

# The Science of the Honeybee

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# Aims for this workshop

- Look at the life-cycle and anatomy of the honeybee
- Find out more about the importance of bees as pollinators
- Share some ideas for activities to boost understanding of biodiversity

# Why are bees important?

There are 25,000 bee species worldwide and 250 bee species in the UK – 25% of these are social bees, the rest are solitary or parasitic bees.

A foraging trip for a worker can be up to 5 miles (although it is more typically around 1 mile) - they make many trips each day. A strong colony can consist of up to 60,000 bees in the summer- so they could fly the equivalent distance from the earth to the moon each day!

Bees carry pollen from one flower to another, which is an essential part for the reproduction of some plants – including important food crops.

Three in four crops worldwide that produce fruit or seeds for human consumption or use depend partially on pollinators, including bees.

Honeybees are the only insects that produce food that humans collect to eat. It takes the equivalent of 10 million trips outside the nest to make enough honey to fill one jar!

## Bumblebees

Hymenoptera



Long antennae

Two pairs of see-through wings

Round furry body, 8-30mm

## Honeybees

Hymenoptera



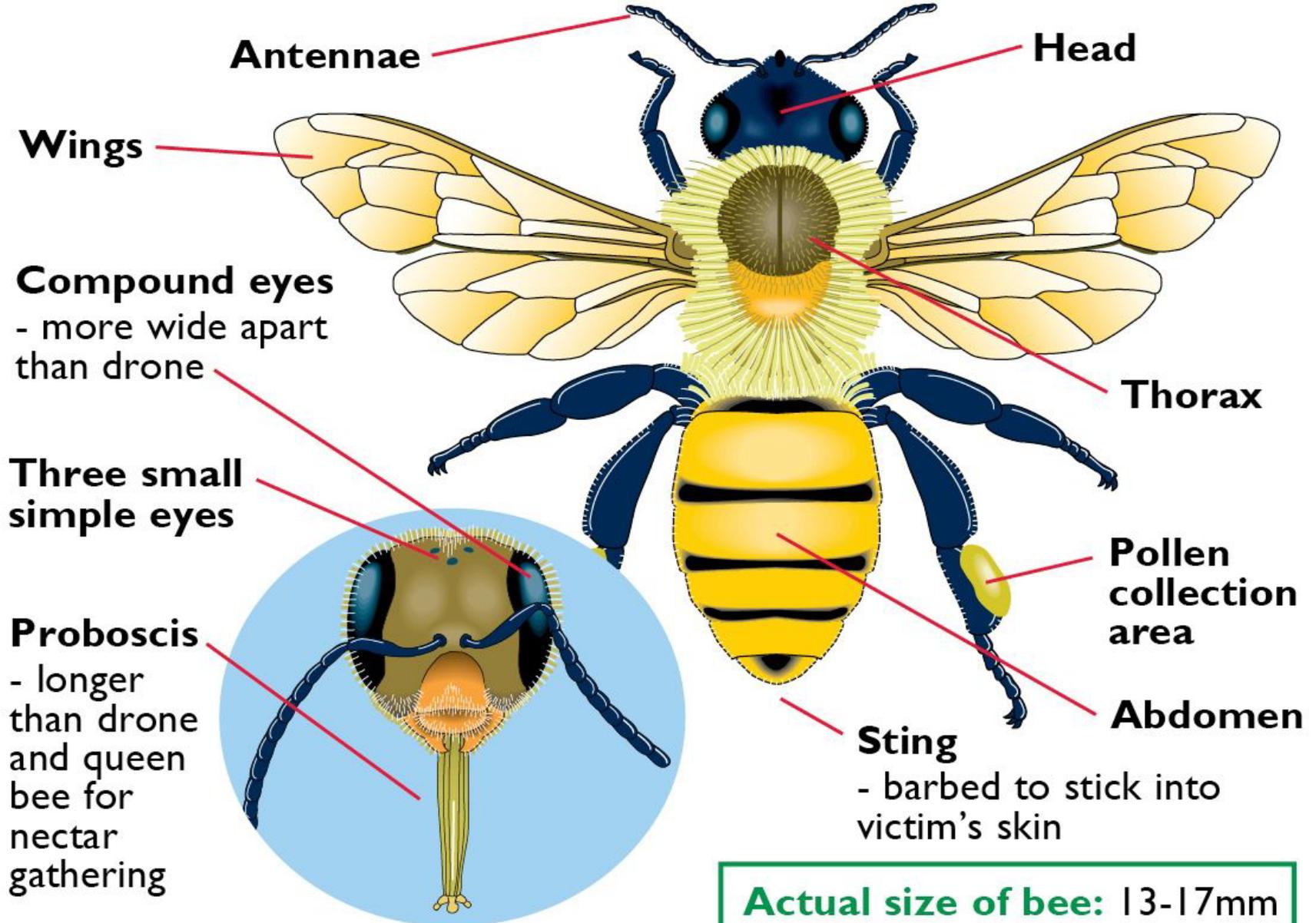
Long antennae

Two pairs of see-through wings

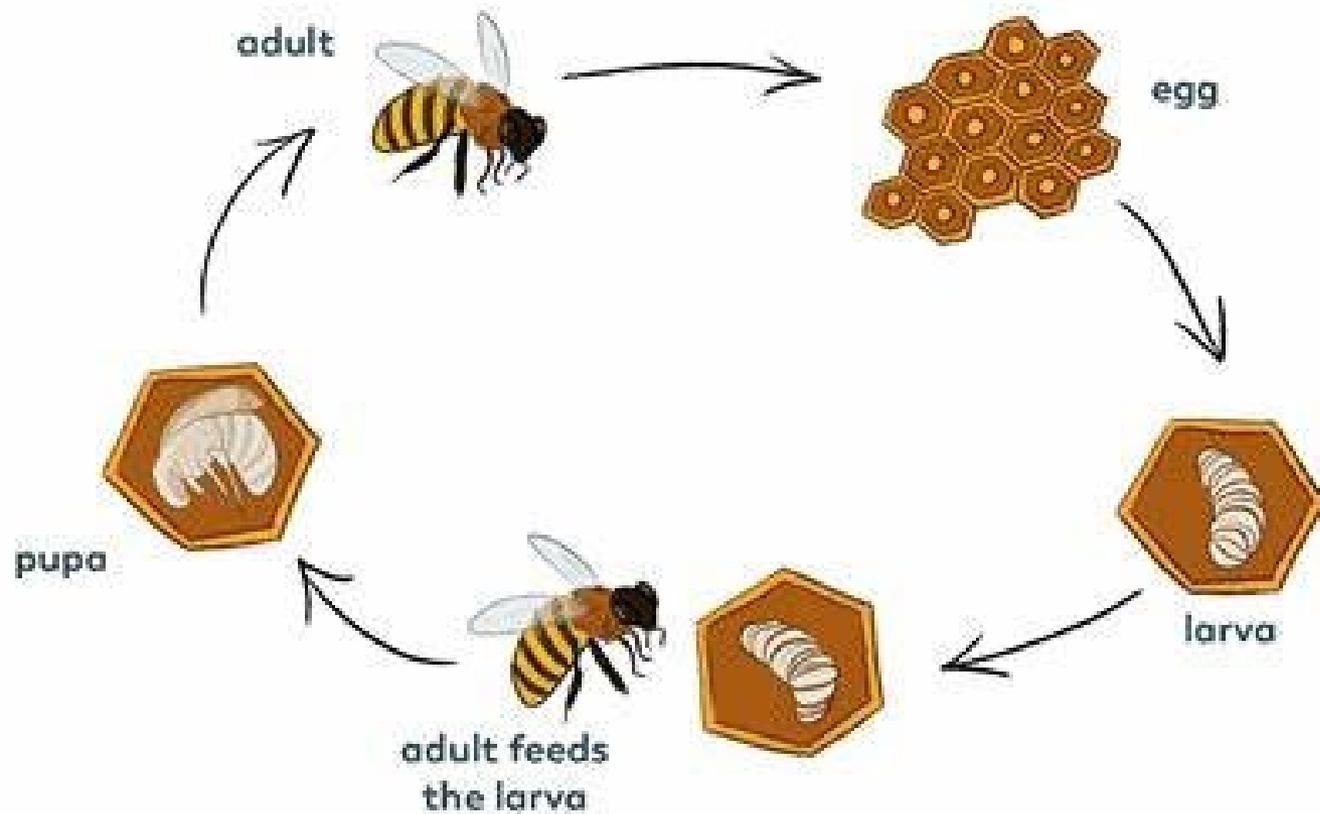
Striped ginger brown body, 5-15mm

[Pollination-chart-26Feb16-low-res-web-quality\\_0.pdf \(imperial.ac.uk\)](#)

# The worker bee

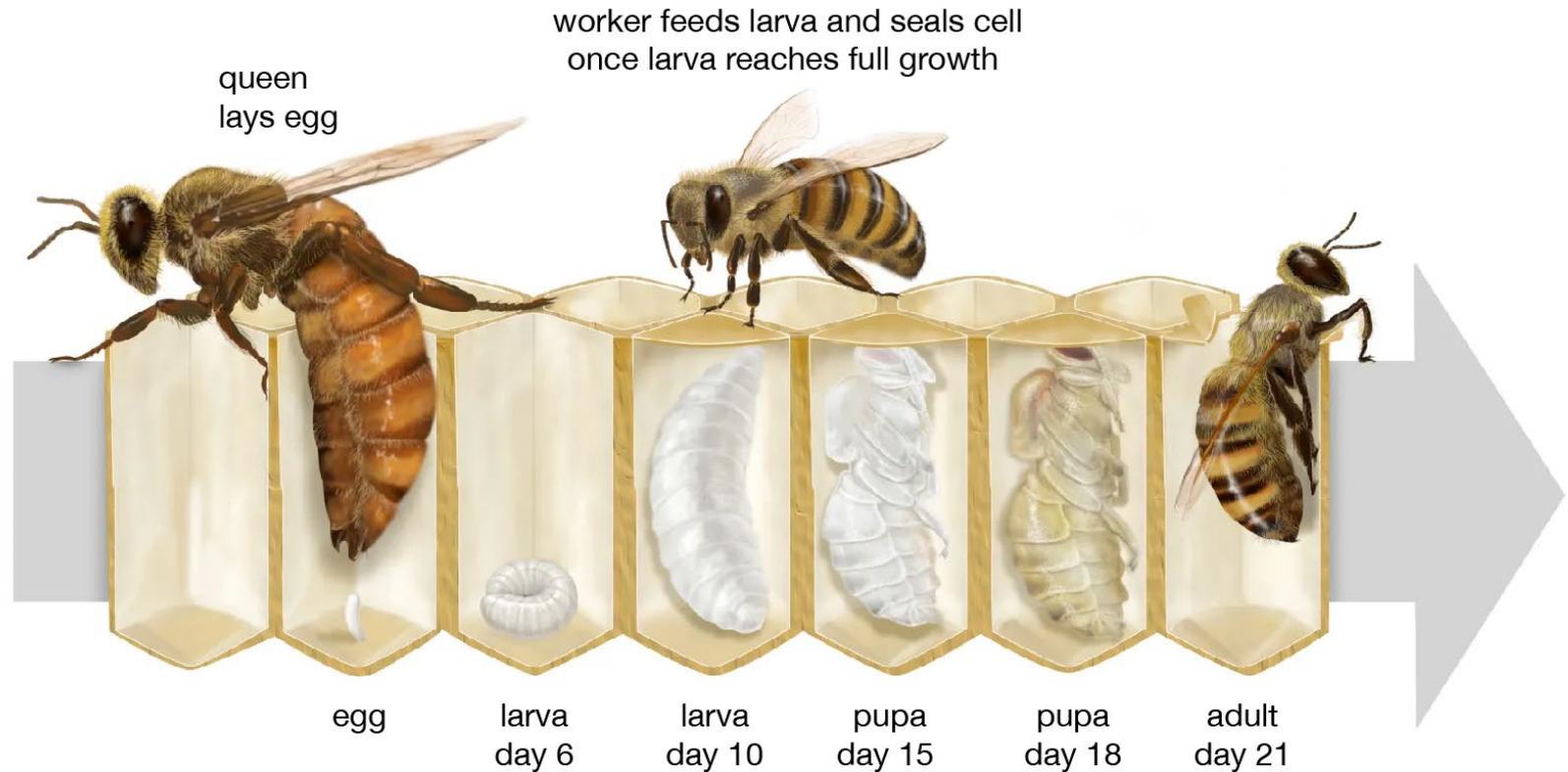


# Life-Cycle of the honeybee



# Life-Cycle of the honeybee – the worker

## Life cycle of honeybees



## Honey Bees:

Take a look at this video showing what goes on inside a beehive....

[Great Science Share for Schools, Find A Scientist: Hayley Sherrard - Bing video](#)

\*the hives in the photos are small nucleus hives or “nucs” –these are used to collect swarms or to house split colonies in the summer.



# Honey, Honey!



[Honey | British Beekeepers Association \(bbka.org.uk\)](http://bbka.org.uk)

# Take a look at this article on biomimicry by PSTT Trustee **Jyoti Sehdev**



[Home - Primary Science Teaching Trust \(pstt.org.uk\)](https://www.pstt.org.uk)

Why&How? Magazine 

## Climate science

*Turning to nature as our teacher*



PSTT Trustee and civil engineer, Jyoti Sehdev, describes how biomimicry – using ideas from nature as models for the design of new structures and systems – can be part of the solution to some of the global challenges we are facing.

**E**ngineers are problem solvers. We evolve our designs over and over to meet the changing needs of society. The last issue of the Why & How magazine focused on society's greatest challenge of the moment: human-induced climate change which is leading to a mass extinction of species.

Consequently, engineers are looking for ways to reduce our use of fossil fuels whilst evolving infrastructure to be resilient to the impacts of changing weather events. Perhaps we need to turn to the very species we are trying to protect, the beings that have been evolving for 3.8 billion years, to develop truly sustainable answers to these challenges.

Biomimicry is the conscious emulation of life's genius to create sustainable designs. Biomimetic design in engineering has led to the development of more efficient and lower carbon solutions. The following examples illustrate some of the recent biomimetic approaches that have been used by engineers.

[Honeycomb Structure Is Space-Efficient and Strong — Biological Strategy — AskNature](#)

## Links to the curriculum and beyond...

I've included links to Scottish CfE -  
where do bees and pollinators fit in to  
your teaching?

# Curriculum for Excellence

## Planet Earth: Biodiversity



curriculum for excellence:  
sciences  
experiences and outcomes

[www.curriculumforexcellencescotland.gov.uk](http://www.curriculumforexcellencescotland.gov.uk)



I can distinguish between living and non-living things. I can sort living things into groups and explain my decisions. **SCN 1-01a**

I can identify and classify examples of living things, past and present, to help me appreciate their diversity. I can relate physical and behavioural characteristics to their survival or extinction. **SCN 2-01a**

# Curriculum for Excellence

## Planet Earth: Biodiversity



I have helped to grow plants and can name their basic parts. I can talk about how they grow and what I need to do to look after them. **SCN 0-03a**

I can help design experiments to find out what plants need in order to grow and develop. I can observe and record my findings and from what I have learned I can grow healthy plants in school. **SCN 1-03a**

# Curriculum for Excellence

## Biological systems: Inheritance

By investigating the lifecycles of plants and animals, I can recognise the different stages of their development. **SCN 2-14a**

### Extras

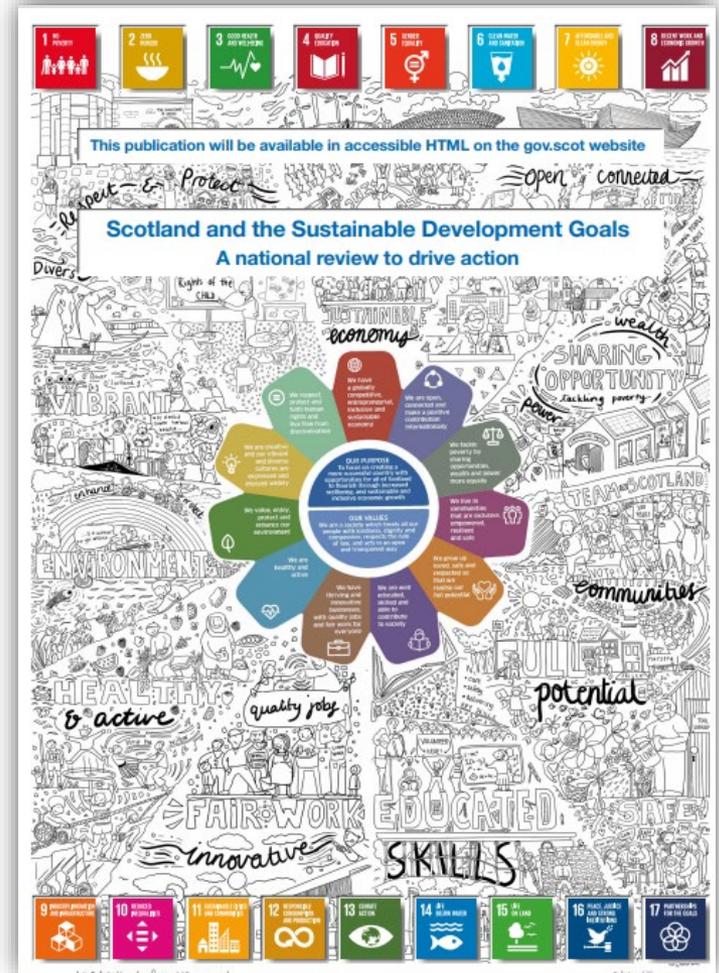
Having explored more complex number sequences, including well-known named number patterns, I can explain the rule used to generate the sequence, and apply it to extend the pattern. **MTH 2-13a**

# Scotland - Sustainable Development Goals

## 15 Life on Land – Environment

Enhancing and protecting Scotland's biodiversity and ensuring the health of its environment is critical in the fight against climate change and ensuring the environmental, social and economic benefits they bring for future generations.

Increasing understanding of how nature sustains us, and the connections between biodiversity, healthy ecosystem functioning and wider benefits to individuals and society is vital to facilitate protection of Scotland's environment.



[Scotland and the sustainable development goals: a national review to drive action - gov.scot \(www.gov.scot\)](http://www.gov.scot)



# SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

**1** NO POVERTY

**2** ZERO HUNGER

**3** GOOD HEALTH AND WELL-BEING

**4** QUALITY EDUCATION

**5** GENDER EQUALITY

**6** CLEAN WATER AND SANITATION

**7** AFFORDABLE AND CLEAN ENERGY

**8** DECENT WORK AND ECONOMIC GROWTH

**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE

**10** REDUCED INEQUALITIES

**11** SUSTAINABLE CITIES AND COMMUNITIES

**12** RESPONSIBLE CONSUMPTION AND PRODUCTION

**13** CLIMATE ACTION

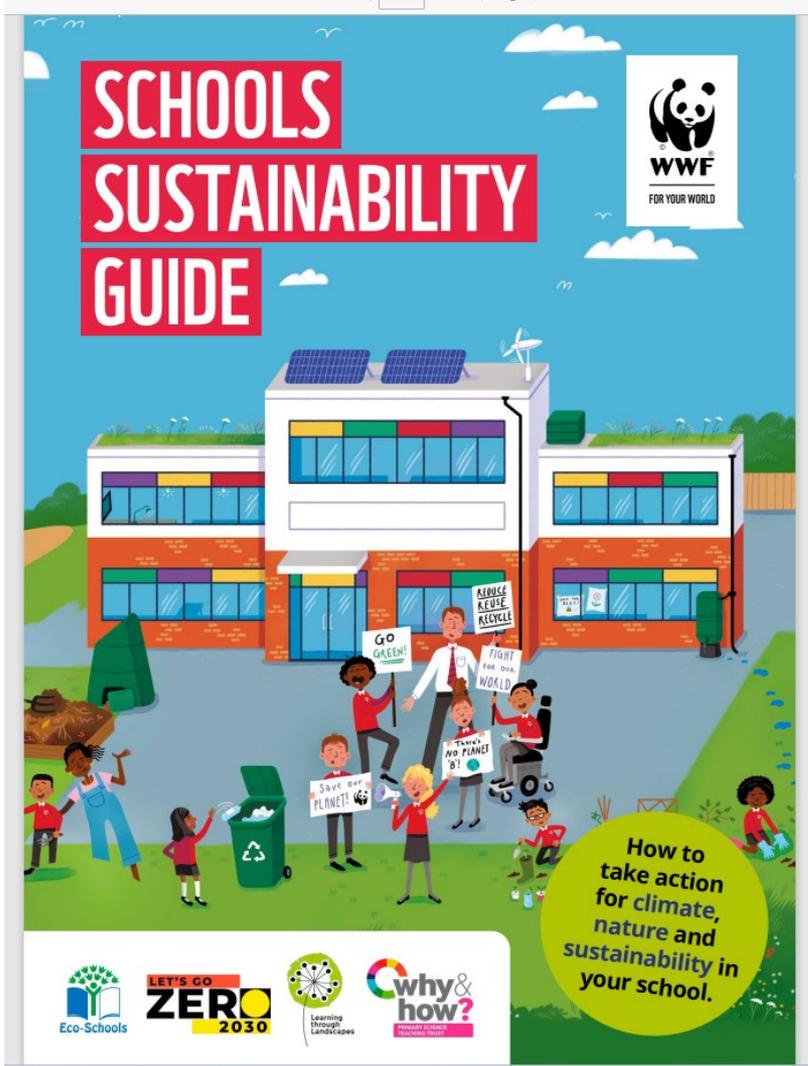
**14** LIFE BELOW WATER

**15** LIFE ON LAND

**16** PEACE, JUSTICE AND STRONG INSTITUTIONS

**17** PARTNERSHIPS FOR THE GOALS

SUSTAINABLE DEVELOPMENT GOALS



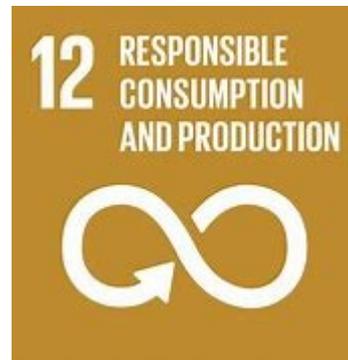
[Schools Sustainability Guide](#) | WWF



**SUSTAINABLE DEVELOPMENT GOALS**  
17 GOALS TO TRANSFORM OUR WORLD



**15:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.



**12:** Ensure sustainable consumption and production patterns.



# PLANET-FRIENDLY SCHOOLS

The Earth is warming and many natural habitats are changing quicker than wildlife or people can adapt. Climate change is harming our planet's variety of life – its biodiversity – which is essential for us to survive. It provides the air we breathe, the water we drink and the food we eat! But we can help fight climate change and nature loss together. By making our schools planet-friendly we can make space for nature, protect the atmosphere and produce less waste. Let's take action to stand up for our world!

## ANYONE HOME?

Bug hotels are a fantastic way to encourage creepy crawlies into your school grounds as they like to have dark, damp places to hide out. Solitary bees like to lay their eggs in small holes, so try to include some bamboo shoots or drill some holes into wooden logs.



Installing bird and bat boxes or special 'habitat bricks' is a brilliant way to provide new homes for wildlife around your school. Creating gaps in fences – or 'hedgehog highways' – can help our prickly friends to pass in and out of your school grounds easily.



## GREEN FINGERS

Planting your own food at school is a brilliant way to help wildlife and do your bit for the planet. You can grow loads of herbs, fruits and vegetables like chives, mint, rosemary, strawberries, tomatoes, carrots and courgettes. You can cook them into a delicious vegetable soup or some sweet fruity jam.



## SWITCH OFF

Reducing the amount of energy we use at school can improve our environmental footprint and help nature. Try to use natural light in classrooms and switch off lights and electronic devices when they're not being used. If you can, try to get your school to switch to a renewable energy supplier as this is much better for the planet.

## UP ON THE ROOF

Solar panels on the roof are a great way of generating your own renewable energy to use at school. Having a 'green roof' covered in grass, moss and other plants can help insulate your school building and reduce flooding from rainwater.



## HOW CAN SCHOOLS HELP?

There are loads of ways to make school grounds better for wildlife. Whether your school has a small tarmac playground or lots of grassy fields, if we all work together we can turn our school grounds into one of the UK's largest nature parks!

## DID YOU KNOW?

We're seeing fewer and fewer wild animals like hedgehogs, water voles, common frogs, butterflies and moths in the UK. In fact, around 40% of our native species are currently in decline. We must all work together to bring back our nature!



## POCKET PONDS

Even a tiny pond made from an old sink, bucket or washing up bowl can be a wonderful home for dragonflies, newts and frogs. Ponds also provide a feeding ground buffet for mammals such as hedgehogs and bats.



## COMMUNITY

Schools are a brilliant place for families and communities to come together. You can involve local people and businesses in planting trees or wildflowers, harvesting or selling food, building wildlife habitats, greenhouses or feeders, surveying local wildlife and so much more.



## SPEAK UP!

Let everyone know what you're doing around school. This might be through making posters and videos, campaigning locally, holding a school assembly, or writing to your councillor, MP or MSP to demand action. You and your school have the power to make a big difference by influencing your families, friends, local businesses and the government. Be a force for good in the fight against nature loss and climate change!

## NATURE DETECTIVES

Use wildlife spotter guides or apps to conduct nature surveys around your school to see if your biodiversity is improving. You could even install cameras near any bird feeders, bug hotels or hedgehog houses to see what your local wildlife gets up to when you're not watching!



## BUSY BEES

Our pollinator friends love flowering plants like lavender, marigolds, native wildflowers and blossoming trees because they provide lots of tasty nectar. Lots of different plants can be grown in pots, recycled containers and even up a wall if you don't have much space.



## LEAVE IT LONG

Letting some areas of grass grow long encourages wildflowers to grow and helps protect wildlife like frogs, field mice, butterflies and ladybirds.



## Making a bee line for biodiversity

What's the science?

Biodiversity is the library of life: the animals and plants that live around us. With better biodiversity, we have more species and a more stable climate. Pollinators, like bees and butterflies, help us to grow food and are a key element of biodiversity. Unfortunately, their habitats are under threat from new building developments and farmland. Creating new habitats can help to encourage more pollinators into our local area, helping biodiversity to thrive.

What are scientists doing about it?

Scientists track population trends of bees across the world. They are also researching how to reduce the use of pesticides on crops to encourage bee populations to increase. One research project found that planting a wildflower strip on farming land can increase the yield of the crops by attracting more pollinators to help the food to grow. This increases the bee population and earns the farmers more money.

How could you explore this in the classroom?

- ▶ Ask learners to consider how they could contribute to the bee line by learning about the best habitats for bees and then creating these within their school grounds.
- ▶ With help, learners could gather and record data by creating a 'library of life' of the animals and plants they see in the school. This could include making tally charts and information posters with details of the animals and their habitats.
- ▶ Learners could identify and classify the plants, researching and observing which are best for attracting bees. Discuss with them why pollinators are important and ask them whether bees fly towards the trees or the flowers. Why do they think this is?
- ▶ Take action by planting a wildflower strip and making bee hotels during DT.
- ▶ Ask learners to observe over time by reviewing the area some weeks or months later. Are there more pollinators than before?
- ▶ To link with numeracy learners could look at how bees communicate through a waggle dance and link this with positional and directional language, giving each other instructions. Within ICT learners can code Beebots to move around to find their new home.
- ▶ Contact your local beekeepers' association and have an avid apiarist speak to the learners about their passion for beekeeping.

### Curriculum links

Habitats; observing over time; gathering and handling data; ICT; DT; numeracy

# Pollination

What is it? How are bees (and other animals) involved?

# Pollination – what is it?

The transfer of pollen from the stamen to the stigma...

Photograph [www.science 3-18.org](http://www.science 3-18.org)



Animal pollination



Wind pollination

Ideas for science enquiry? Which plants require animals to pollinate them? How can you tell?

# Pollination and interactions between plants and animals...

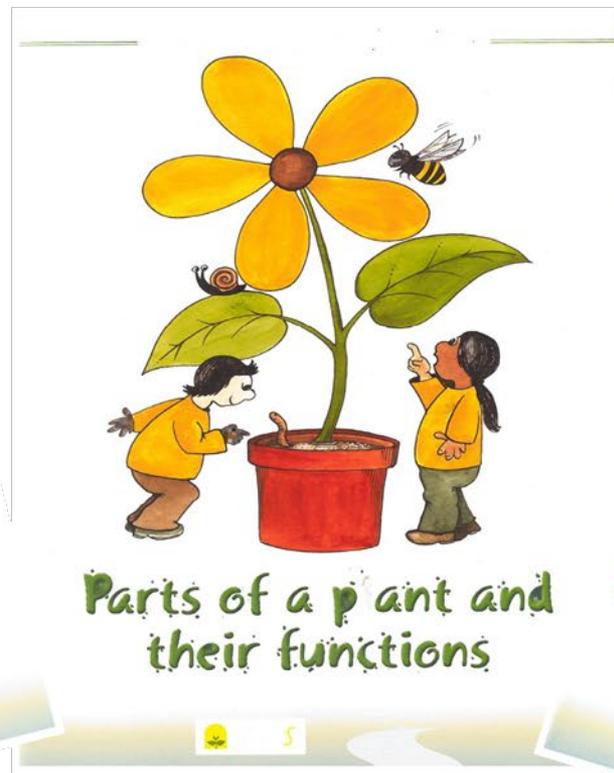


[Louie Schwartzberg: The hidden beauty of pollination | TED Talk](#)

[Why we need bees | TED Talks](#)

[Jonathan Drori: Every pollen grain has a story | TED Talk](#)

# More ideas from Plants for Primary Pupils

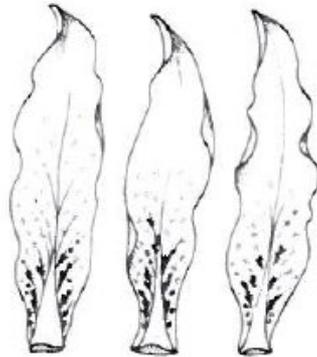


[SAPS Primary Resources Homepage](http://saps.org.uk)

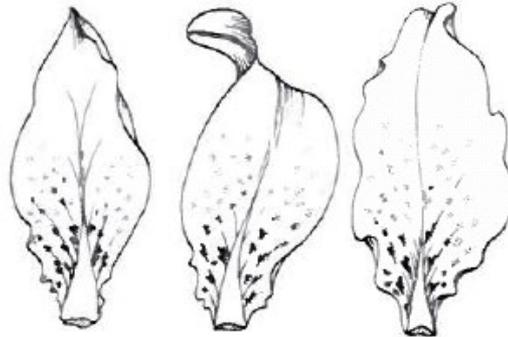
[Plants for Primary Pupils Booklets - Overview \(saps.org.uk\)](http://saps.org.uk)

[Primary Booklet 3 - Reproduction and Life Cycles - Part 2 \(saps.org.uk\)](http://saps.org.uk)

# A closer look at a flower!



sepals



petals



stamens

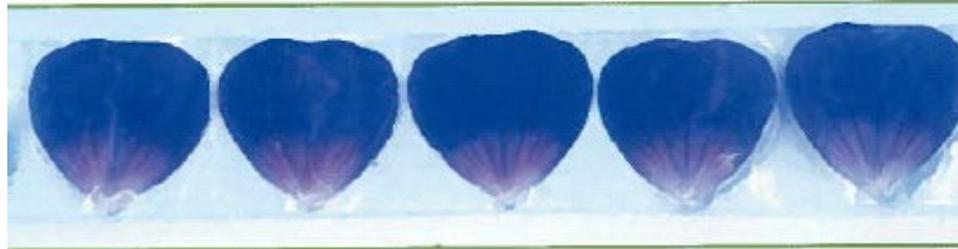
carpels

Lay the parts of the flower onto double-sided sticky tape

Sepals



Petals



Stamens



Carpel

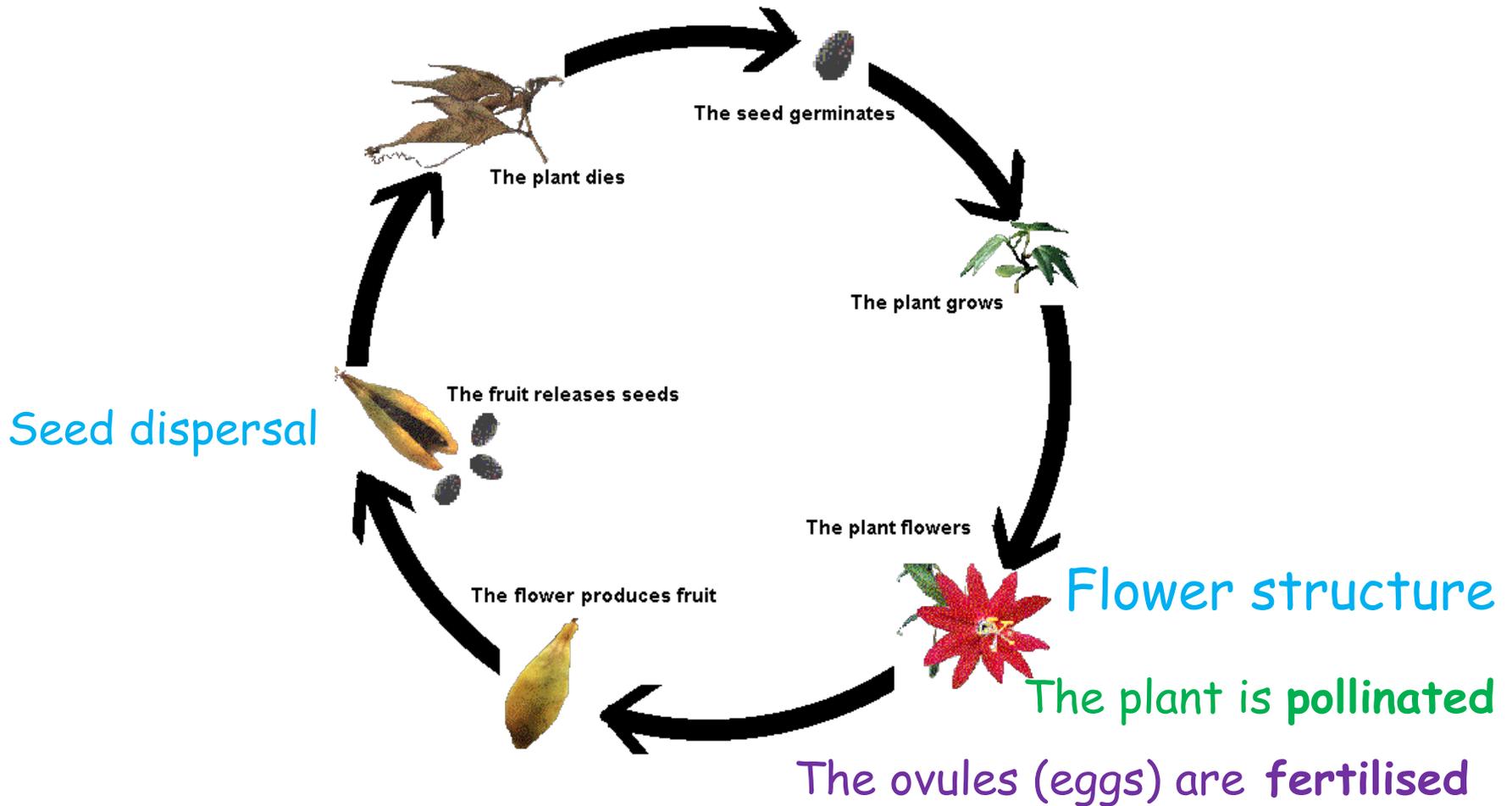


Lay the parts of the flower onto sticky-backed plastic.

You could place them face down and put card behind the finished display.

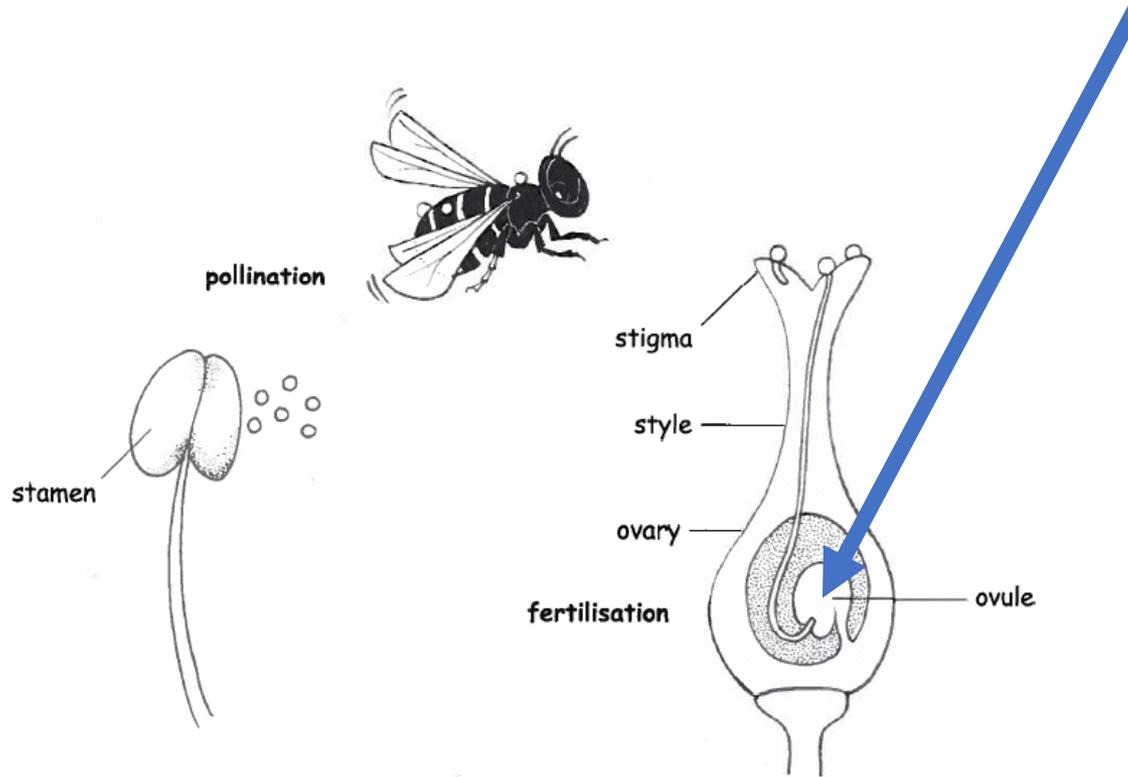


# The Life Cycle of a Flowering Plant

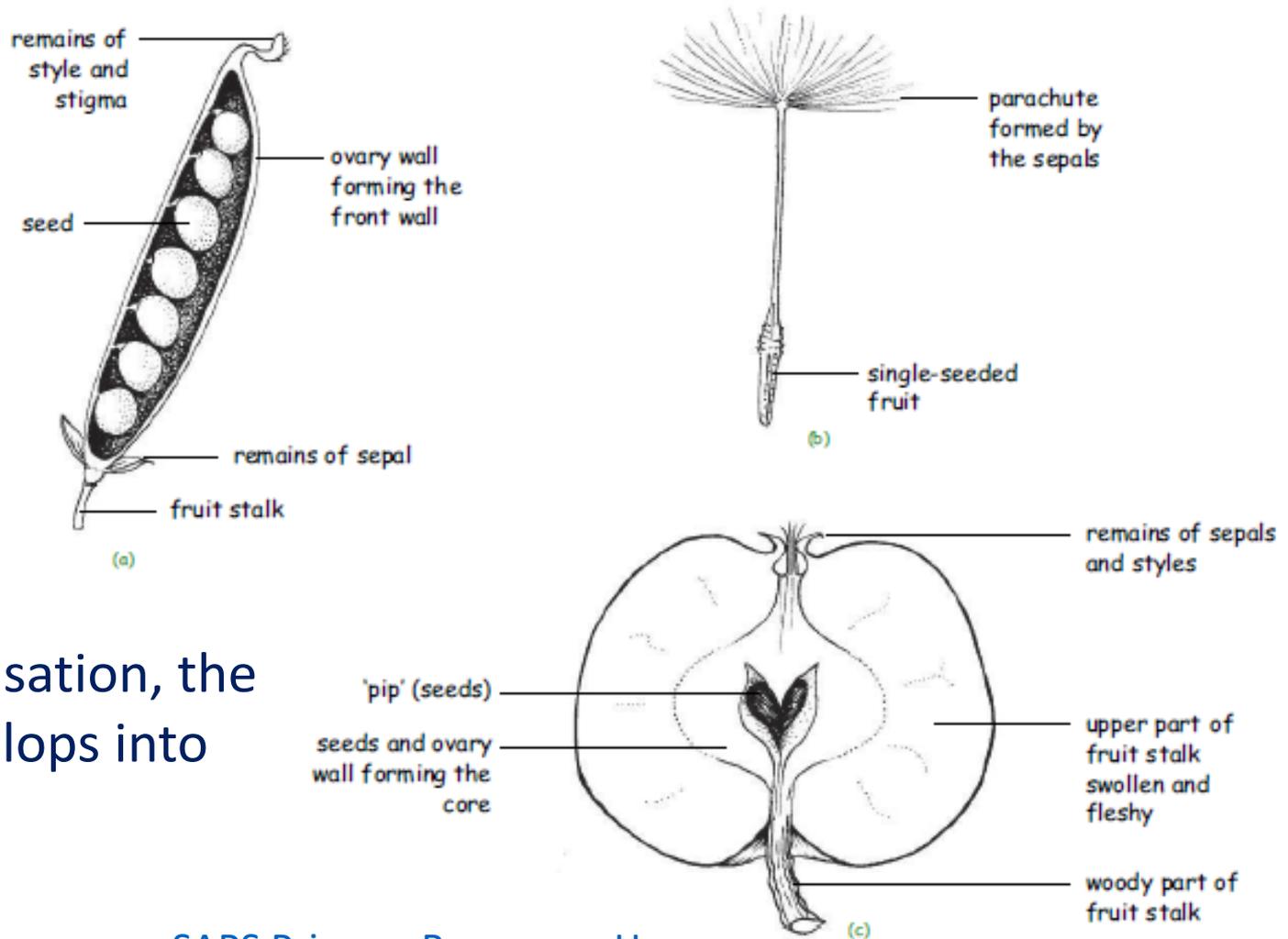


# Fertilisation – What is it?

The fusion of male pollen cell with female cell

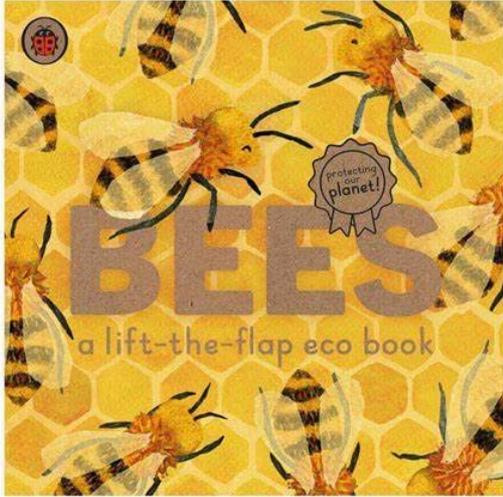


# Formation of the fruit

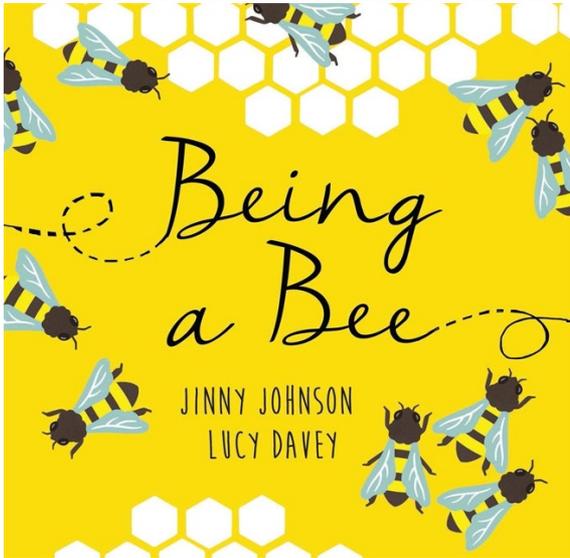


After fertilisation, the ovule develops into the seed.

## Some good books on bees:



[Bees: A lift-the-flap eco book \(penguin.co.uk\)](http://penguin.co.uk)



[Being a Bee by Jinny Johnson, Lucy Davey | Waterstones](#)

Book reading on YouTube:

<https://tinyurl.com/2p9r2a53>

# Making seed balls to attract pollinators

You will need:

Clay powder <https://tinyurl.com/FullersEarthClay>

Compost/soil

Wildflower seeds <https://tinyurl.com/wildflower-seeds>

Gloves (optional)

Ice cream tubs/bag

Water in bottle (with nozzle attached)

Watch the video here:

[Bee Bomb.mp4](#)

# Some good links and websites:

[science.cleapss.org.uk/Resource-Info/PS087-Bees-and-beekeeping-in-schools.aspx](http://science.cleapss.org.uk/Resource-Info/PS087-Bees-and-beekeeping-in-schools.aspx)



[Buzz about bees! - National Geographic Kids \(natgeokids.com\)](http://natgeokids.com)



[Surveys - Bumblebee Conservation Trust](#)

[Polli:Nation Survey | Research groups | Imperial College London](#)

[Bee Kind: Imperial scientists' efforts to protect pollinators | Imperial News | Imperial College London](#)

[Bees in the Curriculum | British Beekeepers Association \(bbka.org.uk\)](http://bbka.org.uk)

[CBBC - Show Me the Honey!](#)

<https://www.rspb.org.uk/fun-and-learning/for-kids/games-and-activities/activities/>

<https://www.wildlifetrusts.org/actions>

Royal Entomological Society - Garden Entomology booklet:

[Layout 1 \(royensoc.co.uk\)](https://www.royensoc.co.uk)

[https://www.royensoc.co.uk/wp-content/uploads/2021/12/Garden-Ent\\_hi-Res.pdf](https://www.royensoc.co.uk/wp-content/uploads/2021/12/Garden-Ent_hi-Res.pdf)

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[record bees and](#)  
[help science |](#)  
[Friends of the](#)  
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