

OL PEJETA CONSERVANCY

TOPIC 3: HOW PLANTS FUNCTION



STRUCTURE, POLLINATION, AND SEED DISPERSAL

TOPIC 3: HOW PLANTS FUNCTION

TOPIC OUTLINE

Plants are the only living things that can make their own food. They do this during the day while they are using a process called **photosynthesis**, which takes in carbon dioxide and produces oxygen. This is why all animals need oxygen to breathe, and this is one of the reasons why plants are integral to life on earth.

In this topic, learners will discover the basics of plant biology and photosynthesis, learn about the different parts of the plant and how they are used in natural ecosystems and human systems. Learners will also learn about the processes involved in plant growth, the importance of pollination. Finally, learners will move on to the topic of seed dispersal, where they will learn about plant reproduction.



SUB-TOPICS:

Plant structure

- Learners will learn how to identify and label the different components of a plant.
- Learners will discuss and observe the ways in which plants are used both in their ecosystems and by humans.

Pollination

- Learners will learn how and why pollination is facilitated by pollinators in engaging and memorable ways.

Seed dispersal

- Learners will be able to understand how plants are able to reproduce by spreading their seeds in a variety of different ways.

Please note: the activities below act as guidelines. You may wish to adapt them to suit the needs of your class (e.g. different age groups, abilities, grades, materials and time available).

ACTIVITY SHEETS: PLANT STRUCTURE

BACKGROUND INFORMATION

The basic structure of almost all plants includes roots, stems, leaves, flowers, fruits, and seeds.

The **roots** provide support by anchoring the plant in the soil and absorbing water and nutrients needed for growth. They can also store sugars and carbohydrates that the plant uses to carry out other functions.

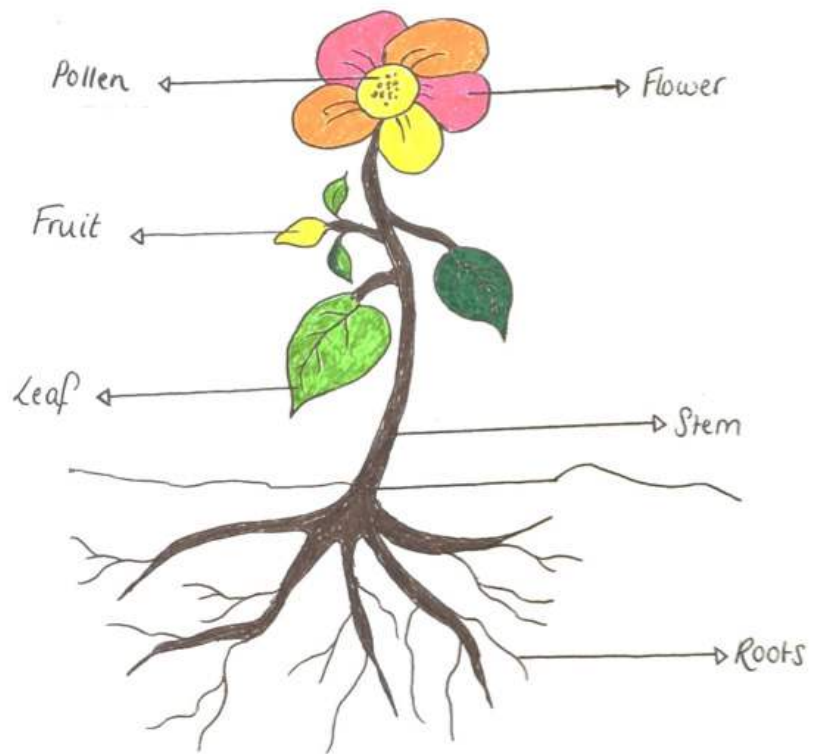
The **stem** has many functions, including supporting the plant's structure. It also conducts water and nutrients from the roots as well as food (in the form of glucose) from the leaves to other plant parts. Stems can be herbaceous (like the soft stem of a daisy) or woody (like the trunk of a tree).

Leaves come in different shapes and sizes. They are designed to capture sunlight using a green substance in leaves called **chlorophyll** in a process called **photosynthesis**. Leaves make food for the plant. To do this they need water and mineral salts obtained from the soil, which are then carried inside little veins in the leaf.

Flowers produce seeds which form new plants. They often hold pollen – the male fertilising agent of flowering plants and trees, although not all plants have flowers.

Fruits provide a covering for seeds. Fruit can be fleshy like an apple or hard like a nut.

Seeds form inside the fruit and contain new plants.



ACTIVITY 1

8- YRS

OPC/HOME

PLANT LABELLING

Objective:

- To help younger learners learn and remember the different parts of a plant through colour.

Age group:

- 8 and under

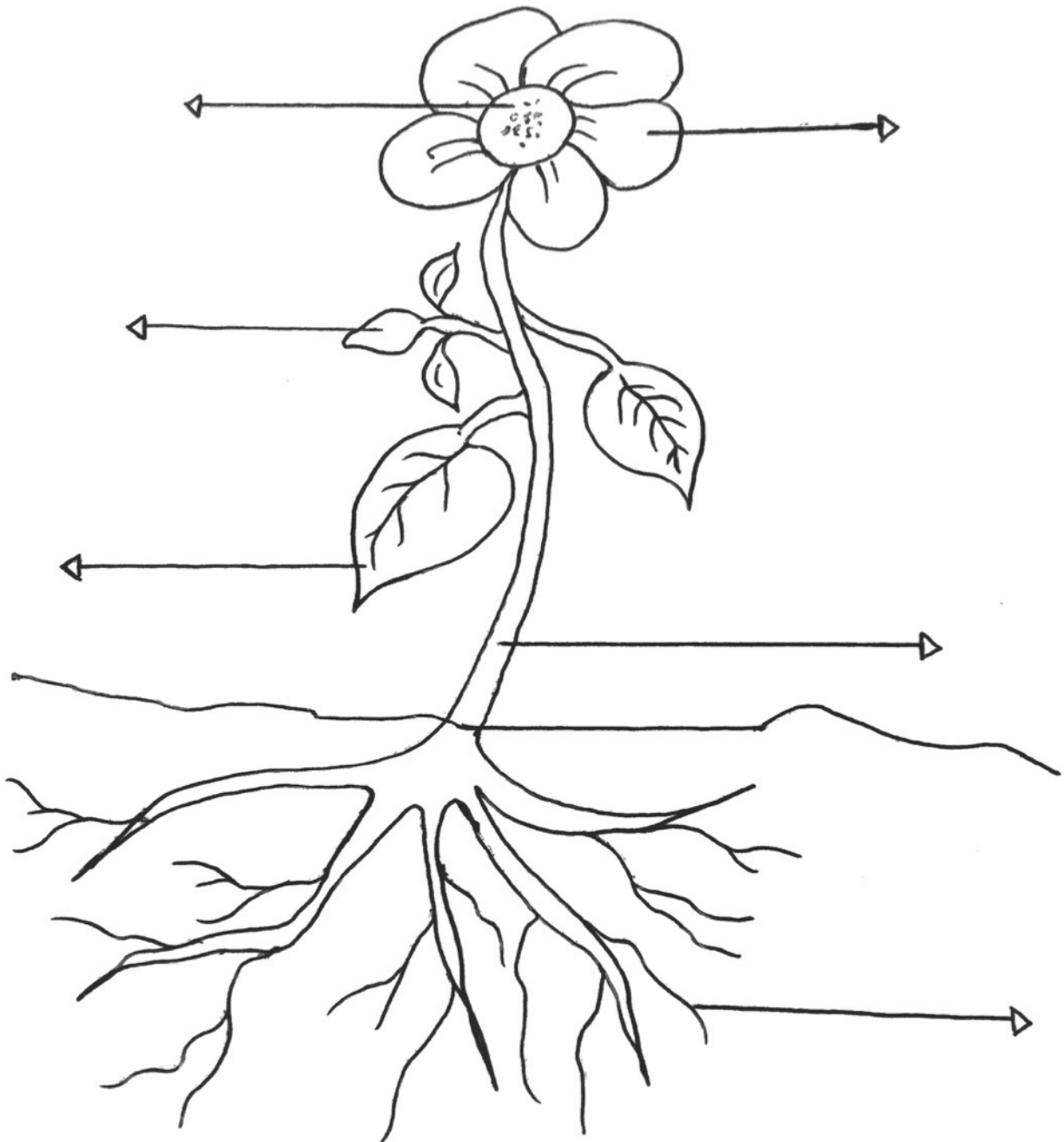
Materials needed:

- Colouring materials (such as crayons, pens, pencils, or paint)
- Flower worksheets (next page)

Procedure:

1. Give each learner a flower worksheet (below).
2. Ask the learners to complete the labels for different parts of the plant, encouraging and prompting them where they need help.
3. Hand out the colouring materials and let the learners colour in their picture to take home.

Note: if a printer is unavailable, you can have the learners draw their own diagram before labelling.

LABEL THE PLANT:

ACTIVITY 2

ANY AGE

HOME

FLOWERS NEVER SAY 'DYE'



Objective:

- To demonstrate to learners the processes of capillary action and **osmosis** in a creative and engaging way.

Age group:

- Any age

Materials needed:

- Clear jars
- White flowers and/or celery
- Food colouring
- Water

Procedure:

- Put some white flowers/celery in coloured water by adding a few drops of food colouring into a jar of water.
- Leave overnight so that they take up the colour.
- Explain to students that this demonstrates the action of water movement through the plant, which uses **osmosis** to draw water through its capillaries.

Discussion point

In pairs, small groups, as a whole class, or as an individual research task/writing piece, the facilitator can help the learners discuss the following topic:

- How do we, as humans, use different parts of plants for different purposes?

You may want to encourage their ideas with these prompts: food, shelter, medicine, to hold soil, for fuel, for clean air, etc.

ANY AGE

OPC/HOME

ACTIVITY 3

THE SPONGE EFFECT

Objective:

- To demonstrate to learners the importance of plants in maintaining soil structure and preventing flood damage.

Age group:

- Any age

Materials needed:

- One large sponge
- Four water containers (buckets or tubs)
- Water

Procedure:

1. Explain to learners that plants help to prevent the flooding of soil by soaking up rain water through their roots, just like a sponge. This is why floods and runoff happen when we cut down trees and vegetation.
2. Split your students into two teams and give each team two buckets/containers. Fill one bucket per team with water, and place the other bucket 10m away from the first.
3. Explain that both teams must get all the water from one bucket to another, and they must do it quicker than the other team.
4. But there is a catch – only one team is allowed the sponge! The other team must use their hands.
5. Get one member from each team to play rock, paper, scissors with the other representative to find who gets to use the sponge.
6. Relay race: transfer all the water from one bucket to the other, and see which group can do this the fastest. The first participant of each team will dip a sponge into the water bucket/use their hands to carry water to the other bucket where they will release it. They then run back to their teammates and have the next participant do the same.
7. The team using the sponge should win. Ask your students: If the sponge represents the plants soaking up water, what do the hands represent?
 - a. The hands represent human efforts to reduce flood damage, which are not as effective as the plants.
2. Feedback and discussion: why are plants important to ecosystems? Why are plants important to human societies?



ACTIVITY 4

LEAF MURALS

9- YRS

HOME

Objective:

- To use art and creativity to engage younger learners in observation of plant life by printing leaves and noting their different patterns and shapes.

Age group:

- 9 and under

Materials needed:

- Craft paint
- White paper

Procedure:

- Help students collect different kinds of leaves from the ground.
- They then paint the surfaces of the leaves (using different colours for different leaves), and while the paint is still wet they press the painted surface onto the white paper to produce colourful leaf patterns.
- Help them label the names of any leaves they can identify, adding any that they do not know.

ANY AGE

OPC/HOME

ACTIVITY 5

FLORA OBSERVATION

Objective:

- To test learners' existing knowledge of plant structures and put learning into a real-world context.

Age group:

- Any age

Materials needed:

- White paper
- Glue/double sided tape
- Pens

Procedure:

- During your field trip to Ol Pejeta, tell the learners to look out for plants that are flowering or have fruits already.
- Test their knowledge of the parts of the plant, as studied above, and draw their attention to different types of flowers.
- Help them appreciate the connection between flower and fruit (i.e. the flower precedes the fruit).
- Have learners collect samples of leaves, flowers, and other parts of plants. Note: try not to take too many, and be careful of plants with thorns.
- Learners should stick their samples on pieces of paper, and have a guide or facilitator help to identify them.



ACTIVITY SHEETS: POLLINATION

BACKGROUND INFORMATION

One of the ways that plants reproduce is by making seeds. **Pollination** is the act of transferring pollen grains from the male **anther** of a flower to the female **stigma**.

Flowers are the tools that plants use to make seeds. Seeds can only be produced when pollen is transferred between flowers of the same **species**.

How does pollen get from one flower to another?

Flowers must rely on **vectors** to move pollen. These vectors can include wind, water, birds, insects, butterflies, bats, and other animals that visit flowers. Animals or insects that transfer pollen from plant to plant are called **pollinators**.

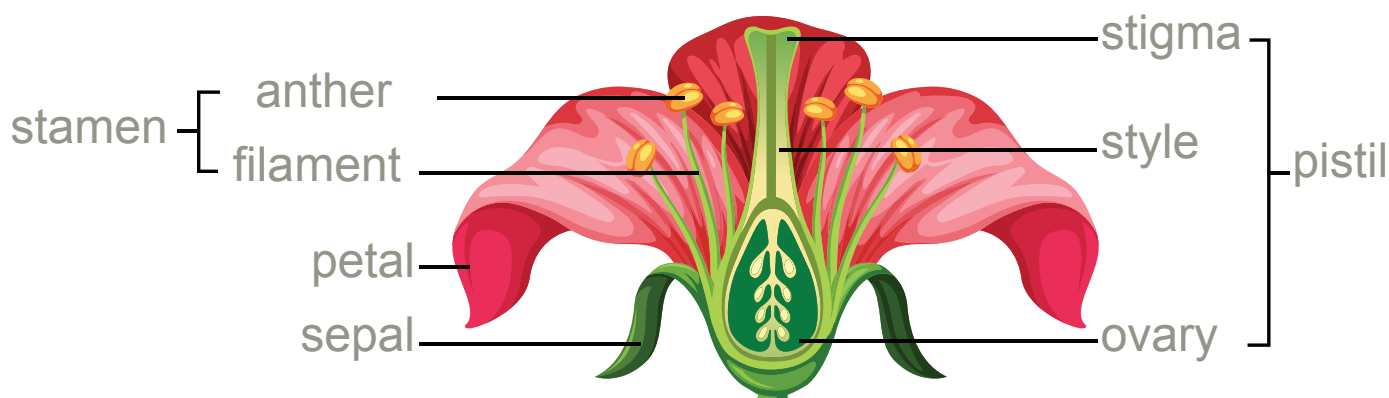
How does the pollinator pick up the pollen?

Pollen grains attach themselves to the pollinator's body when it is eating/collecting pollen for the pollen's protein and other nutritional characteristics or it is sipping nectar from the flower. When the pollinator visits another flower for the same reason, pollen can fall onto the flower's **stigma** and may result in successful reproduction of the flower.

How is the flower fertilised?

Pollen from the anthers of one flower is deposited on the stigma of another flower. Once on the stigma, pollen may "germinate," which means that a **pollen tube** forms on the sticky surface of the stigma and grows down into the **ovule** of the plant. This leads to **fertilisation** of the flower and the growth of seeds and fruit.

N.B.: It is important to note that some plants don't have flowers. Plants such as mosses and ferns reproduce by **spores**. Cone-bearing plants, like pine trees, reproduce by means of pollen that is produced by a male cone and travels by wind to a female cone of the same species. The seeds then develop in the female cone.



ACTIVITY 1

9- YRS

OPC/HOME

POLLINATION DEMONSTRATION

Objective:

- To help younger learners understand the act of pollination by re-enacting the movement of pollinators from one flower to another.

Age group:

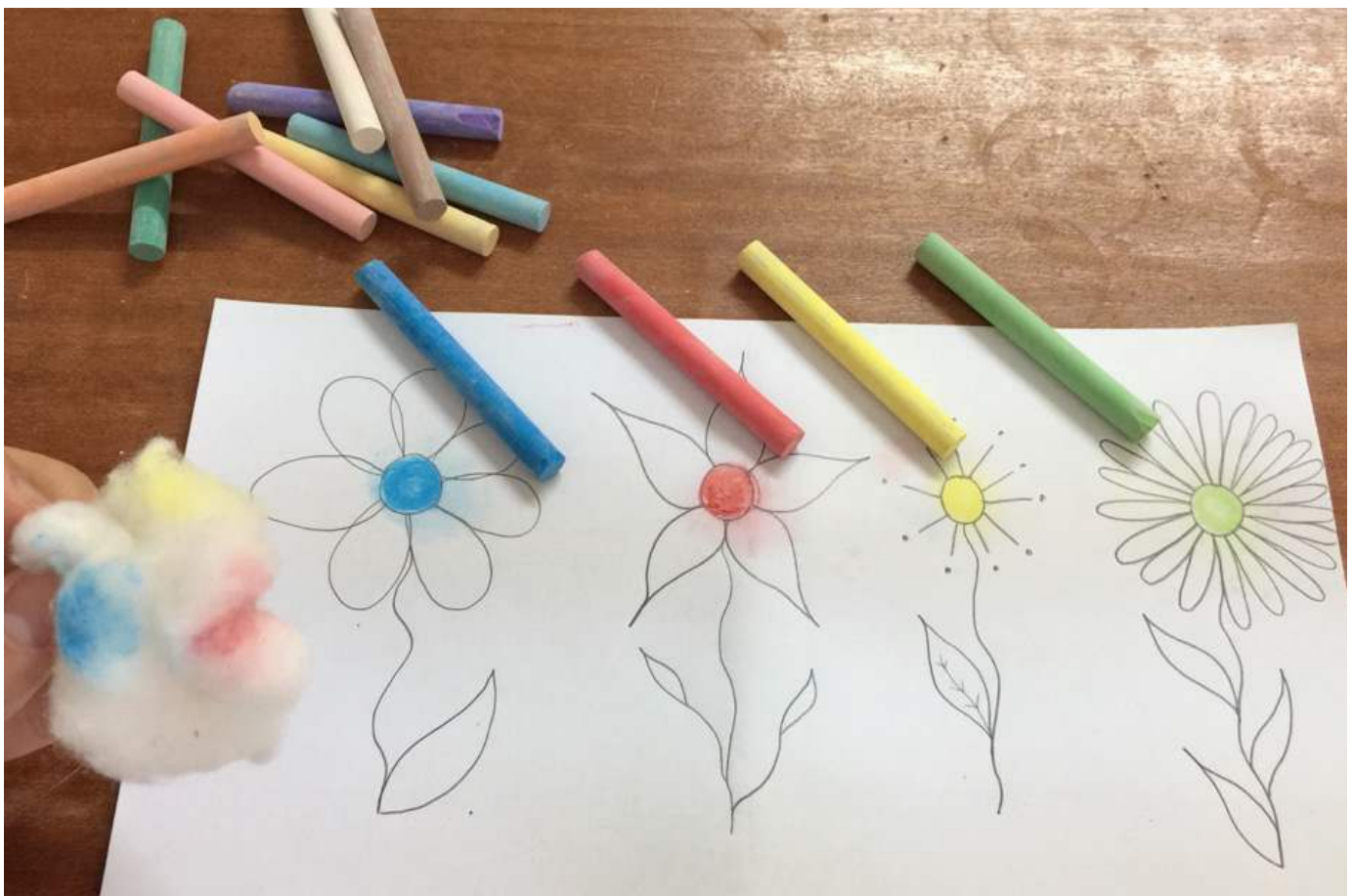
- 9 and under

Materials needed:

- Paper and pens
- Coloured chalk
- Cotton ball

Procedure:

1. Give each learner a picture of a flower, or have them draw a picture of their favourite flower on a sheet of paper, making sure each flower has a circular centre.
2. Get the learners to colour the centre of the flower in using the chalk (whether the printed picture or their own drawing).
3. As the facilitator, take a cotton ball to act as the bee – stopping by each flower and rubbing the cotton ball in its centre.
4. Show the learners the bottom of the cotton ball when you finish and point out the mixture of colours. They should notice that the pollen (chalk) has transferred from the flower onto the bee (the cotton ball) and then onto other flowers.
5. You may wish to allow the learners to try this action for themselves!



ACTIVITY 2

9+ YRS

OPC/HOME

POLLINATION RELAY RACE

Objective:

- To demonstrate to learners the path of a pollinator in a fun, active way.

Age group:

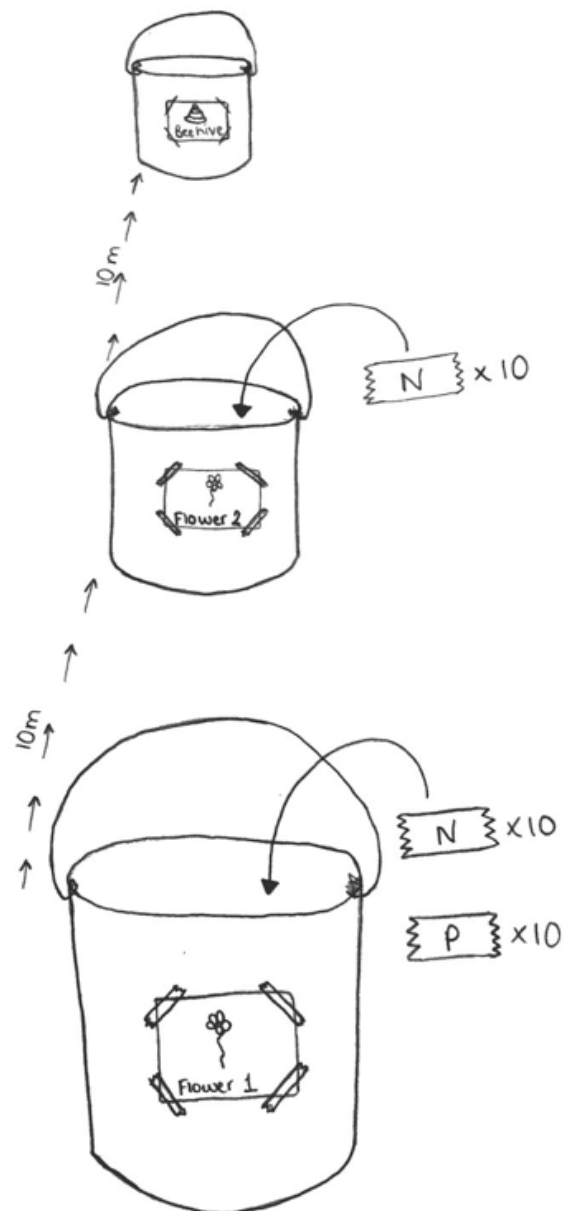
- 9+ years

Materials needed:

- Two 'bees' (puppets, toys, or printed picture)
- Six buckets
- At least 20 pieces of paper labelled 'P' (for pollen) and at least 40 labelled 'N' (for nectar)

Procedure:

- Separate learners into two teams of equal numbers.
- Set a bucket 10ft in front of each team, another bucket 10ft away from the first bucket, and a third bucket (representing the beehive) 10ft away from the second bucket.
- Put at least 10 'nectars' in each of the front two buckets of each line (leaving the 'beehive' empty at the end of the line), and put at least 10 'pollens' in **only the front bucket**. (You can get your students to help you with the set up!)
- Instruct each team to get in a line, and give the learner at the front of each line a 'bee'.
- Explain to the students that the front two buckets in each line represent two different flowers, and the third bucket is the beehive – their destination! Their aim is to take nectar from the first and the second flowers to the end bucket, **but** they must pick up pollen on the way and deposit it to the second flower.
- Therefore, each learner must run to the first bucket and pick up a 'P' (for pollen) and an 'N' (for nectar). They must deposit the pollen in the second bucket, where they also pick up another nectar. All of the nectar (two pieces) should, finally, be dropped at the beehive, before running back to their team to pass the bee to the next student.
- The first team to take all the nectar to the hive wins!



RELAY RACE SET UP

Tip: You may label the buckets 'Flower 1', 'Flower 2', and 'Beehive' to help learners grasp the task more easily.

ACTIVITY SHEETS: SEED DISPERSAL

BACKGROUND INFORMATION

Pollination facilitates a process that allows the formation of seeds inside a covering (which becomes the fruit). These seeds in turn allow the growth of a new plant, thus forming the species' method of reproduction.

It is important for plants to spread out their seeds – not only so that the offspring may have better growing conditions, but also so that they do not compete with their parents for nutrients, light, and water. The act of spreading seeds is called **dispersal**, which plants may achieve through gravity, animals, force, wind, or water.



ACTIVITY 1

10- YRS

OPC/HOME

SEED DISPERSAL HIDE AND SEEK

Objective:

- To show learners a real-life example of seed dispersal in plants
- To discuss optimum conditions for seed growth and revise this information in a fun and engaging way.

Age group:

- 10 and under

Materials needed:

- Cotton wool balls

Note: this activity should take place in an outdoor teaching area.

Procedure:

1. For this activity, collect a *Bidens pilosa* (black jack) plant if possible. Use it to show and explain to learners that black jack is very successful in its dispersal of seeds, which stick onto animals and humans and get carried long distances.
2. Explain to students that optimal growing conditions for most plants include nutrient-rich soil, water, shelter, space, and sunlight.

3. Divide the group in half and give one group a handful of cotton wool balls (enough for one per student), which you can tell them are to represent seeds.
4. The group with the 'seeds' must hide them around the outside teaching area while the other group close their eyes and count to thirty. Remind the students that plants need certain conditions to survive.
5. After counting to thirty, the seekers look for and collect the seeds, taking a mental note of their various locations.
6. Discussion: were the seeds placed in good locations for the new plants to survive?
7. In the next round, the groups should swap over – meaning that the counting group now hides the seeds while the others count to thirty. However, *this* time the hiders should place the seeds in the *worst* location possible for their seeds to grow.
8. After the seekers have brought back all the seeds, discuss as a whole class the differences between good and bad places for seeds to land.

Discussion point

In pairs, small groups, as a whole class, or as an individual research task/writing piece, the facilitator can help the learners discuss the following topics:

- How does seed dispersal help a plant reproduce and continue species existence?
- How can seed dispersal encourage plant variety in different environments?
- How can seed dispersal aid the introduction of invasive species in new environments?

ACTIVITY 2

ANY AGE

OPC/HOME

PLANT SOME SEEDS!

Objective:

- To give learners the knowledge, materials, and enthusiasm required to plant and grow an organism from seed.

Age group:

- Any age

Materials needed:

- Plant seeds (based on choice/availability)
- Plant pots
- Soil

Procedure:

1. The facilitator can organise for the learners to participate in OI Pejeta's tree planting programme, which allows participants to plant seedlings of indigenous trees in exclusion zones.
2. This can then be done at home or in school so that the learners can observe their trees' growth and production flowers and fruits. Guide the learners into planting some seeds of their choice in a pot of soil at school or at home so that they can watch them germinate.

FURTHER ACTIVITY

TREE CARDIOGRAPH

ANY AGE

OPC/HOME

Objective:

- To show learners that all organisms, including plants, are living beings like ourselves and should be treated better.

Tip: Do this activity before the tree planting so that the learners know that they are planting something that is alive. This will increase learner engagement in the task.

Age group:

- Any age

Materials needed:

- Stethoscope or paper cup

Procedure:

1. Allow the learners to pass around the stethoscope or paper cup, listening to the sound of their own heartbeat.
2. Ask learners the question 'Do you think you can also hear the beat of a tree?' and listen to their ideas.
3. Explain that the learners can place the stethoscope against the trunk of a tree and listen to see if they can hear anything.
4. Feedback: ask students what they can hear and what the sound means to them.
5. Explain to them that trees are alive and should be treated like the living organisms they are – and not chopped down!

