

Invertebrate morphology lesson plan

The study of morphology seeks to assess the physical forms of organisms and why they differ; what is the purpose of these different body structures. By learning about the structure of invertebrates we learn about how their body plans aid their survival. It is vital to learn this analytical technique as it can be applied to other aspects of biology such as taxonomic classification and evolutionary history.

Learning Intentions:

The purpose of this lesson pack is to guide an investigation of the shape and structure of invertebrates while asking how this structure relates to their environment. Social Skills will include listening to others and quietly sharing information. By the end of the lesson pupils should be able to:

1. Identify simple features of invertebrates.
2. Understand how these features aid them in their daily survival and life cycle.
3. Use this knowledge for larger organisms such as mammals and birds.

Prior knowledge

Pupils should be familiar with a few common invertebrates e.g. bees or ants and what they look like, where they live and what they eat.

Curriculum for excellence

First Level

- Pupils will investigate, and collect information on, the variety and quantity of invertebrate life which lives in their local area. Pupils will learn about different microhabitats and learn how the physical characteristics of the habitat affect what invertebrates live there (**SCN 1-01a / SOC 1-13b**).
- Pupils experience the energy and excitement of presenting/performing for audiences and being part of an audience for other people's presentations/performances (**EXA 0-01a / EXA 1-01a**).

Second Level

- Pupils will learn about adaptations that invertebrates have to their natural environment. They will learn about the life cycles of some invertebrates and how their physical form changes though development (**SCN 2-01a, 2-14a**).
- Through discovery and imagination, pupils can develop and use problem-solving strategies to construct models (**TCH 2-14a**).
-

Core outcome

Pupils will understand that all organisms adapt their bodies to suit their natural environment. They will spot similar and different body features in common invertebrates.

Challenge outcomes

Some pupils will be able to relate this knowledge to the study of larger organisms and their body plans.

Pre-lesson

Discuss learning outcomes that you hope to achieve. Develop a health and safety contract with pupils over the correct way to behave in an outdoor environment that will ensure the wellbeing of invertebrates. This should be on a large poster, the pupils will then sign at the bottom to maintain the agreement.

Prior reading at www.buglife.org.uk/, our website has many resources for helping with invertebrate identification.

Additionally:

- Arrange transport to a site with green spaces; this could be to a grassland meadow or woodland.
- Complete a risk assessment.
- Assure proper dress for conditions e.g. wellies and waterproofs.
- Organise permission slips if heading off site from school.

Introduction

- Ask class to name as many invertebrates as they can.
- If there is time, ask pupils to quickly draw a picture of a bee, butterfly and a beetle – highlight that although these are different organisms with different life strategies they still have many things in common e.g. shape of the head, number of legs, body shape, wings, mouth parts, eyes etc.
- Highlight that the shapes and sizes of these appendages are different.
- Explain how different body structures help organisms live in different environments:
 - Long powerful legs help grasshoppers move from stem to stem.
 - Large wings help butterflies to fly.
 - Bees have warning patterns on their backs to protect them.
 - Ground beetles have small eyes as they move in the dark and use their antennae more.
 - Worms are long and slender to ease movement through the soil.

ACTIVITIES

Build a bug! [takes 1 hour]

Pollinator structure – the purpose of this game is to get pupils thinking about the structure of pollinators and why their body structure is suited to their life cycle.

What you will need:

- Thin glass/test tube with narrow opening that is long with small volume of water at bottom.
- Crafting materials (pipe cleaners, straws, glue, crèche paper, cardboard, paper etc.).

This game involves pupils designing a pollinator that can get the nectar (i.e. water at the bottom of the test tube). The tube should be placed high up; the organism needs to reach the nectar. Once there it will also need a mechanism to retrieve the water from the bottom of the tube. Warn the pupils that they must also be careful that another insect does not eat them. Divide the class up into small groups and let them have 10 minutes to brainstorm and design a small pollinator that could reach the water and drink. Once they have agreed on the shape and have a simple diagram they will then build a model.

Using crafting materials, they will build a pollinator that can:

1. Spot/smell the tube (look at eyes /antennae).
2. Get up to the tube (by crawling or flying), e.g. with sticky feet, claws, wings etc.
3. Stay fixed at the mouth of the tube (using its legs or hovering).
4. Retrieve the nectar (a mechanism like a straw for a long tongue).
5. Protect itself from predators (having and using camouflage, bright markings, a sting, bite).

Pupils are given 20 - 30 minutes to build this pollinator. They can also name the pollinator to reflect its design e.g. “super-flyer”.

Each group should be able to inform the class how the pollinator they have designed meets the criteria for reaching the water, drinking from the tube and also how it protects itself.

Outcomes

Pupils will come up with various designs that reflect different body plans and structures that are reflected in real life. To encourage diversity the teacher can then highlight various invertebrates that are designed to meet the criteria but who have different approaches, such as bees, butterflies, hoverflies and beetles.

Extension work – the tube can vary in shape and size with different levels of nectar. This would reflect the changing nature of flower structure and would then affect the pollinators that could use these flowers.

Outdoor Lesson – [takes 30 minutes]

This session carries on from the previous session but can also stand alone. To show the real world designs that invertebrates have come up with. This could also be an opportunity to ask the pupils if real world invertebrate body plans meet their designs.

What you will need:

- Sweep nets (if available)
- Magnifying glass
- Jars
- Clipboard
- Paper
- Coloured pencils/pens
- Different habitat types e.g.
 - Long grass
 - Deadwood
 - Flowers

Introduction:

Explain that you will be exploring three different habitat types: flowers, long grass and deadwood.

1. Rotate groups around the three different habitats, about 10 minutes each.
2. Pupils will observe each habitat type for 10 minutes and keep a written note/diagram of the structural features of the invertebrates that visit the habitats.
3. On the paper these features will be written under the heading marked by the habitat type.
4. Use the sweep net through long grass to get a bigger sample. Try catching some invertebrates in jars to get a closer look at their body structure. Instruct pupils to note the similarities and differences between organisms.
5. Once studied release invertebrates unharmed.

At the end of the exercise when each habitat type has been investigated each group should be able to report to the class what invertebrates they observed and their features. The class will then discuss what where the similarities and differences between the invertebrates that visited each habitat.

Assess the pupils by asking them about body shape and function:

1. Why an organism had a long tongue would be found at a flower.
2. Which invertebrates had hard shells – flyers or walkers and why?
3. Which invertebrates had long powerful legs
4. Which ones had piercing mouthparts?
5. Which one had hairy bodies?
6. Which organisms had the smallest eyes?



Further discussion: highlight how scientists group certain organisms into designated families and how organisms like this retain similar features across a group such as flies, beetles, bees/wasps etc.

Outcomes

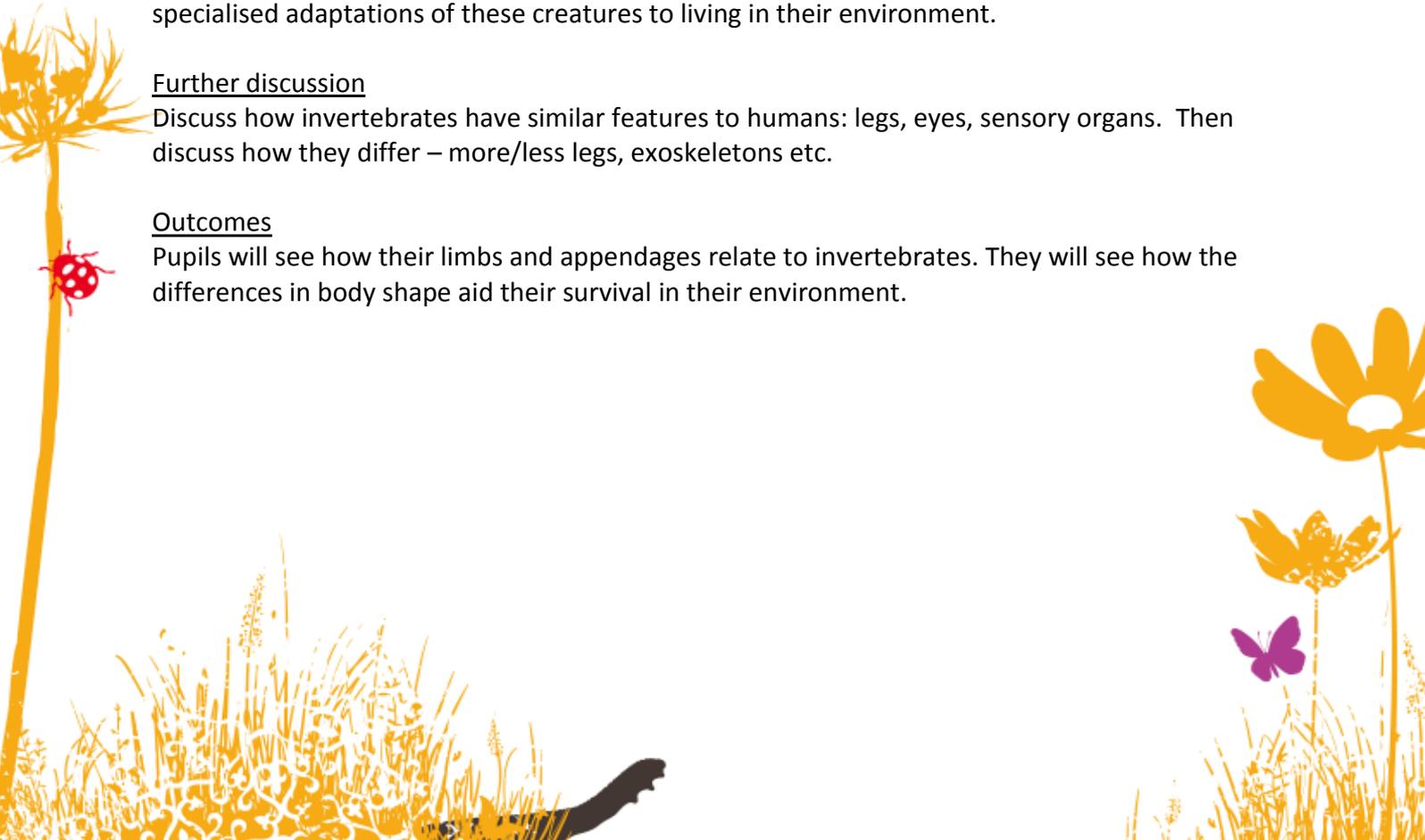
Pupils will learn how habitat pressures affect the body shape of organisms. Pupils will be able to hypothesise why certain structures of these organisms have evolved

Body shape game [takes 20 minutes]

This is a simple activity that can aid pupils understanding of invertebrate body shapes and how it relates to the environment.

Divide the class into groups of three. Write down the names of different invertebrates onto scraps of paper and hand them out individually to all the groups. Get the groups to join together and form the shape of their invertebrate and act out how they moved. Then get them to act out a part of the invertebrate's lifecycle using the limbs and sensory organs. The rest of the class then has to guess what invertebrate they are acting out. This will highlight the specialised adaptations of these creatures to living in their environment.

Further discussion



Discuss how invertebrates have similar features to humans: legs, eyes, sensory organs. Then discuss how they differ – more/less legs, exoskeletons etc.

Outcomes

Pupils will see how their limbs and appendages relate to invertebrates. They will see how the differences in body shape aid their survival in their environment.