

This lesson pack has been designed to support the teaching of Science and PSHE. It explores the relationship between flowers and pollinators, and how we humans rely on both for our wellbeing and that of our planet.

HOW TO USE THIS PACK

This pack contains a lesson plan that explores the ecology found within a pollinator garden, and the importance of pollinators to the garden's survival and, indirectly, to our own.

This pack also provides activity cards, activity resources and supporting materials as outlined below to support the lesson plan. The lesson plan is intended to combine learning in relation to the Science curriculum and PSHE.

THE PRIMARY LESSON PLAN and resources are targeted at KS2 reading level but can be adapted for older or younger learners. The 'Ideas for additional activities' section provides suggestions for differentiated activities that could replace any in the lesson plan, or as extension tasks. The lesson plan could be used for a science lesson and/or to support the Schools PSHE/PDP activities.

THE PACK INCLUDES:

Activity Cards

These are designed for teachers and provide instructions for each activity. They provide prompts for discussing in class how gardens can be used to learn about maintaining human health.

Activity Resources (AR)

These are designed for students to complete independently, while working with a partner or group. They need to be photocopied or printed out. There are a number of Activity Resources for each lesson plan that support observation activities to be conducted in the garden. Some of the Activity Resources have questions to be used collaboratively between students and teacher.

Supporting Materials (SM)

These are designed to support the lesson and individual activities. They need to be photocopied or printed out and could be laminated.

A number of Supporting Materials have also been provided to replace activities in the lesson plan or to be used as extension activities (see the Ideas for additional activities section on the lesson plans).

OVERVIEW OF LESSON PLANS

The theme of the primary lesson plan is the ecology found within a pollinator garden. The need to protect from climate change and species loss is now fully embedded in the public conscience. The science behind the need for humans to reduce their negative impact on the planet is clear and overwhelming.

This lesson plan provides the opportunity to integrate Science lessons around pollinator plants and their vital contribution to a healthy planet, with life lessons for human health and wellbeing in line with PSHE guidelines (PSHE Association).

The lesson is mostly based outdoors, where students will observe and record different interactions within the garden between the likely species to be found there. These observational activities are also designed to encourage discussion about human health.

To prompt thinking about how gardens can be used to learn about human wellbeing, we have included a relaxation testing activity - using a simple 'relaxation thermometer' students will record their relaxation level prior to going into the garden and at the end of the time in the garden. It is anticipated that general relaxation will be achieved through being in the garden and that this can prompt thoughts and discussion.

This lesson is best done when weather is good and plants are in flower, possibly late May, June, July and possibly September.

TOPIC INTRODUCTION

Humans are part of the natural world. To have a positive impact on the natural world requires us to know how we compete and cooperate with other species. Through cooperating more than competing with them, we are likely to be healthier at both societal, community and individual levels.

How a healthy planet is important to human health is best summed up by the concepts put forward by ecopsychology (the study of the emotional bond between humans and the Earth). As a demonstration of how humans are part of ecology we can, not surprisingly, use lessons from the natural world to think about our own health. Observing nature encourages us to consider our own behaviours and needs in relation to both planetary and human health.

LEARNING OBJECTIVES

For students to:

- Be able to identify different parts of a plant
 - Be able to identify what supports plant growth and relate this to human growth
 - Be able to identify the local ecosystem surrounding pollinator plants
 - Be able to identify different species within that ecosystem and see humans as part of its ecology
-

CURRICULUM LINKS

Science: KS2

Students should:

- Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant
- Recognise that environments can change and that this can sometimes pose dangers to living things
- Describe the life process of reproduction in some plants and animals
- Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

PSHE: KS2

Compulsory subject:

- Health education
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PRE-LESSON PREPARATION

The lesson plan has been designed to be differentiated across KS1-2. It provides a series of activities. You can choose to leave out an activity or adapt the Activity Resources (AR) to suit your students.

All activities can be set up for 2-6 students to work together, although some elements are best carried out by lone working.

Factor the size of your school's garden into your decision-making process about the size of the groups in which you want the students to work. Include in your timings how long it will take them to walk from classroom to garden and back again.

Photocopy or print out sufficient copies of the Activity Resources (AR) and Supporting Materials (SM) listed on each Activity Card for students to have one each or to work in pairs.

Room set-up

Activity 1 takes place in the classroom, which can remain arranged as usual. The other activities in this lesson plan are intended to be carried out in your garden.

Additional resources needed

- Clipboards, 1 per student
- Colouring pencils, one set per student
- Magnifiers – *optional*
- Camera – *optional*

ACTIVITY 1

Introduction

Students will be learning some new words connected with ecology and plants. They will also record how relaxed they're feeling before going outside to spend time in the garden.

Suggested duration: 10 minutes

Pack resources: Activity Card 1 | AR1 | AR2 | AR3

ACTIVITY 2

What do plants and people have in common?

Students will be thinking about what plants need in order to grow and thrive, as well as exploring the needs we humans share with plants.

Suggested duration: 20 minutes

Pack resources: Activity Card 2 | AR4 | SM1

ACTIVITY 3

Visiting species

Students will be observing the insect life in the garden, thinking about how far they've travelled and the size of the garden's ecosystem.

Suggested duration: 15 minutes

Pack resources: Activity Card 3 | AR5 | SM2 | SM3 | SM4

ACTIVITY 5

Humans in the garden's ecosystem

Students will identify how humans have been involved in creating the garden at your school.

Suggested duration: 10 minutes

Pack resources: Activity Card 5

ACTIVITY 6

Are gardens good for us?

Students mark their level of relaxation after time spent outside. Discuss how we can use observations of nature, ecology, and different species to think about how we can keep ourselves healthy and well mentally and physically.

Suggested duration: 5 minutes

Pack resources: Activity Card 6 | AR3

IDEAS FOR ADDITIONAL ACTIVITIES

- Using the wellbeing thermometer on AR3 will provide data that could be transferred into charts and graphs to support science and maths
- Use the AR1 keywords sheet for a whole class activity of reading and comprehension
- The wordsearch on AR6 is a great way for students to remember key words in relation to ecosystems
- SM5 describes the amazing adaptations bees have made through evolution in order to collect pollen - students could imagine how a different insect or even a mammal could evolve to collect pollen and nectar

ACTIVITY CARD 1

Pack resources: **AR1 | AR2 | AR3**

Introduction

(10 minutes)

Explain that in this lesson students will be finding out about plants, what plants need to grow and how they interact with other species within the garden.

Use **AR1** and **AR2** to introduce new terminology.

Before leaving the classroom, use **AR3** to get students to assess their own relaxation level.

Before going into the garden remind the student to be quiet and calm to have the best chance to see the most wildlife.

IMPORTANT: Take **AR1** and **AR3** with you into the garden to support the next activities.

What do plants and people have in common?

(20 minutes)

(This and the subsequent activities can be arranged for anywhere between 2-6 students to work together, although some elements should be carried out by students working alone.)

Explain that in this section students will be thinking about what plants and people need to grow and thrive.

Use AR4 for students to draw a flowering plant and ask them to use the words provided on the sheet to label it. Students could support each other in their groups.

1. Plants need certain things to be able to grow and produce seeds to create more plants like themselves. Plants need:
 - sunlight • water • nutrients • air • warmth • room to grow
2. Humans share a need with plants for certain things to develop and stay healthy. Can students think of what they might be (use SM1)? Just like plants, human beings need:
 - sunlight • water • nutrients • air • warmth • room to grow

Still using AR4, add in the things plants need to grow and thrive, either using the words provided or drawing them (students may come up with more).

Prompts

- Name nutrients important to human growth
 - Think about what room we need as individuals to grow (e.g. when should teachers, parents, guardians, or siblings let us find our own way?)
 - Using the parts of a plant think of our own bodies' different parts and what they do for us to make us healthy and allow us to grow
 - While plants stay in the same place, we humans move about. But do we have roots too? What are human roots? Can human roots connect us to others, to places, to a purpose or give us a positive identity?
 - Thinking about the ecosystem in the garden can we think about ourselves as living in an ecosystem? What other species are critical to human health and survival? How do we interact with other species? Can you think of a time you have helped a different species?
 - Can you think about the relationships in your life and how they give you different things, some friends make us laugh and smile, others help us learn, others can share our worries, others may even make us more resilient because our personalities are different?
-

ACTIVITY CARD 3

Pack resources: AR5 | SM2 | SM3 | SM4

Visiting species

(15 minutes)

Watch the plants, insects and any other species for a minute or two.

Using AR5 observe and list the insect species you can see in the garden. Discuss how far they may have come to your garden and, therefore, how big your garden's ecosystem might be.

Use SM2 and SM3 to support discussion.

For useful web resources about garden wildlife see SM4.

Prompts

- Do you think that all the pollinators live in the garden?
 - Maybe they live outside the garden and are just visiting. If they are just visiting, how far do you think they have come?
 - How big do you think the ecosystem of your garden is?
-

ACTIVITY CARD 5

Visiting species

(10 minutes)

Discuss how humans are part of your garden's ecosystem too.

Prompts

- You are part of this ecosystem because you helped grow the seeds and care for the plants.
 - How else have humans been part of the garden ecosystem?
 - Are we cooperating or competing with the other species?
-

ACTIVITY CARD 6

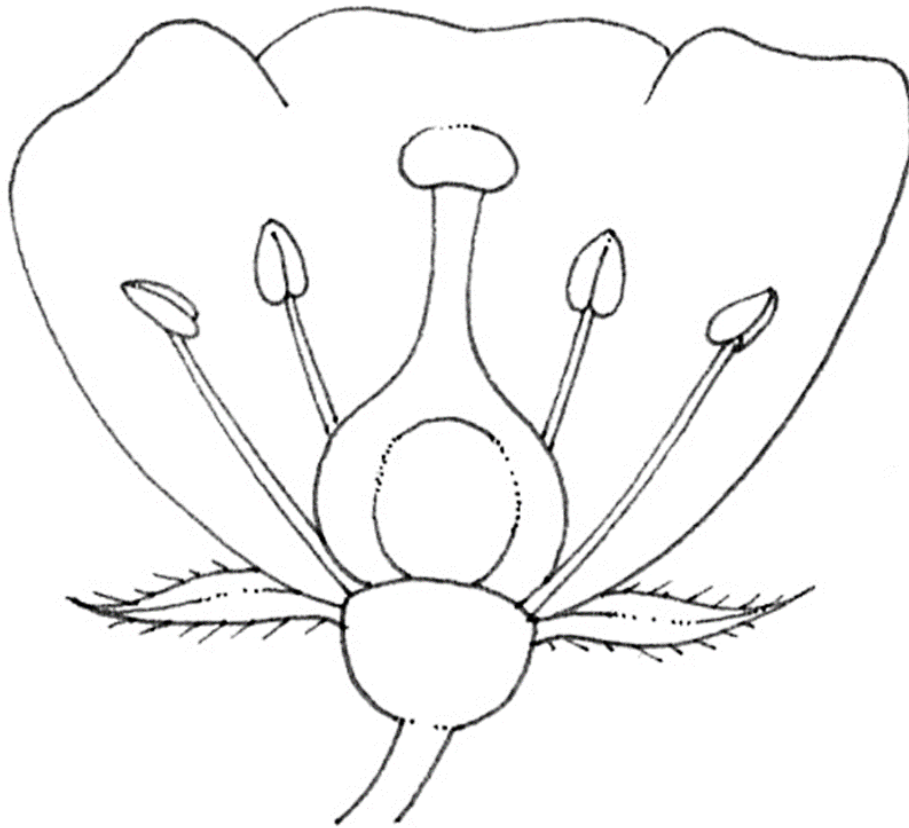
Pack resources: AR3

Are gardens good for us?

(5 minutes)

Using AR3 again, ask the students to mark their level of relaxation after spending time in the garden. Hopefully they will feel more relaxed, and this can be used to discuss how paying attention to nature, ecology, and different species around us can help us to think about how we can be healthy and well.

ORGANISM	any living thing, such as animals and plants
PLANT	an organism that uses sunlight to make food for itself
INSECT	a small animal with <u>six</u> legs
SPECIES	a way of grouping living things that could mate with each other
ECOSYSTEM	the connections between animals and plants and the world they live in
ECOLOGY	the study of animals and plants and the world they live in
POLLINATOR	an animal that moves pollen from one flower to another
PROPAGATION	growing new plants from the plants we have already
COMPETITION	when two organisms are trying to win against each other
COOPERATION	when two organisms are helping each other
EVOLUTION	changes in animals and plants that take place over a long time



Here is a cross-section of a flower. Label the flower parts from the list below:

PETAL

ANTHER

STYLE

FILAMENT

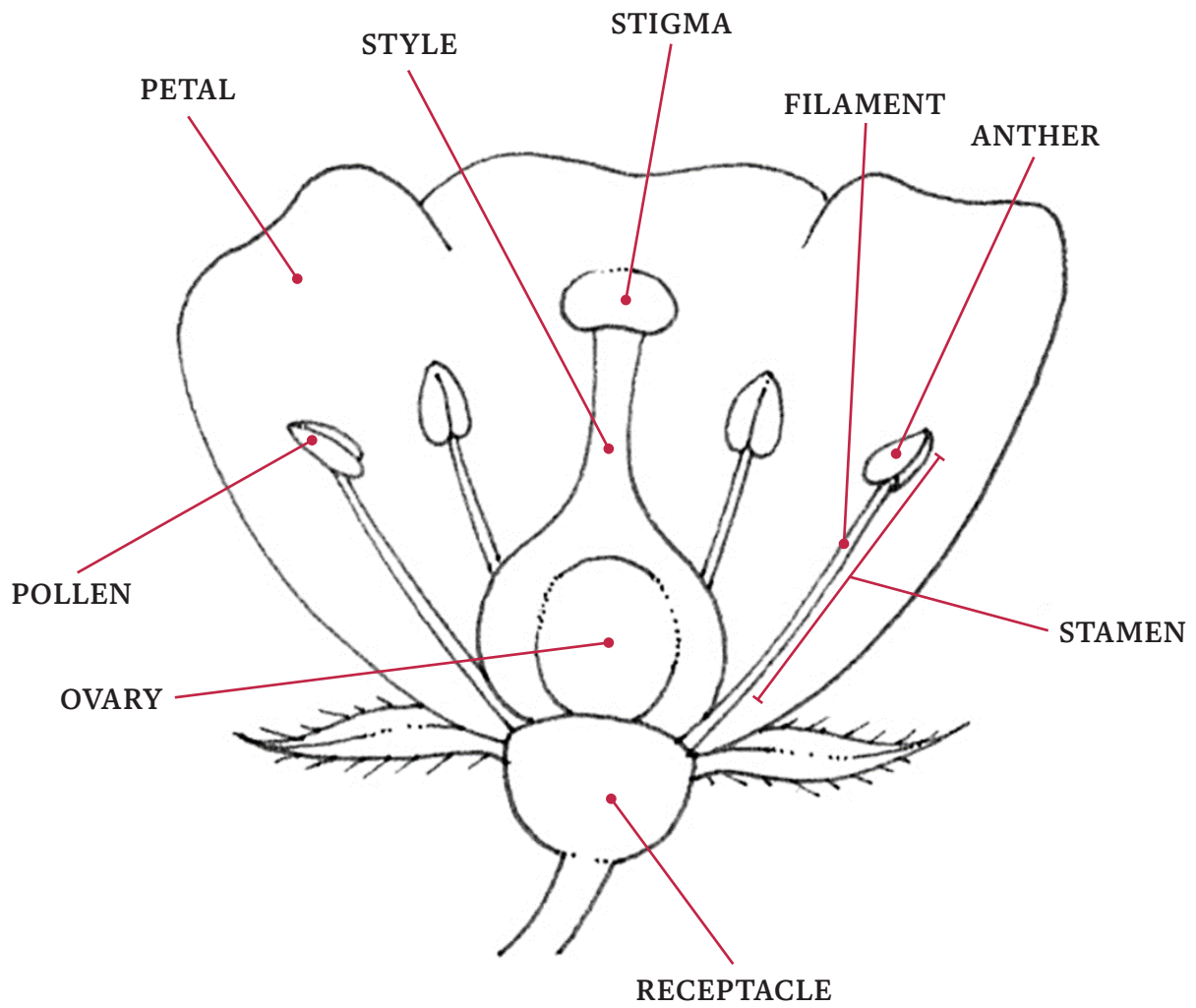
STIGMA

STAMEN

OVARY

RECEPTACLE

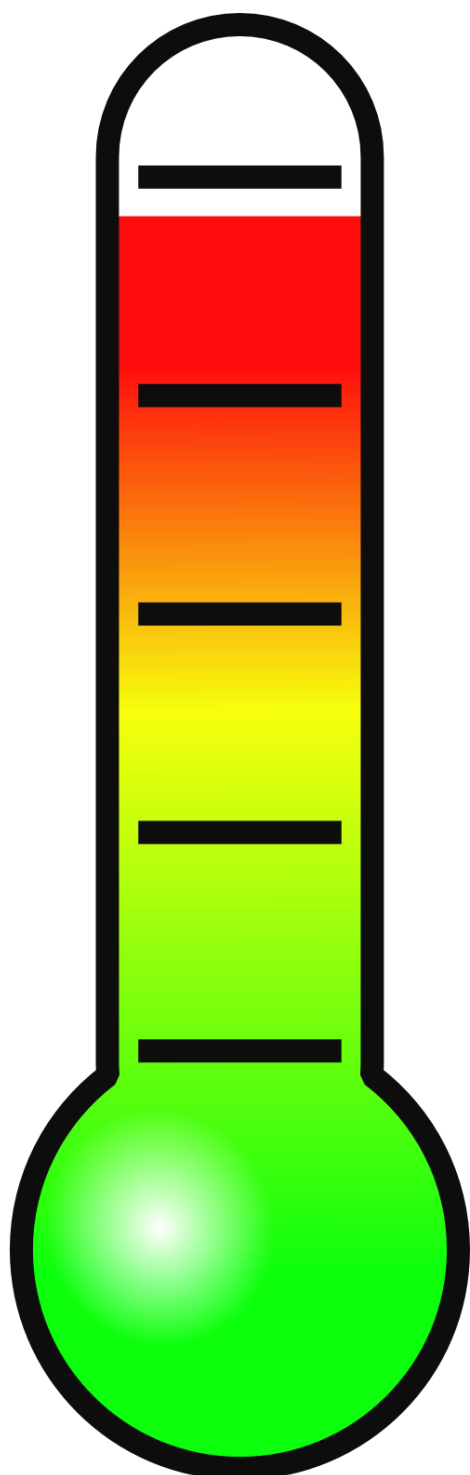
POLLEN



AR3

RELAXATION THERMOMETER

Mark on the Thermometer how relaxed you feel.



NOT RELAXED

VERY RELAXED

Have a look around you in the garden.

1. Choose a plant with flowers that you like.
2. Draw a picture of the plant in the space below.



3. Use the words from the boxes below to label the parts of your plant.

LEAF

STEM

FLOWER

PETAL

BUD

4. Now think about the plant and the things it needs to be able to live and grow. Add the words from the boxes below to label these things (or draw pictures of them around your plant drawing).

WATER

FOOD

AIR

SOIL

SUNLIGHT

WARMTH

INSECTS

Bees

Honeybee

Bumble Bee

Solitary Bee

**Butterflies**

Tortoiseshell

Comma

Cabbage White

Painted Lady

Small White

Meadow Brown

Large White

Holly Blue

Peacock

Orange Tip

Red Admiral

Small Copper

**Moths**

Silvery Y

Burnished Brass

Six-Spot Burnet

Cinnabar

Hummingbird Hawkmoth

Angle Shades

Garden Tiger

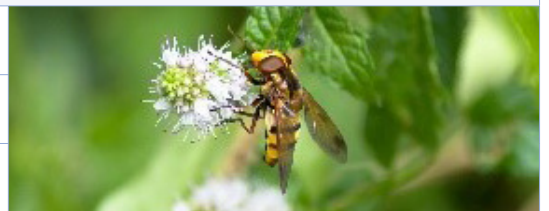
Elephant Hawkmoth

**Hoverfly**

Marmalade

Brown

Bumblebee

**Beetle**

False Oil

Red Soldier

Longhorn

Thick-Legged Flower

**Wasp**

Common Wasp

Tree Wasp

Rudd's Ruby-tailed Wasp



Crane Fly



Shieldbug Fly



Garden Spider



Woodlouse



Centipede



Lacewing



B A E R L Y
 D D V X D A Q Z H D O Q
 X T G Y D S L X Q E M I N S E C T U
 Z M L Q H W P R P X J U V O F G Q G
 D X Y C G Q Q V E A W D F Q V I U N K X
 N P L A N T H L H N D Z P F N L X B X N
 T G R A S S C U N I L Z X S O R G A N I S M
 R J M H A M P D M P W H X Y C J P V U H E F
 W O H N N B P A P O L L I N A T O R D J
 Y Q S U N L I G H T D N J Z C
 G X Y O F E X M G
 P X P A Y T O B E Z O O C
 C Z W X J G B U U P X O F H W
 W H Y I K O D E Y C T R P P O L L E N
 U N B E E T L E I W O T U H B J E L Q F R
 U U W C F L I B V R L E D F N T R P P I A
 G B E E O M S D X V Y F R Q S G V A I Y C L X
 K N G N S I K V O N M F Y Y Q I G L O F R
 O L S W Y K D D T D F L S O X N I H T J Q
 P W S M S T X X C L Y K S H E M R W F
 L E J Y T L K N Y O K G F R B J F
 P U N E E N P F Z O H S A
 F X M D Z V M A Z
 N C X
 K P A

ANIMAL

BEE

BEETLE

BUTTERFLY

ECOSYSTEM

FLY

GRASS

INSECT

ORGANISM

PLANT

POLLEN

POLLINATOR

RAIN

SOIL

SUNLIGHT

B A E R L Y
 D D V X D A Q Z H D O Q
 X T G Y D S L X Q E M I N S E C T U
 Z M L Q H W P R P X J U V O F G Q G
 D X Y C G Q Q V E A W D F Q V I U N K X
 N P L A N T H L H N D Z P F N L X B X N
 T G R A S S C U N I L Z X S O R G A N I S M
 R J M H A M P D M P W H X Y C J P V U H E F
 W O H N N B P A P O L L I N A T O R D J
 Y Q S U N L I G H T D N J Z C
 G X Y O F E X M G
 P X P A Y T O B E Z O O C
 C Z W X J G B U U P X O F H W
 W H Y I K O D E Y C T R P P O L L E N
 U N B E E T L E I W O T U H B J E L Q F R
 U U W C F L I B V R L E D F N T R P P I A
 G B E E O M S D X V Y F R Q S G V A I Y C L X
 K N G N S I K V O N M F Y Y Q I G L O F R
 O L S W Y K D D T D F L S O X N I H T J Q
 P W S M S T X X C L Y K S H E M R W F
 L E J Y T L K N Y O K G F R B J F
 P U N E E N P F Z O H S A
 F X M D Z V M A Z
 N C X
 K P A

ANIMAL

BEE

BEETLE

BUTTERFLY

ECOSYSTEM

FLY

GRASS

INSECT

ORGANISM

PLANT

POLLEN

POLLINATOR

RAIN

SOIL

SUNLIGHT

AIR

Carbon Dioxide: Required for photosynthesis and used to create new cells within plants

Oxygen: Needed for respiration and taken in through the roots

SOIL

Water: Taken in through the roots, gives the plant turgor or rigidity in cells, enable photosynthesis and allow for nutrients and minerals to travel through the plant

Nutrients: Found in the soil and enter through the roots. These chemical elements are found in rotted matter and benefit the plant as it grows.

SUN

Light: Plays a vital part in photosynthesis. Sunlight converted into energy through chlorophyll in leaves that converts carbon dioxide and water into glucose (carbohydrates)

Warmth: Plants need a certain temperature to be reached before they are able to develop, although the temperature differs between plant varieties

Information about some of the flower varieties that were planted in the Tower of London's moat for the Superbloom project in 2022 and the pollinator species they attract.

Flower name	Description	What does it attract?
Blue Flax	Lovely flowers attractive to smaller pollinators which can be supported by its delicate petals.	Pollen beetle (<i>Brassicogethes aeneus</i>) – A tiny beetle which feeds on pollen and nectar of many plants. Particularly common in fields of flowers or in meadows where populations can flourish.
Californian Poppy	A bright and bold flower popular among many smaller insects.	Western Honey Bee (<i>Apis mellifera</i>) – The most common bee worldwide, with the majority living in hives as domesticated livestock because of their capacity to produce honey. Versatile pollinators which are able to visit almost any flower and consume nectar all year round.
Catchfly	Beautiful flowers which are attractive to a range of pollinators including butterflies.	Large Skipper (<i>Ochlodes venata</i>) – A very common butterfly in grassy areas and wherever nectar is available. The caterpillars eat grasses and the adult male butterflies find perching positions high up from which to monitor their territory.
Cornflower	This flower is extremely valuable for pollinators as it's large and bushy, making it easier to land on for flying insects, whilst offering loads of nectar and pollen.	Red-tailed Bumblebee (<i>Bombus lapidaries</i>) – These magnificent creatures will fly all spring and summer long with the queens emerging early to find new nests in which to lay eggs that hatch as worker bees. As with many other bumblebees, the queens nest underground often in old mammal holes, in stones or in walls. Providing them with the right places to nest is just as important to bumblebees as getting enough nectar from flowers.
Corn Marigold	This is an excellent flower for pollinators because it's bright, large, open and easily accessible.	Green-veined White (<i>Pieris napi</i>) – A white butterfly with green veins on the underside of the wings. The caterpillars need to feed on crucifers (plants with four petals or leaves growing in a cross) and can do really well in towns and cities. The adult butterflies feed on a range of plants, including Corn Marigolds.
Dill	Visited by many pollinators including hoverflies and soldier beetles.	Common Red Soldier Beetle (<i>Rhagonycha fulva</i>) – called soldier beetles because many have colouring similar to regimental uniforms. These are versatile insects which often prey on smaller creatures while also feeding themselves on flower nectar and pollen.

Flower name	Description	What does it attract?
Fairy Toadflax	Delicate flowers perfect for small solitary bees and wasps.	Ruby-tailed Wasp (<i>Chrysis ignita</i>) – With a glittering ruby tail and metallic green bodies, these small wasps lay eggs in the cells of other bees and wasps. The adults visit flowers to feed on the nectar and pollen and are very efficient pollinators of smaller varieties of flowers.
Paper Daisy	These large papery flowers make excellent landing boards for small and large insect pollinators.	Peacock (<i>Aglais io</i>) – A large and beautiful butterfly which can be seen feeding from flowers. The caterpillars eat nettles and do well in gardens where small corners are allowed to go wild.
Poppy	Its red flowers are perfect feeding stations for all types of insects including bees, butterflies, and wasps.	Common Wasp (<i>Vespula vulgaris</i>) – A well known black and yellow insect which loves eating flies, aphids, caterpillars and other insects. The adult wasps feed and collect pollen from plants for themselves and their young back in the nest. They play an important role in plant pollination.
Pot Marigold	A very common plant grown in towns and cities which is loved by wildlife, including pollinators and other beneficial insects (and slugs and snails!).	Chequered Hoverfly (<i>Melanostoma scalare</i>) – A distinctive hoverfly with a slim chequered body. It's found near lush vegetation and is attracted to open flowers. The young larvae will eat lots of different smaller insects and like to live in leaf litter.
Red Orache	This flower is mainly pollinated by the wind, but it's also popular with smaller pollinators and other invertebrates.	Ichneumon Wasp (<i>Netelia testaceus</i>) – This highly specialised wasp uses tall plants as resting posts whilst they look for prey.
Tickseed	A fantastic flower for smaller pollinators that require more specialised feeding.	Common furrow bee (<i>Lasioglossum calceatum</i>) – These bees like to nest in soils in a variety of habitats. They collect pollen and nectar for themselves and their young, often visiting smaller plants. This bee plays an important part in the pollination cycles of many plants.
Viper's Bugloss	A favourite flower of many butterflies and moths because its delicate flowers are best suited to insects with a long tongue (proboscis)!	Narrow-bordered Five-spot Burnet (<i>Zygaena lonicerae</i>) – A common day-flying moth that lives in grasslands and gardens.

In the UK the majority of pollination is carried out by bees (wild solitary bees and bumblebees, as well as domesticated honeybees), flies (including hoverflies and bee-flies), butterflies, moths, wasps and beetles.

BEEES

Bees will generally travel under a mile to collect food but will travel up to 5 miles if necessary.

Bees can fly at speeds of up to 20mph (32km ph), but only about 12mph (19km ph) when fully laden with pollen.

When bees locate a good source of food, they communicate its location to other members of the hive by performing a dance - a round dance if the source is under 164ft (50m) away, or a waggle dance if the source is over 164ft (50m) away. This dance is a series of figure of eight turns and returns accompanied by the release of chemical scents that provide information about distance, location and quality of the food source.

BUTTERFLIES

Painted Lady butterflies migrate from tropical Africa to the UK and back each year over successive generations. They fly at an altitude of 1,640ft (500m) at speeds of up to 30mph (48km ph).

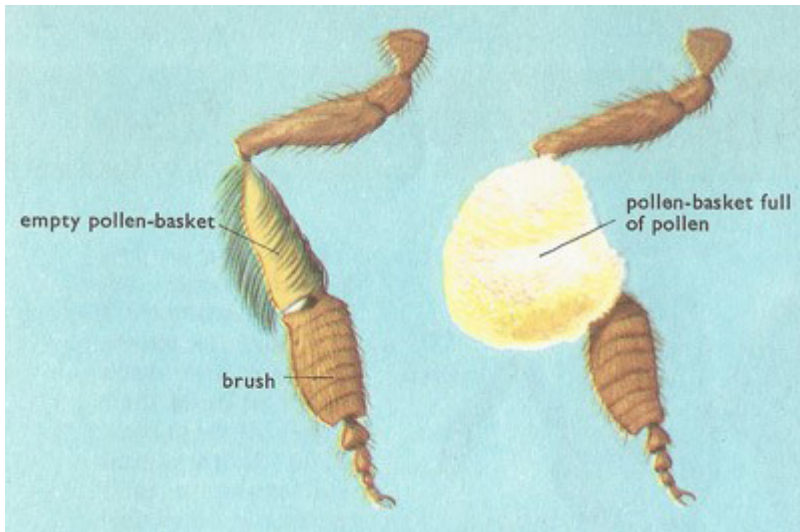
<https://bna-naturalists.org/> The British Naturalists' Association has lots of resources on wildlife in the Britain including very good ID guides with good imagery to help identify the species in your garden.

<https://www.buglife.org.uk/> Buglife have a good range of resources in relation to UK insects. Their identification guide can help you identify an insect through a description tool. Additionally, you could get involved in their campaign to monitor insect populations.

<http://wlgf.org/index.html> The Wildlife Gardening Forum has a whole host of resources about gardening and wildlife. Their resources have a great deal of information about the lifecycle and behaviour of wildlife found in UK gardens. They have resources specific to garden ecology and food webs in UK gardens.

<https://www.wildlifetrusts.org/> The Wildlife Trusts website has great information about protecting and promoting wildlife. Additionally, you could find your local Trust who often have educational engagements that your school could access.

The BBC bitesize resources also have excellent resources related to this topic.

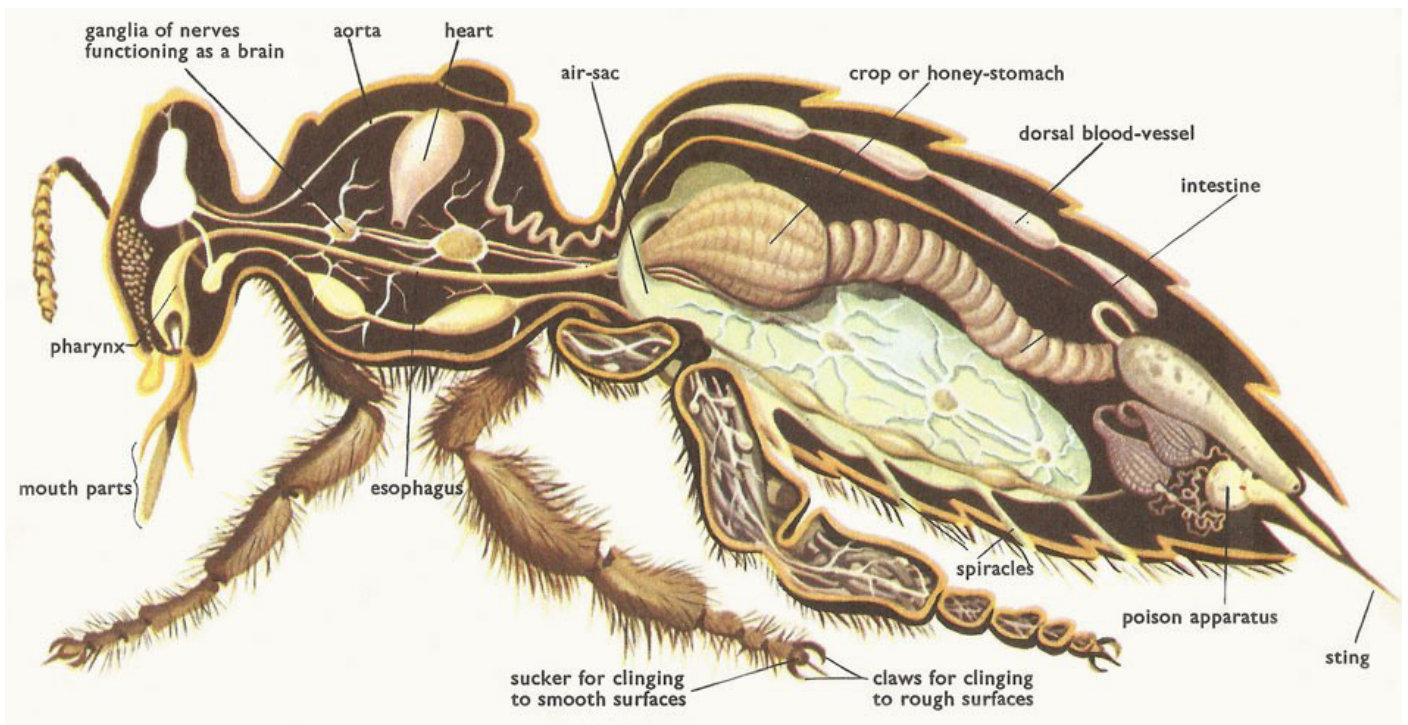


Here are two diagrams showing adaptations that bees have evolved to enable them to collect and transport pollen and nectar.

The first one shows a pollen basket on the rear pair of a bees legs. The 'basket' is actually made up of specially adapted hairs called 'scopa'. Some types of bee have scopa on their abdomen instead.

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The second diagram below shows the honey stomach that bees use to store nectar and pollen which is later regurgitated.



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