Animals

Introduction

Key concepts of animals

The activities in this topic are designed to explore the following key concepts:

- The scientific definition of ‘animals’ is that they are organisms that ingest food for survival. They are ‘consumers’ in contrast to plants which are ‘producers’, building and storing material through the photosynthetic process.

Structure, function, adaptation

- Animals have various ‘structures’ that enable them to survive: skeletal structures for support; limbs and jaws for ingesting and collecting food; structures for movement and defence; structures for flight or predation; structures for digestion and respiration; and structures for reproduction. Each organism has particular forms of these structures that are essentially solutions to the survival ‘problem’.
- Organisms’ structures and behaviours should be viewed in terms of their survival purposes. Students should be supported to take this view.
- Each animal is adapted to a particular ecological niche, which involves interdependence with other living organisms as well as dependence on non-biotic factors.

Animal behaviour

- Animal behaviour must also be understood in terms of its adaptive function. Animals behave in ways that maximise their survival chances.
- Each species has unique behaviours that can be studied using a range of techniques.

Teaching note: For schools, it is most fruitful to study the behaviour of simpler life forms since their behaviour is not so complex and students are less likely to anthropomorphise.

Animal life cycles

- Some animals change from one form to another during their life cycle.
- Each type of animal has its own life cycle.
- Even during stages at which the animal appears inactive, the animal is alive.

- The changes in the life cycle of an animal have specific environmental requirements.
- Some animals, once they hatch, have the same form for the remainder of the life cycle.

Teaching note: Life cycles should really be called ‘reproductive cycles’. In animals and plants, life cycles have unique details that are adaptive to the particular environment, including the number of offspring (or seeds) and the timing, frequency and mechanisms of reproduction.

In animals, the reproductive cycle can coincide with the life cycle of an organism if the adult dies after fertilisation (as with butterflies, and also some mammals, such as the male antechinus). However, most animals will go through many reproductive cycles in a lifetime.

Students’ alternative conceptions of animals

Research into students’ ideas about this topic has identified the following non-scientific conceptions:

- Students (and adults) will often associate the category ‘animal’ with mammals only, and not include insects, fish, etcetera.
- Students will tend to think of organisms only interacting with the physical environment and plants, without appreciating the complex interdependence of species.
- Younger students will have a view that animal structures are chosen by animals for adaptive purposes, and could be changed if the environment was altered. Thus, a snow leopard actively decides to be white as a camouflage strategy.
- Students will often view ‘adaptation’ as a short-term individual response, like suntanning over summer, rather than in terms of species survival.
- Younger students tend to think of animals as individual rather than focusing on populations or interactions.
- Younger students interpret animal behaviour in psychological terms (the spider is scared, the rabbit likes to live in burrows, the bird protecting its nest is angry), rather than seeing it as adaptive.
- Students will not appreciate that life-cycle diagrams are simplistic models that take no account of numbers of offspring and mortality, ongoing life of an adult animal, adaptive aspects of seasonal timing, etcetera.

Activities

Working with ‘mini beasts’

‘Mini beast’ is not a scientific classification but is a term common in primary schools in particular to describe small animals: insects, spiders, garden snails and slugs, crickets, slaters, centipedes and millipedes, and small pond creatures.

Studying mini beasts can be productive because of their variety in structures, their simple behaviour patterns compared with mammals, and the possibility of keeping them without too much trouble in the classroom.

A nature ramble or scavenger hunt can often generate a variety of classroom activities.

A variety of ideas can be found in Gould League publications involving trails and trailing.

Divergent questioning strategies

The teacher’s skill in asking open-ended or divergent questions is fundamental to the development of curiosity and willingness to generate and evaluate ideas.

Open-ended questions can be used to:

- encourage several answers or possibilities
- stimulate exploration of concepts and ideas
- facilitate creative and critical thinking processes
- promote open mindedness
- consciously value individual differences
- provide challenge for all students.

In direct contrast, closed questions usually have a single or predetermined answer, and often centre on factual, literal levels requiring little thought from the child. The closed question is a tool by which teachers control or dominate the outcome.

With a little thought we can change closed questions to open-ended questions so that students cannot simply respond with a single word, or ‘yes’ or ‘no’ answer.

Examples of open-ended questions

The following question types, illustrated by insect questions, have been found very useful as guidelines to help teachers ask different kinds of divergent questions and help students think creatively and critically in different ways.

Questions about insects

Quantity questions

- List all the different insects you can think of.
- How many different ways do insects survive in the ‘big wide world’?

Change questions

- How would things change if all bees laid eggs, instead of only the queen?

Prediction questions

- Just suppose the killer bee from South America invaded Australia. What are all the things that might happen?
- Just suppose all insects were wiped out because of the excessive use of insecticide. What would all the consequences be?

Point-of-view questions

- Flies are considered pests by humans. Provide a point of view that justifies 'your' existence as a fly.
- Tell the story of your life from the point of view of an insect.

Personal-involvement questions

- You are a beetle that has been caught by a human and put in a matchbox. What will you do?
- You are a caterpillar about to turn into a butterfly. Tell how you feel and all the things you want to do.

Comparative-association questions

- Compare the stages in a butterfly's life to those in a human life.
- Compare the ant community with the human community. In what ways are they alike? In what ways are they different?

Valuing questions

- Which insect do you believe has the greater right to life on Earth—a bee or a butterfly? Look at what each contributes and give reasons for your decision.

ACTIVITY: COLLECTING AND STUDYING MINI BEASTS

Key ideas: Particular animals are found in specific places in a habitat. Animals have features that help their survival.

You will need:

- **a magnifying glass**
- **a stereo microscope**
- **a digital camera.**

Go on a nature ramble and locate two or three interesting 'mini beasts' found under something. Take careful note of where each animal was found.

Carefully examine your animals using:

- **your eyes alone**
- **a magnifying glass**
- **a stereo microscope**
- **a digital camera.**

Draw diagrams and make notes about how the animal looks, how it moves, etcetera. Share your findings with other students.

What similarities and differences can you discover between the mini beasts you have found (e.g. insects, spiders, millipedes, slaters, harvestmen, etc.)?

How would each of the features you have identified for your mini beast contribute to its survival?

Construct a dichotomous key that could be used to identify the different mini beasts found by a class.

ACTIVITY: ECOLOGY

Teaching note: Keith Skamp's *Teaching primary science constructively* (2004, Nelson Thomson Learning, Southbank, Vic.) includes a chapter on the ecology of ponds.

You will need:

- **butcher's paper**
- **pens and pencils**
- **information source (e.g. books, the Internet).**

Work in larger groups to construct a representation of a micro-habitat (e.g. a tree, leaf litter, a pond, etc.) and the animals that live there. Include predator–prey relationships involving the animals and the habitat. You could gather information from books, or the Internet, and draw up your representation on butcher's paper.

Construct a key that will be useful to identify what is in your chosen habitat. What sort of drawings and descriptions are best?

Present your habitat to the rest of the class.

ACTIVITY: CHECKING OUT SNAILS

Key ideas: Studying animals requires close observation. Snails have specific and reproducible behaviours that are adaptive.

You will need:

- **snails**
- **a magnifying glass**
- **a glass plate.**

Get students to collect a snail from home to bring to class (have some around in case they forget!).

Look carefully at the shell. How many colours can you see? How many whorls does your snail's shell have? Is the shell smooth?

Let the snail move along your hand. How does the snail's skin feel? Is it cold/dry/moist? Can you find the mouth? The eyes? How many holes are under the shell?

Look carefully at the tentacles. How does the snail use them? Do they work together? How are they similar? How are they different?

Put a snail on a plate of glass. Lift the glass up and watch how the snail moves from underneath. How do you think the snail moves?

Look at the glass. Can you see where the snail has been? How long is the foot of the snail? Does it change as the snail moves?

ACTIVITY: DRAWING SNAILS

Key idea: Students' observation of details in animal structure.

Choose a snail to focus on. Draw it carefully, including the patterns on the shell. Put the snails in a box overnight. In the morning, find your snail using the drawing as identification.

ACTIVITY: SNAIL SURFACE PREFERENCE

Key idea: Animals have habitat preferences that are adaptive. We study animal behaviour by setting up clear choices for the animal.

You will need:

- **a cardboard box with lid**
- **different materials (e.g. hessian and sandpaper)**
- **scissors**
- **glue.**

Which surfaces do snails prefer? How can we find out?

Line a cardboard box with two types of surface (e.g. hessian and sandpaper). Put the snails in and leave for some time.

Open the lid—which surface did snails prefer? How can you tell? How can you get a measure of this preference?

If the surfaces differ in both texture and colour, how do you know whether the snail preference was for the colour, or texture? How could you find out?

ACTIVITY: SNAIL HUNT

Key idea: A particular animal will be found in habitats with similar characteristics.

List the places at school where you think snails live. Now go and check … But don't bring any back with you.

Display your results in a number of ways, for instance:

- **on a map**
- **as a list of places**
- **in a table, giving numbers in each type of place, for instance 'in amongst plants' and 'underneath wood or rocks or pots', 'in dark places' and 'out in the open', 'in dry places' and 'in moist places'**
- **on a grid for each set of snails, with a tick or a cross against whether the place was dark, moist, had food, etcetera**
- **write a statement saying what you learnt about snails by finding where they live.**

ACTIVITY: INVESTIGATING WEBS

Key idea: Identifying spider behaviour and the nature of webs.

You will need:

- **a digital camera.**

Investigate how strong spider webs are.

Take a camera, a notepad and pencil and go looking for spider webs around the school grounds. This is best done early in the morning as spiders tend to destroy their webs.

Photograph the various different webs that are in the school grounds and write down where they were so that you can check to see if they are in the same place over a period of days.

If a web is unattended you can collect some web material by winding it around a stick to take back to the class. Your group can feel how strong the web material really is.

ACTIVITY: MAKE YOUR OWN WEB

Key idea: Observing closely design in nature.

You will need:

- **coloured cotton thread**
- **assorted colours of paper**
- **paste or spray-on glue**
- **grey lead pencils**
- **a selection of other materials if the students want to make a spider for their web.**

Make your own web using a design from photographs or from real life (you can take photos of webs early in the morning). Work in groups, with each group specialising in a different type of spider.

Decide on the design of the web and sketch it in pencil onto the coloured paper. Coat the coloured thread with paste and lay it on the drawn lines. Continue until the web is completed and let it dry. Now you can add your spider.

ACTIVITY: MAKE A PHOOTER

Key idea: Small creatures are difficult to pick up and need careful handling. Using a phooter can help.

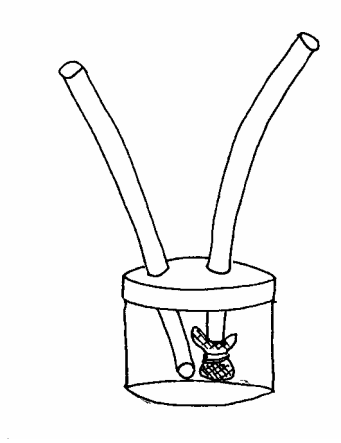
You will need:

- **straws (large are best)**
- **pantyhose or fine gauze**
- **screw-lid containers.**

Cut a strip of pantyhose 3 cm × 14 cm and fold in half lengthwise, then again (four thicknesses). Place folded pantyhose over one end of straw. Push the covered end of the straw into another straw. Check that the stocking is not stretched too much, making mesh holes wider. You can test it on a grain of rice. If it works, tape the straws together.

Now you can test your phooter by placing one end of the straw over an animal and sucking it up. Put your captured animal into the screw-lid container.

FIGURE: PHOOTER



ACTIVITY: SLATER PREFERENCES

Key ideas: Animals have preferences for habitat that relate to their survival. Animal behaviour can be studied by arranging a 'forced choice'.

You will need:

- **at least six slaters**
- **cardboard boxes and cardboard**
- **scissors**
- **sticky tape.**

Where do slaters like to be? One way of answering this question is to set up a habitat and observe where slaters spend most of their time. Another way is to identify what factors might be important, and set up a forced choice for the slaters. Do they prefer dark or light? Do they prefer dry or damp?

Construct different environments inside cardboard boxes. For example, one side is damp and dark while the other side is dry and light. Other boxes may try other combinations. For example, one side is light and damp and the other side is dark and dry. Ensure that the different combinations (dark, light, dry, damp) are represented. Put the slaters in, and allow time for them to settle.

Count how many slaters made each choice.

ACTIVITY: LIFE CYCLE GAME

Key idea: All animals go through a life cycle.

You will need:

- **an A3 sheet of paper**
- **four A3 sheets of thick cardboard**
- **four dice**
- **four counters.**

Make a board game by drawing up forty-two squares on an A3 sheet of paper (fourteen squares across and nine squares down). On random squares, write in something that could happen to the young animal as it goes through its life cycle (e.g. 'Weather is warm. Egg grows quickly. Move forward two spaces.', 'Egg hatches. Rest for one turn.', 'Young cannot find more food, so it dies. Go back 4 spaces.').

On the inside of the board game, leave four blank squares for the students to draw the major aspects of the animal/plant life cycle.

Divide the class into groups of about four. Make a copy of the game for each group and get the group to trace or paste the game onto thick cardboard.

Students can then draw pictures from the life cycle of any plant/animal into the squares in the middle. Each group could do a different insect, for instance.

Give the students a counter each or get them to make one. Each group will need a die.

Now play the game … perhaps think of a prize for the winner of each group.

ACTIVITY: LIFE CYCLE OBSERVATIONS OF MEALWORMS

Key idea: Mealworms have a four-stage life cycle, with the adult in beetle form.

You will need:

- **mealworms**
- **a bottle to keep mealworms in**
- **bran**
- **apple peelings**
- **observation sheet**
- **a tray**
- **pencils and paper for drawing.**

Set up a colony in a bottle of bran, with apple peelings on top to keep moist. Put in a small number of insects, all at the one stage. Prepare an observation sheet as shown in the figure below.

FIGURE: OBSERVATION SHEET

Date	No. of larvae	No. of pupae	No. of adults	Special observations

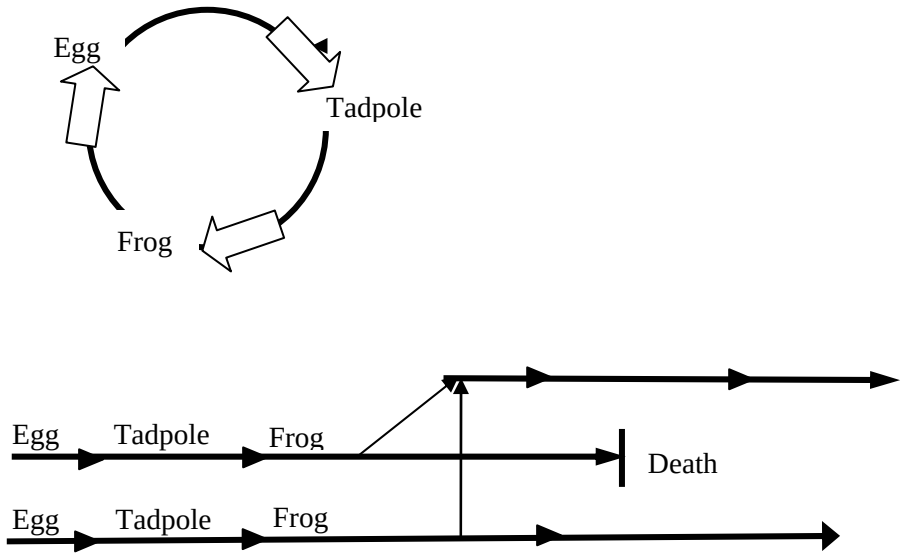
Tip the contents of the bottle onto a tray for census taking, every two days for three weeks. Compare your results with other groups.

Produce large-scale drawings of each of the stages. Write descriptive observations of the mealworms and their behaviour. Write about mealworm movement.

Explanatory note: Different numbers of stages in life cycles:

- One-stage growth: baby similar in form to adult (humans, kittens, etc.)
- Two-stage growth: egg to adult (grasshoppers, spiders, etc.)
- Three-stage growth: egg to nymph to adult (some insects: e.g. dragonfly)
- Four-stage growth: egg to larva to pupa to adult (most insects: e.g. butterfly).

FIGURE: FROG LIFE CYCLE MODELS



ACTIVITY: BEHAVIOUR OF MEALWORMS

Key idea: Mealworms have certain behaviours depending on their environment.

You will need:

- **mealworms**
- **a container with edges**
- **a container with sides**
- **a variety of coloured paper.**

Can you make a mealworm back up? What colours does a mealworm prefer? Do mealworms always find an edge? What happens when you slowly take a 'wall' away? Does the worm follow?

Urban birds

Students enjoy watching wildlife, and particularly birds. Given that they are plentiful around any schoolyard, birds are a wonderful way to explore the natural world.

Key concepts of birds

The activities in this topic are designed to explore the following key concepts:

- Birds have different ways of moving.
- Birds communicate with one another in a variety of ways.
- The shape of a bird's beak is related to how it eats.
- Each sort of bird has a distinct flight pattern.
- Birds eat a variety of foods including seeds, nectar from flowers, and small animals.
- The shape of a bird's feet is related to the way the bird lives.
- Most birds are active only in the daytime.
- Some birds are more active at night than in the daytime.

- The times at which the majority of birds are most active are the hours after sunrise and the hours before sunset.
- Where you see birds depends on the location of suitable food, nesting sites and safety.
- Many birds have characteristic songs.
- Many birds communicate by sound.
- Birds communicate with one another by body movements.
- Birds behave according to patterns.

ACTIVITY: BIRD FEATURES

Key idea: The basis of bird classification.

You will need:

- **a bird identification book.**

Work with a bird identification book or similar. Discuss what features are common to all birds. What is the essential distinguishing feature of birds?

ACTIVITY: WHAT'S SIMILAR? WHAT'S DIFFERENT?

Key ideas: Diversity in animal structures, and behaviour. Observation can be aided by a recording strategy.

You will need:

- **time to observe birds in your local environment**
- **a 'bird profile' chart.**

Spend time observing birds in your local environment. Observe similarities and differences between bird features and bird behaviours. Compare notes with others in your group.

Design a 'bird profile' chart that will enable you to record differences in features, and differences in behaviour.

TABLE: BIRD PROFILE CHART

Movement	Parts	Sounds	Food gathering	Habitat
gliding	tail	whistle	scratching	nest
diving	beak	screech	pecking	tree
soaring	bill	croak	seeds	fork
flapping	claw	twitter	grass	branch
hovering	toe	pitch	insects	hollow
hopping	wing	chirp	fruit	egg
walking	feather	harsh	roots	
swimming		metallic	nectar	
paddling		loud		
wading		musical		
swift		soft		
deliberate		raucous		

ACTIVITY: LISTENING POST

Establish a 'listening post' and develop a classification system for bird calls. The figure *Listening post worksheet* provides a possible layout.

Principle

Birds, like humans, are vocal, social and territorial creatures and soon reveal their presence in an area by call note or song. Birds will only allow non-competitors in a feeding or shelter area, and therefore, tend to move in particular zones. This activity will give you an estimate of the numbers and diversity of bird species using a habitat and a measure of their activity.

Method

Select a suitable spot and seat yourself, making use of whatever cover is available. Keep as close to ground level as possible. Avoid sudden movements. Note and record, using the table below, all calls audible for a period of five minutes. For one minute after you finish recording, try attracting some birds to you by making buzzing and sucking noises with your teeth and lips. Imitating a call will also bring birds to you.

If you are unable to identify the calls, list them under the headings below and check these in your Gould League Field Guide.

Make a tape recording of your five-minute stay and analyse the findings at a later date. This is an excellent test of your perception.

FIGURE: LISTENING POST WORKSHEET

Call Type	1	2	3	4	5	Call Type	1	2	3	4	5
piping/whistle						screech					
sweet song						cough/bark					
chatter/click						hoot/clang					
seedy/buzz						laugh					
trill/warble						grunt/moan					
up-call						monotonous					
down-call						carolling					
squeak/chirp						bell-like					
loud						high pitch					
soft						low pitch					
raucous						mournful					

ACTIVITY: TERRITORIAL BEHAVIOUR

Key idea: Animal behaviour serves a survival purpose.

You will need:

- **time to observe birds in your local environment.**

Observe birds around the school grounds and in the local environment. What sort of territorial behaviour do different species of birds display? Are the same birds seen in a particular tree, or wider area, regularly? Under what circumstances does aggression occur between birds?

ACTIVITY: EXPLORING FEATHERS

Key idea: Diversity in animal structures.

You will need:

- **a variety of feathers**
- **pens and paper to draw a classification scheme.**

Collect, as a class, a variety of feathers. Develop a classification scheme for feathers.

ACTIVITY: FEATHERS AND OIL

Key idea: Environmental degradation can disrupt animal life.

You will need

- **oil (motor or cooking)**
- **a plastic dish**
- **water**
- **bird's feathers.**

Half fill the dish with water. Add drops of oil until a greasy film can be seen on the surface. What can you see is happening to the oil?

Immerse the feather in the oily water and stir it around. Remove the feather and observe it carefully. What effect do you think oil may have on birds?

Add detergent to the oily water. Re-immerse the feather and stir it around. What can you notice? (Note: the detergent itself can be harmful to life.)

ACTIVITY: COUNT BIRDS ALONG A PATH

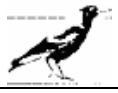
Principle

The number and kinds of birds in an area is an excellent indicator of habitat quality. The diversity or lack of diversity within an urban school ground can be established by counting the number and kinds of birds along a trail. By repeating the count at several different times, daily or seasonal patterns may be revealed or there may be indication of permanent changes over a period of time.

Method

Walk around the boundary of the school ground and look for birds. Use the table below to record the kinds and numbers of birds that you see. Repeat your bird observations and counts at different times of the day, at daily, weekly or monthly intervals, or along a similar path at different locations.

Gould League Urban Bird Stickers or books may help you to identify the birds. Binoculars will help identification of birds that you cannot get close to.

		Count number									
Birds		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Magpie											
House Sparrow											
Raven											
Blackbird											
Spotted Dove											
Domestic Pigeon											
Starling											
Indian Myna											
Welcome Sparrow											
Goldfinch											
Silver Gull											
Nankeen Kestrel