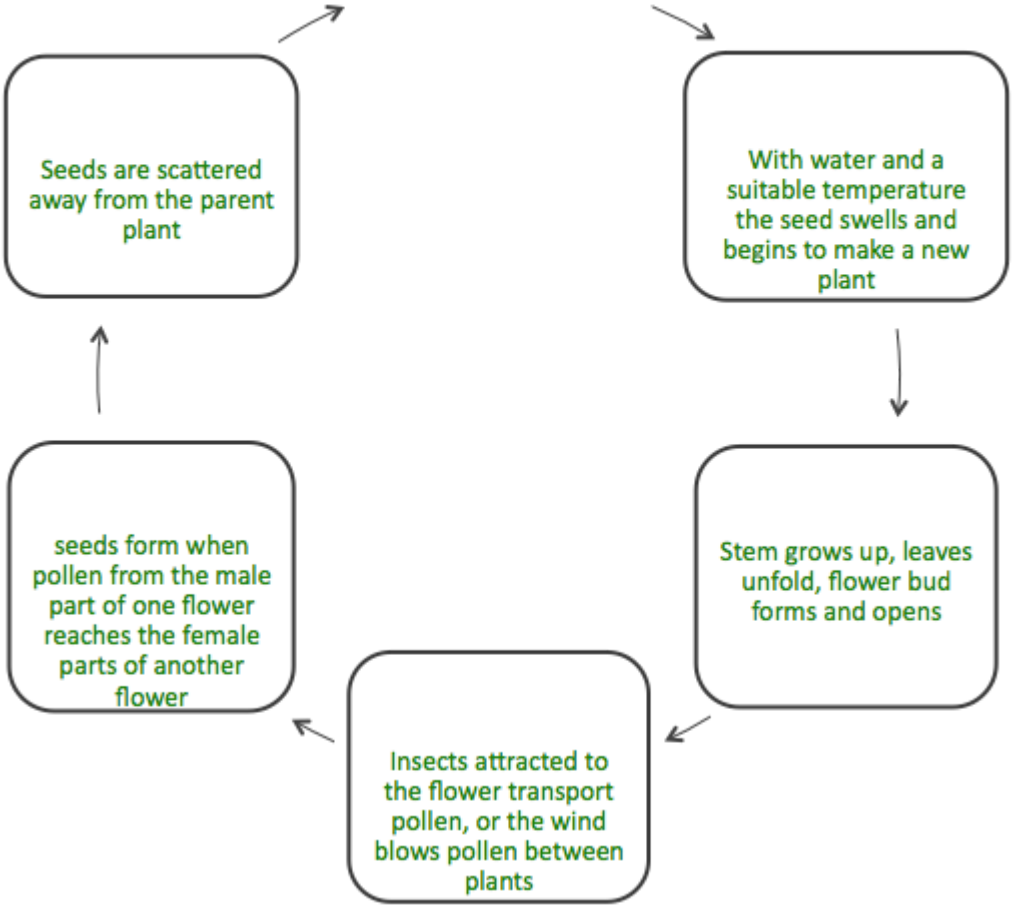
Can the children use the different seed dispersal methods to create their own game? It could be based on a popular game such as bingo.

LIFE CYCLE OF A PLANT

1. Choose a seed and draw it in the space at the top of the flow chart. You could draw either an individual seed or the fruit/pod that contains the seeds.
2. Can you fill in the correct heading for each box, using the words in the box below:

We value your feedback!

Let us know what you thought of this lesson plan by completing this Google Form https://forms.gle/cGAwi9AWXfSZgrYa9. **Thank you!**



pollination	**seed dispersal**	**germination**
fertilisation	**plant growth**	