Science: Life and living

Catalogue of digital curriculum resources
# Contents

**Introduction**  
**Learning objects**

- Garden detective series (Years P–2)  
- Food chains series (Years P–2)  
- Animal search series (Years 1–2)  
- Animal search series [ESL] (Years 1–2)  
- Food chains: assessment series (Years 3–4)  
- Human body series (Years 3–4)  
- Plant life series (Years 3–4)  
- Surviving in a habitat series (Years 3–4)  
- Human impact series (Years 3–4)  
- Animal search: assessment series (Years 3–5)  
- Frog pond habitat series (Years 3–9)  
- Create a creature series (Years 5–6)  
- Eyeball challenge series (Years 5–8)  
- Bacteria zoo series (Years 5–8)  
- Dugong dilemma: assessment (Years 7–9)  
- Genes series (Years 9–10)  
- Genes: assessment series (Years 10–11)

**Content from other sources**

- Life cycles series (Years P–4)  
- Animal groups series (Years P–4)  
- The place that's right for me (Years P–4)  
- Body systems (Years 3–4)  
- Body parts series (Years 5–7)  
- Aches and pains series (Years 5–7)  
- Rainforest life series (Years 5–8)  
- Feral peril (Years 5–8)  
- The transport system in a plant (Years 5–8)  
- Microscopes (Years 5–8)  
- Ecosystem balance (Years 5–10)  
- Eco series (Years 6–10)  
- Osmosis in potatoes (Years 7–8)  
- Effects of light intensity on photosynthesis (Years 7–8)  
- EagleCat: plants (Years 8–10)  
- EagleCat: cell division (Years 10–12)  
- Evolution series (Years 11–12)  
- Genetics series (Years 11–12)  
- Microevolution series (Years 11–12)  
- Photosynthesis (Years 11–12)  
- Diffusion (Years 11–12)  
- Osmosis (Years 11–12)  
- Cell division (Years 11–12)  
- Homeostasis (Years 11–12)  
- Drug dosage (Years 11–12)  
- Greenhouse (Years 11–12)  
- Germination (Years 11–12)  
- Food chain (Years 11–12)

**Digital resources**

- Australian Children’s Television Foundation  
- Australian Museum  
- australianscreen online  
- CSIRO  
- Getty Images  
- Museum of New Zealand Te Papa Tongarewa  
- Museum Victoria
National Archives of Australia 61
The National Film and Sound Archive 62
National Library of Australia 63
Powerhouse Museum 65
State Library of Queensland 66

Themes 67
Creature features (Years 5–6) 67
Introduction
This catalogue contains details about the *Science: Life and living* digital curriculum resources made available by The Learning Federation (TLF) to all schools in Australia and New Zealand. The content supports and enhances students' understanding of key scientific concepts in a range of contexts for the P–12 years.

The resources include:
- hundreds of interactive learning and assessment objects
- a large and diverse range of digitised items such as images, film clips, maps, songs, posters and documents, all with detailed teachers' notes.

Learning and assessment objects
The learning and assessment objects are based on current research findings in Science education and pedagogy. The objects foster skills, such as scientific inquiry, data interpretation, analysis and synthesis that are transferable to daily life and to offline learning opportunities.

The objects promote scientific literacy and are organised around scientific concepts with real-life applications for students. They contain open-ended investigative tasks, tools, activities and processes that enable students to engage in 'real' science experiences and to construct and test their own scientific understandings.

Many of the objects also provide meaningful models, simulations and demonstrations of scientific concepts and practices. These objects provide teachers and students with experiences that are not universally available because, for example, they require expensive equipment or occur over extended periods of time.

Other objects are short activities that allow students to explore and practise a range of scientific concepts and skills.

Learning objects are generally published in series and some are also aggregated into single, larger learning objects. Aggregated learning objects are identified with the 🎥 symbol.

An asterisk (*) on the series title indicates that not all the learning objects in that series have been released. The remaining learning objects will be released progressively.

Some learning objects contain non-TLF content. See the acknowledgements and conditions of use in the learning objects for details.

Digital resources
A remarkable range of digitised items licensed from leading Australian and New Zealand cultural and scientific institutions is also available. These items include:

- clips from documentaries, newsreels, television programs and feature films
- photographs, line drawings, maps and documents
- audio files of interviews, broadcasts and speeches.

With each item, TLF supplies an Educational value statement comprising a description and contextual information that enriches the value of the asset for the teacher.

This catalogue contains a representative sample of digital resources licensed from TLF's partner institutions useful for the Science: Life and living strand.

Themes
This catalogue also includes examples of how teachers can draw on the extensive range of content to create thematic collections to challenge and engage students.
Other catalogues
You can download catalogues for each of the Science strands at: www.ndlrn.edu.au

A comprehensive Index of Science digital curriculum resources is also available for download.

Accessing and viewing the content
Government and non-government education authorities in each Australian state and territory and in New Zealand have responsibility for facilitating access to the pool of digital content. Full details about how to access the content, including the necessary technical and software requirements for viewing it, can be found at:

www.ndlrn.edu.au
Learning objects

Garden detective series (Years P–2)

Students explore and classify many small living creatures found in Australian and New Zealand gardens.

Features include:

- a print option, which allows students to keep a record of their collections with the accompanying information about each animal
- an object for English as a Second Language learners. It features modified language, a glossary of words used and audio support for instructional and feedback text.

Students:

- examine an Australian or New Zealand garden with a magnifying glass looking for different creatures.

Garden detective: explore a New Zealand garden
L1182 – Years P–2

Students examine the garden with the magnifying glass looking for different creatures. Once found, a description of the creature with some of its distinguishing characteristics is displayed. Students can then choose whether to include the creature in their collection or to move on to look for others.

Garden detective: group New Zealand animals
L1183 – Years P–2

Students use the magnifying glass to find New Zealand creatures in the garden. Students are challenged to find groups of animals with like characteristics. For example, three creatures with wings.

Garden detective: New Zealand garden
L1181 – Years P–2 🌿

This is an aggregated learning object combining the two other New Zealand garden learning objects in a sequence.

Garden detective: explore an Australian garden
L1118 – Years P–2

Students examine the Australian garden with the magnifying glass looking for different creatures. Once found, a description of the creature with some of its distinguishing characteristics is displayed. Students can then choose whether to include the creature in their collection or to move on to look for others.
<table>
<thead>
<tr>
<th>Learning Object</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Garden detective: group Australian animals</strong> L1119 – Years P–2</td>
<td>Students use the magnifying glass to find Australian creatures in the garden. In this learning object students are challenged to find groups of animals with like characteristics, for example, three creatures with wings.</td>
</tr>
<tr>
<td><strong>Garden detective: Australian garden</strong> L699 – Years P–2</td>
<td>This is an aggregated learning object combining the two other Australian garden learning objects in a sequence.</td>
</tr>
<tr>
<td><strong>Garden detective: Australian garden [ESL]</strong> L6782 – Years P–2</td>
<td>This is an aggregated learning object combining the two other Australian garden learning objects in a sequence. Also includes a word and sound game that highlights the names of creatures used.</td>
</tr>
</tbody>
</table>
**Food chains series (Years P–2)**

Students explore how plants and animals get the energy to live. Students are able to create simple food chains that show the flow of energy from the sun to plants and on to animals.

**Features include:**
- diagrams showing selected food chains within various environments
- geometric shapes as visual cues to help students classify living things as plants, herbivores, omnivores or carnivores
- audio support and three levels of difficulty
- feedback and scaffolding of the learning tasks (not text dependent).

**Students:**
- classify living things as producers (plants), primary consumers and secondary consumers (herbivores, carnivores or omnivores)
- construct simple food chains
- identify the Sun as an energy source at the start of all food chains
- identify plants as direct converters of energy from the Sun into a form that can be consumed by other living things
- explore the flow of energy from the Sun to plants and on to other living things.

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**Food chains: what is a food chain?**

L1147 – Years P–2

This is a simple animation that introduces students to the concept of a food chain. It can stand alone as a resource, but is also packaged as an introduction to the other objects in this series.

**Food chains: the town**

L894 – Years P–2

Students create simple food chains starting with the energy from the Sun, and then incorporate plants and animals typically found in a city park. Each of the food chains the students create is recorded as a clear, simple graphic representation.

**Food chains: the desert**

L1143 – Years P–2

Students create simple food chains starting with the energy from the Sun, and then incorporate plants and animals typically found in a desert. Each of the food chains the students create is recorded as a clear, simple graphic representation.
<table>
<thead>
<tr>
<th>Title</th>
<th>Code</th>
<th>Years</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food chains: the wetlands</td>
<td>L1144</td>
<td>P–2</td>
<td>Students create simple food chains starting with the energy from the Sun, and then incorporate plants and animals typically found in a wetlands environment. Each of the food chains the students create is recorded as a clear, simple graphic representation.</td>
</tr>
<tr>
<td>Food chains: the farm</td>
<td>L1145</td>
<td>P–2</td>
<td>Students create simple food chains starting with the energy from the Sun, and then incorporate plants and animals typically found on a farm. Each of the food chains the students create is recorded as a clear, simple graphic representation.</td>
</tr>
<tr>
<td>Food chains: the forest</td>
<td>L1146</td>
<td>P–2</td>
<td>Students create their own simple food chain with the energy from the sun, and then incorporate plants and animals typically found in a forest. Each of the food chains the student creates is recorded as a clear, simple graphic representation.</td>
</tr>
</tbody>
</table>
Animal search series (Years 1–2)

Students analyse the physical features of a group of animals and use that information to classify the animals as fish, amphibian, reptile or mammal.

Features include:
- an introduction to the features that are common to classes of vertebrates
- questions that help students to distinguish a class of vertebrates from other animals
- features to enable students to group animals according to their physical features
- audio support to assist pre-readers
- clear visual feedback.

Students:
- identify a set of physical features common to a class of vertebrates
- choose questions that help to distinguish a class of vertebrates from other animals
- analyse the physical features of a group of animals and use that information to distinguish which is a given type of vertebrate: fish, amphibian, reptile or mammal.

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**Animal search: is it a mammal?**  
L766 – Years 1–2

Students classify mammals based on a feature such as the ability to make milk to feed its young.

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**Animal search: is it a reptile?**  
L1135 – Years 1–2

Students determine which animals are reptiles, looking at features such as whether the animal has tough, dry skin and is covered in scales.

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**Animal search: is it an amphibian?**  
L1136 – Years 1–2

Students determine which animals are amphibians. Includes animals such as an eel. Students look for features such as whether the animal lays eggs when it is an adult.

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**Animal search: is it a fish?**  
L1137 – Years 1–2

Students determine which animals are fish. Includes animals such as a jellyfish. Students look for features such as whether the animal breathes with gills.
Animal search series [ESL] (Years 1–2)
Students compare the physical characteristics of a range of animals and identify which is a mammal, fish, reptile or amphibian.

Features include:
- audio support for all instructional and feedback text
- an audio-supported glossary of words used in the learning object
- two 'match the pair' card games that reinforce the names of creatures.

Students:
- analyse the physical features of a group of animals and use that information to distinguish which is a mammal, fish, reptile or amphibian
- choose questions that help to distinguish types of animals
- sort animals into groups based on their physical features.

Animal search: is it a mammal? [ESL]
L8551 – Years 1–2
Students sort animals into groups based on their physical features to identify a mammal.

Animal search: is it a fish? [ESL]
L8554 – Years 1–2
Students classify animals based on their physical features to identify a fish.

Animal search: is it a reptile? [ESL]
L8552 – Years 1–2
Students sort animals into groups based on their physical features to identify which is a reptile.
Students sort animals into groups based on their physical features to identify which is an amphibian.

**Food chains: assessment series (Years 3–4)**

Students demonstrate their understanding of food chains in a habitat. They select living things to complete elements of a food chain.

**Features include:**
- initial scaffolded feedback and geometric shapes as cues to help students classify living things as plants, herbivores, omnivores or carnivores
- a gradual increase in difficulty
- diagrams showing selected food chains within an environment
- a printable report of the student's performance.

**Students:**
- classify living things as producers (plants) and consumers (herbivores, carnivores, omnivores)
- identify plants as direct converters of energy from the Sun into a form (food) that can be consumed by other living things
- describe the flow of energy along food chains from producers to consumer
- construct simple food chains by selecting elements from a number of options to form several possible pathways.

Assesses student understanding of food chains in a wetland habitat through food chain construction, multiple-choice questions and an open-ended question requiring a free text response.

Students demonstrate their understanding of food chains in a desert habitat. They select living things to complete three elements of a food chain. For example, they select native grasses with seeds as a plant that provides food to a bilby, which becomes food for an eagle.
Food chains: forest: assessment
L9954 – Years 3–4

Students demonstrate their understanding of food chains in a forest habitat. They select living things to complete three elements of a food chain. For example, they select grass with seeds that provides food to a bandicoot, which becomes food for a dingo.

Human body series (Years 3–4)

Students explore the structure and function of features of the human body through simulation, animation and interactivity.

Features include:
• the option to look up further information and answer questions.

Students:
• relate structural features of the human body to their functions
• predict the functional effects of changes to the human body.

Take a deep breath
L21 – Years 3–4

Students visit a virtual lab where a girl is exercising, and learn about the circulatory and respiratory systems.

Superhuman
L22 – Years 3–4

Students change a human skeleton so that it exhibits the characteristics of other animals; they explore the interrelatedness of body structures. The learning object includes a printable worksheet for designing customised ‘superhumans’.

In digestion
L1 – Years 3–4

Students interactively follow the passage of a range of food through the human body and learn about the major digestive processes.
Fish out of water
L23 – Years 3–4

Students select from a choice of three animals (a human, a frog or a fish) to test how each breathes and whether it can survive on land or in water.
Plant life series (Years 3–4)

Students explore the structure and function of flowering plants.

Features include:
- the option to look up further information and answer questions.

Students:
- relate the structure of plant parts to their functions
- identify requirements for plant growth, reproduction, seed dispersal, uptake of nutrients and elimination of wastes.

What on Earth?
L30 – Years 3–4

Students explore the structure and function of plants through the animation of an alien who is in charge of testing living things on the planet Earth. They explore the needs of a plant (water flow, nutrients, carbon dioxide and the Sun) and the parts of a plant (flower, petals, leaves, seeds, stem, roots, and water and food tubes).

Plant scan
L31 – Years 3–4

Students undertake a quiz on plant parts and functions. They label features of plants and match the correct function with plant parts.
Surviving in a habitat series (Years 3–4)

Students explore different habitats to understand why particular plants and animals live there.

Features include:
- the option to look up further information and answer questions.

Students:
- investigate the relationships between living things and their dependence on non-living things
- identify methods for protecting living and non-living things
- observe differences between living things that suit those living things to particular environments
- investigate animals’ requirements for survival, including growth, reproduction, breathing, shelter, intake of water and nutrients.

Who lives here?
L24 – Years 3–4

Students explore a north-eastern Australian rainforest habitat for visual and sound clues about the animals that live there. They write a survey report, including observations and conclusions, and can check if their predictions are correct.

Who’s for dinner?
L25 – Years 3–4

Students examine a food chain and food web from a billabong habitat. Then, in game format, they play the role of a tadpole, a fish or a heron. The aim is to find enough food to eat and avoid predators so their animal can grow and breed.

Platypus life cycle
L28 – Years 3–4

Students choose their own adventure-style exploration of the life cycle of a platypus. They visit a platypus habitat and make choices to help the survival of the platypuses and their babies.

Alien life form
L29 – Years 3–4

Students design a plant, choosing different combinations of leaves, seeds and roots, so that it will survive in a specific environment (mangroves, cool rainforest, mountain slopes or arid land). They check results and receive feedback on selecting the plant features to suit the environment.

*"Surviving in a habitatland* and *Who lives here* contain non-TLF content. See Acknowledgements in the learning object.
Human impact series (Years 3–4)

Students explore the human influence on the environment.

Features include:
- the option to look up further information and answer questions.

Students:
- identify methods for reducing human impact on the environment
- investigate relationships between living things and their dependence on non-living things
- explore processes for preventing and rectifying environmental damage.

Old Bernie’s story
L26 – Years 3–4

Students interview Old Bernie about a local pond and its environment near where Bernie and his family have lived for generations. Students question Bernie about the ecology of the pond and how things have changed. Bernie replies via video clips.

Old Bernie’s pond
L27 – Years 3–4

Students help to restore Old Bernie’s Pond, which has been polluted and invaded by introduced species, to its original state. Students choose possible solutions for restoring the pond, check the ecological outcomes of the restoration choices, and try other options until the pond is healthy. They earn a Pond Restorer certificate.

Why recycle?
L32 – Years 3–4

Students meet a group of children finishing their lunch at school. Each school child chooses to dispose of their plastic lunch bag in a different way. Students predict where the bags might end up and the possible environmental consequences. They learn about the durability of plastics and the environmental benefits of recycling.

Earth alert
L33 – Years 3–4

Students tune in to an environmental news program called ‘Earth alert’. They solve four ecological problems involving pest animals or human activities: domestic cats, European wasps, sea stars, and native animals killed by careless drivers. The learning object includes suggestions for exploring solutions to an environmental problem in the students’ local area.
Animal search: assessment series (Years 3–5)
Students demonstrate their understanding of the physical features of animal groups.

Features include:
- assessment of students' understanding of features that are common to groups of animals
- questions that help distinguish between animal groups (eg does it have a backbone?)
- a printed report summarising student input and providing feedback on student performance.

Students:
- identify a set of physical features common to each group
- analyse and compare the physical features of a group of animals and use that information to distinguish which belongs in which group
- recognise that some features are shared by different animal types, and other features are specific to one type.

Animal classification: assessment
L9179 – Years 4–5
Students demonstrate their understanding of animal groups based on physical features. They create a Venn diagram to compare two animal groups. For example, they show that having a backbone is common to both mammals and fish.

Animal classification: assessment: teacher guide
R9718

Animal search: is it a mammal: assessment
L9176 – Years 3–4
Students are assessed on their understanding of features that are common to mammals.

Animal search: is it a mammal: assessment: teacher guide
R10900

Animal search: is it a reptile: assessment
L9177 – Years 3–4
Students are assessed on their understanding of features that are common to reptiles.

Animal search: is it a reptile: assessment: teacher guide
R10901

Animal search: is it an amphibian: assessment
L9178 – Years 3–4
Students are assessed on their understanding of features that are common to amphibians.

Animal search: is it an amphibian: assessment: teacher guide
R10902
Frog pond habitat series (Years 3–9)

Students investigate, gather, synthesise and evaluate data in virtual wetland environments.

Features include:
- an interactive notebook for students to record their observations about each habitat
- models of appropriate specimen collection practices which do not damage a study area
- detailed descriptions and photo or video images for each species featured
- a printable report builder which allows students to select relevant data and compile their report.

Students:
- investigate wetland habitats and sub-habitats within a pond environment and identify the features of each which make them suitable for animal life
- evaluate methods of collecting specimens from a study area according to their impact on the animal and the study area
- investigate how different animal species in a pond habitat might meet their needs for food, water, shelter or protection
- model relationships between a frog species and other organisms in a wetland environment
- identify possible causes for the decline of a frog population.

Environmental field project: frog pond habitat
L419 – Years 3–6

In this virtual field trip students explore four sub environments of a pond environment (the pond, a grassy bank, a rocky bank, trees and shrubs). They gather data using appropriate sampling tools (magnifying glass, camera, net, fish trap, hand, and bucket) and record their observations in an interactive notebook.

Environmental evaluation project: frog pond habitat
L418 – Years 5–9

Based on a real habitat, this learning object aims to immerse the students in a virtual investigation of the likely causes of decline in a frog population. Students test, analyse and synthesise a range of ecological graphic and statistical data to investigate their hypothesis as to the most likely cause of the decline of the green-and-gold bell frog.

This series contains non-TLF content. See Acknowledgements in the learning objects.
Create a creature series (Years 5–6)

Students explore the different body parts of a large number of creatures, such as wolf spider, cricket, scorpion and dragonfly, in an innovative way. Students examine the impact these body parts have on both the attributes and habitat of the creature.

Features include:
- a palette of body parts for students to select when building their own creature
- a match-a-creature tool to enable students to identify specific creatures
- an option to print students' created creatures

Students:
- explore the basic features of animals by designing small invertebrates using different body parts
- analyse the needs of a small invertebrate and relate them to body structure and function.

Create a creature: my creature
L1123 – Years 5–6

Students explore descriptions of the features of small creatures, including the body parts and uses for these body parts. They then use the palette of body parts to create their own creature in the Work area. Students are asked to describe the name, habitat, food requirements and size of the creature they have created.

Create a creature: match a creature
L1124 – Years 5–6

Students discover the identity of a creature displayed in the Work area by matching each of its body parts with corresponding elements from the palette of body parts and by reading the descriptions. As each body part is matched, its attributes are listed to aid identification of the creature. When all body parts have been correctly matched, they are asked a series of questions about the anatomy of the creature to help identify it.

Create a creature: find a home
L1125 – Years 5–6

Students must place a creature within its most appropriate habitat. Students discover the identity of a creature by matching each of the body parts with corresponding elements from the palette.

Create a creature
L755 – Years 5–6

This is an aggregated learning object combining the three other learning objects in a sequence.
**Create a creature: my creature**  
**L1123 – Years 5–6**

Students explore descriptions of the features of small creatures, including the body parts and uses for these body parts. They then use the palette of body parts to create their own creature in the Work area. Students are asked to describe the name, habitat, food requirements and size of the creature they have created.

**Create a creature: match a creature**  
**L1124 – Years 5–6**

Students discover the identity of a creature displayed in the Work area by matching each of its body parts with corresponding elements from the palette of body parts and by reading the descriptions. As each body part is matched, its attributes are listed to aid identification of the creature. When all body parts have been correctly matched, they are asked a series of questions about the anatomy of the creature to help identify it.

**Create a creature: find a home**  
**L1125 – Years 5–6**

Students must place a creature within its most appropriate habitat. Students discover the identity of a creature by matching each of the body parts with corresponding elements from the palette.

**Create a creature**  
**L755 – Years 5–6 🌐**

This is an aggregated learning object combining the three other learning objects in a sequence.
Eyeball challenge series (Years 5–8)

In game-like environments students explore the structure and function of the eyes of a range of animals. They discover how these animals see things in a variety of ways due to the different characteristics of their eyes.

Features include:
- detailed descriptions of characteristics of vision including: field of view, brightness, structure, focus, colours and sharpness.

Students:
- use the Eye facts to investigate the structure and function of the eyes of six different animals: dog, cat, bee, fish, eagle and human
- find their way through an ancient temple by choosing animal eyes best suited to avoiding hazards
- navigate through the temple, solving puzzles as they proceed, to reach the treasure.

Eyeball challenge: eye facts
L442 – Years 5–8

Students explore details of the visual systems of a dog, cat, bee, fish, eagle and human. Includes animations to illustrate the structure and functioning of animal eyes and compares and contrasts the way different animals perceive the same scene.

Eyeball challenge: wall tile puzzle
L443 – Years 5–8

Students choose the best eyes to solve a puzzle with limited colours to unlock a secret chamber.

Eyeball challenge: rock bridge puzzle
L446 – Years 5–8

Students choose eyes with a wide field of vision that can see ultraviolet light to solve a puzzle and unlock a secret chamber.

Eyeball challenge: killer bees puzzle
L447 – Years 5–8

Students choose the eyes that are best at focusing quickly on moving targets to solve the problem and reach the secret chamber.
<table>
<thead>
<tr>
<th>Eyeball challenge: mission 1</th>
<th>L441 – Years 5–8</th>
<th>This is an aggregated learning object combining the killer bees, rock bridge and wall tile puzzles.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyeball challenge: door keys puzzle</td>
<td>L444 – Years 5–8</td>
<td>Students choose the best eyes to solve a puzzle in near darkness and unlock a secret chamber.</td>
</tr>
<tr>
<td>Eyeball challenge: stone wheel puzzle</td>
<td>L445 – Years 5–8</td>
<td>Students choose eyes with good close-up vision to solve a puzzle and unlock a secret chamber.</td>
</tr>
<tr>
<td>Eyeball challenge: slingshot puzzle</td>
<td>L1187 – Years 5–8</td>
<td>Students choose eyes with very good distance vision to solve a puzzle and unlock a secret chamber.</td>
</tr>
<tr>
<td>Eyeball challenge: mission 2</td>
<td>L542 – Years 5–8</td>
<td>This is an aggregated learning object combining the door keys, slingshot and stone wheel puzzles.</td>
</tr>
</tbody>
</table>
Bacteria zoo series (Years 5–8)

Students identify and classify different bacteria according to their structure, function and survival in different environments. They are challenged to appreciate the diversity of bacteria and their importance to humans.

Features include:
- a magnifier tool to examine the bacteria samples
- extensive facts about a range of bacteria.

Students:
- identify and classify different bacteria according to their structure, function and survival in different environments
- appreciate the diversity of bacteria and their importance to humans.

**Bacteria zoo: the zoo**
L529 – Years 5–8

**Bacteria zoo: the zoo [no spoken instructions]**
L530 – Years 5–8

Students are introduced to the concept of finding and categorising bacteria by shape in a lab environment.

**Bacteria zoo: collect new specimens**
L531 – Years 5–8

**Bacteria zoo: collect new specimens [no spoken instructions]**
L532 – Years 5–8

Students explore and categorise bacteria according to their shape, location and type of movement in a rural environment.

**Bacteria zoo: significant species**
L1519 – Years 5–8

Students explore images and facts about a range of bacteria that are interesting, helpful or harmful to humans. They look at bacteria that cause diseases, aid digestion, help crop plants to grow, or break down waste. Large-format, high-quality images of each sample of bacteria, can be printed for classroom use.

**Bacteria zoo**
L527 – Years 5–8 🌷

**Bacteria zoo [no spoken instructions]**
L528 – Years 5–8 🌷

This is an aggregated learning combining ‘Bacteria zoo: the zoo’ and ‘Bacteria zoo: collect new specimens.’

This series contains non-TLF content. See Acknowledgements in the learning objects.
Dugong dilemma: assessment (Years 7–9)

While investigating the decline of dugongs, students are assessed on their ability to test a hypothesis by investigating data and using scientific models.

Features include:
- a printable report capturing student responses to scaffolded questions contained within the resource.

Students:
- interact with a number of available tools to collect relevant data
- select likely hypotheses for a decrease in dugong population
- investigate living things in a coastal marine habitat and use a food web to understand the relationships between different animals.

Dugong dilemma: assessment
L7734 – Years 7–9

Using a population modeller, students investigate impacts due to population change. Students summarise their reasons for their decision on the most likely hypothesis causing dugong decline.

Dugong dilemma: assessment: teacher guide
R9248

*Dugong dilemma: assessment* contains non-TLF content. See Acknowledgements in the learning object.
Genes series (Years 9–10)

Students explore the components of genes and DNA through construction of a DNA double helix and the modelling of DNA replication, protein synthesis and gene splicing.

Features include:
- introduction and modelling of DNA structure and genes, including pairing of nucleotide bases
- introduction and modelling of DNA replication and transcription, protein synthesis, and gene splicing
- structured feedback to user input
- audio help for pronunciation of unfamiliar terms
- end-of-section quizzes to test understanding.

Students:
- locate the structures responsible for genetic coding in organisms
- model the construction of the complementary strands of a DNA molecule by pairing nucleotides
- model DNA replication and the action of helicase and DNA polymerase
- model the transcription process to construct mRNA from DNA
- use the triplet code to model the construction of proteins from mRNA
- model the transplantation of genes from one species to another.

Genes: introduction to genes
L5918 – Years 9–10

Students zoom in on a living plant to see views down to the atomic level and discover how each component consists of smaller parts. Students identify the structures responsible for genetic coding in organisms including cells, cell nuclei, chromosomes, DNA and genes.

Genes: what is DNA?
L5919 – Years 9–10

Students discover what DNA is composed of and model its construction. They discover how the components match up to form the double helix: how to alternate sugar and phosphate molecules to form the 'uprights' of the helix and how to pair the four bases: thymine, adenine, cytosine and guanine to form the 'rungs' of the helix.

Genes: DNA replication
L5920 – Years 9–10

Students model DNA replication and the action of helicase and DNA polymerase. They discover the part played by enzymes in the replication process and select the correct base pairings to complete the DNA double helix, eg pairing adenine with thymine.

Genes: gene splicing
L5922 – Years 9–10

Students model the process of gene splicing to transfer a desired gene to a different organism. This is the
process used in producing insulin needed by people with diabetes. Students select the correct restriction enzyme to cut the insulin gene from a DNA strand. This is then inserted into the DNA of a plasmid.

**Genes: protein synthesis**  
L5921 – Years 9–10

Students build an RNA strand to copy the gene code of the DNA. They then follow the RNA out of the nucleus to the ribosome and use a triplet code to pick the correct sequence of amino acids to build the protein.

**Genes**  
L5917 – Years 9–10

This is an aggregated learning object combining the five other learning objects in the series.

This series contains non-TLF content. See Acknowledgements in the learning objects.
Genes: assessment series (Years 10–11)

Students are assessed on their understanding of cellular components responsible for the transmission of genetic information within an organism.

Features include:
- a series of multiple-choice questions requiring students to provide reasons for their answers
- model answers for students to compare their reasoning against
- a printable report of the student's performance.

Students:
- distinguish between nuclear and cell division for growth and repair (mitosis), and nuclear and cell division for production of sex cells (meiosis) in terms of inputs, outputs and implications
- model replication of DNA
- identify the cellular components responsible for the transmission of genetic information
- identify specified structures in cells and their function in transmitting instructions for new cells.

Cell division and DNA: assessment
L9839 – Years 10–11

Students demonstrate their understanding of nuclear and cell division referring to mitosis and meiosis. They select the correct base pairings to model the DNA replication process.

Introduction to genes: assessment
L9840 – Years 10–11

Students are assessed on their understanding of cellular components responsible for the transmission of genetic information. They order the cellular components responsible for transmission of genetic information relative to each other and the organism as a whole.
Content from other sources

Life cycles series (Years P–4)

Students understand the life cycle of a range of animals and plants.

Features include:
- timeline, graph, calendar or storyboard options to present students' findings.

Students:
- explore the life cycle of a range of animals and plants
- arrange sequences of images into a storyboard
- record developmental data and construct a graph, timeline and calendar.

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Life cycles: birds
L1361 – Years P–4

Students look at the life stages of a blue wren, including eggs hatching and chicks being cared for in the nest. They then make a storyboard about the life cycle of another bird.

Life cycles: butterflies
L1358 – Years P–4

Students look at the life stages of a monarch butterfly, including eggs, caterpillar and pupa. They hatch some insect eggs and take photos over several days then arrange the photos to make a storyboard about the life cycle.

Life cycles: crocodiles
L1359 – Years P–4

Students look at the life stages of a crocodile, including laying eggs and digging babies out of a nest. They are challenged to create the life cycle of a different creature using a flowchart.

Life cycles: flowers
L1360 – Years P–4

Students look at the development of a waratah flower from a tight bud, the bud opening up to a full flower, and finally, the flower wilting. They are challenged to grow some flowers and take daily notes on their development, recording changes in a calendar.
Life cycles: gum trees  
L1363 – Years P–4  
Students look at the growth of a manna gum tree over 200 years. They are challenged to make a timeline or graph of events that occur over a period of time.

Life cycles: whales  
L1364 – Years P–4  
Students look at the growth of a humpback whale over ten years. They see that baby whales are around five metres long when born but their body length triples over time. They then graph the growth of another animal or plant.

Part of a pattern  
L1472 – Years P–4  
This learning object is a combination of six objects in the series.

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**Animal groups series (Years P–4)**

Students explore the characteristics of a range of animals such as a crab, octopus, snake and tortoise or groups of animals such as mammals, reptiles and fish.

**Features include:**
- the option to print information pages on animal characteristics.

**Students:**
- examine the features of animal groups
- group animals into vertebrates and invertebrates.

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**Animal groups: at the zoo 1**  
L1355 – Years P–4

Students identify whether animals are vertebrates or invertebrates.

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**Animal groups: at the zoo 2**  
L1356 – Years P–4

Students explore the various characteristics of a group of animals, such as reproduction.
The place that’s right for me (Years P–4)

Students explore a range of Australian environments and examine the adaptations of the animals to their habitat.

Features include:
- a range of Australian environments to explore: eucalypt forest, hollow log, river bank and desert.

Students:
- explore the needs of native animals and relate them to body structure and function
- explore the basic features of native animals by designing animals using different body parts.

Body systems (Years 3–4)

These are short interactive tasks that allow students to examine the major bones and digestive organs of the human body.

Features include:
- labelling of components as tasks are completed
- questions and answers can be printed for classroom use.

Students:
- identify and assemble major components of a body system
- answer questions about the system.

Bones in our skeletal system

L7574 – Years 3–4

Students add bones one by one to complete a human skeleton.

Organs in our digestive system

L7579 Years 3–4

Students add human organs one by one to complete a digestive system.
Body parts series (Years 5–7)

Students explore the human body and its functions through short activities and quizzes.

Features include:
- labelling activities to test students' knowledge (eg. place body parts onto a diagram of the respiratory system).

Students:
- explore the structure and function of parts of the human body.

**Body parts: blood**
L717 – Years 5–7

Students examine components of human blood: plasma, antibodies, and white and red blood cells. They find out how much blood the body contains, and how blood cells are replaced and what is meant by ‘blood count’ and ‘blood group’.

**Body parts: digestive system**
L719 – Years 5–7

Students explore the structure and function of the human digestive system. They find out how food is moved around, broken down and absorbed, and wastes excreted. They learn what enzymes are and which organs release them.

**Body parts: endocrine system**
L720 – Years 5–7

Students explore the structure and function of the human endocrine system. They learn what hormones are and which glands release them. They find out which glands regulate bodily functions such as energy levels, digestion, calcium, growth and puberty.

**Body parts: hearing**
L721 – Years 5–7

Students explore the structure and function of the human auditory system. They follow sound waves as they travel through a human ear, and how vibrations from the eardrum are translated into electrical messages sent to the brain.
Body parts: heart and circulation  
L722 – Years 5–7  
Students explore the structure and function of the human circulatory system. They find out how the heart pumps blood to the lungs to pick up oxygen, and then through arteries to the rest of the body. They learn what is meant by ‘blood pressure’ and ‘pulse rate’. They listen to a heartbeat and learn how to count their own pulse rate.

Body parts: immune system  
L723 – Years 5–7  
Students explore the structure and function of the human immune system. They investigate how the human body defends itself against bacteria and viruses. They look at defences in the skin and linings of body parts. They learn the importance of the spleen and the lymphatic system and examine antibodies and lymphocytes to see how they work.

Body parts: kidneys and bodily fluids  
L724 – Years 5–7  
Students explore the absorption and circulation of fluids in the human body. They follow a mouthful of water as it moves around inside a person. They find out how water is absorbed, purified and excreted. They learn that two kidneys control the amount of water and blood in the body. See how drinking water helps to keep cells healthy.

Body parts: muscles  
L725 – Years 5–7  
Students explore the structure and function of the human muscular system. They look closely at major muscles in the human body and find out which muscles control functions such as smiling, moving arms and legs, and pumping food through the body.

Body parts: respiratory system  
L726 – Years 5–7  
Students explore the structure and function of the human respiratory system. They follow the journey of air as it is breathed in through human airways to the lungs. They find out how oxygen is absorbed and moved around the body, while carbon dioxide is produced and breathed out. They see how the diaphragm causes the chest to expand during breathing.
### Body parts: skeleton
L727 – Years 5–7

Students explore the structure and function of the human skeletal system. They examine a human skeleton and find out the names of major bones and what is inside bones. They learn how the body repairs broken bones and get tips on what to eat to grow healthy bones.

### Body parts: skin
L728 – Years 5–7

Students explore the structure and function of human skin. They look under the surface of human skin and find out the names for skin layers and major parts within the skin. They learn about fingerprints, nails, skin colour, wrinkles and how the body repairs breaks in the skin. They find out how sweating uses fluids to cool the body.

### Body parts: taste and smell
L729 – Years 5–7

Students identify taste and smell functions of the human tongue, nose and nervous system. They look at how people smell things and taste food. They see how taste buds on the tongue send messages about flavour: sweet, salty, sour and bitter. They find out how smells help to warn us of dangerous gases or bad food.

### Body parts: teeth
L730 – Years 5–7

Students explore the structure and function of human teeth. They look closely at the 32 teeth inside a teenager's mouth and find out the name for each type of tooth, and see what is inside teeth. They get tips for brushing teeth and flossing.

### Body parts: vision
L731 – Years 5–7

Students explore the structure and function of the human visual system. They look closely at parts of a human eye and learn how people see. They learn why we have eyebrows, eyelashes and tear ducts and learn about vision problems such as colour blindness and short-sightedness.

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**Aches and pains series (Years 5–7)**

Students examine a range of health issues and complete short activities and quizzes to test their understanding.

**Features include:**
- multiple-choice questions, match-a-word games and other tasks to test understanding.

**Students:**
- explore the causes of common ailments and injuries
- identify prevention and treatment methods.

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**Aches and pains: acne**  
L732 – Years 5–7

Students explore the structure of sweat glands in human skin, and the causes of pimples. They find out how pimples form through interactions between hormones, sweat glands and bacteria. They learn how the body responds to acne, and how it can be prevented or treated.

**Aches and pains: asthma**  
L733 – Years 5–7

Students explore the structure of human airways, and the causes of breathing difficulties. They learn how the body responds to asthma attacks, and how they can be prevented or treated.

**Aches and pains: breaks and fractures**  
L734 – Years 5–7

Students explore the structure of human bones, and the causes of fractures. They learn how the body repairs broken bones, and how healing can be helped with slings or fibreglass casts. They learn about different types of breaks such as a 'greenstick fracture' and 'stress fracture'.

**Aches and pains: cancer**  
L735 – Years 5–7

Students explore the causes of tumours, and how cancers spread. They learn how the immune system responds to abnormal cells, and how cancer can be prevented or treated. They learn about different types of cancer such as leukaemia and lung cancer.
Aches and pains: colds and flu
L736 – Years 5–7
Students explore the causes of colds and flu, and how viruses spread. They look at how colds affect people over a week or more; two to three weeks for flu. They find out which viruses cause colds and flu, and how people develop immunity and how symptoms can be helped.

Aches and pains: diabetes
L737 – Years 5–7
Students explore the regulation of blood sugar levels in the human body, and the causes of diabetes. They look at how the human body uses insulin to control blood sugar level and find out how people are affected by high or low blood sugar levels. They learn how different types of diabetes can be prevented or treated.

Aches and pains: epilepsy
L738 – Years 5–7
Students explore the causes of fever fits and epilepsy. They learn how some people's brains have sudden bursts of electrical activity. These 'epileptic fits' cause wild muscle movements, which a person cannot control. They find out how epilepsy and 'fever fits' can be treated and learn how to use the 'recovery position' to help a person having a fit.

Aches and pains: headaches
L739 – Years 5–7
Students explore the symptoms and causes of headaches: muscular tension, blood flow and sinus problems. They find out how headaches can be prevented or treated.

Aches and pains: high blood pressure
L740 – Years 5–7
Students explore the flow of blood in the human body, and the causes of hypertension. Students look at health problems caused by high blood pressure and find out how high blood pressure can be prevented or treated. They learn that doctors measure people's blood pressure while the heart is pumping blood and also at rest.
Aches and pains: sore ears
L741 – Years 5–7

Students explore the causes of ear infections and how they can be treated. They look at common causes of sore ears: bacterial infections in the middle ear or outer ear, and learn how ear infections can be prevented or treated.

Aches and pains: stomach pains
L742 – Years 5–7

Students explore common causes of stomach pains: gastroenteritis, constipation, food poisoning and appendicitis. They learn how to deal with mild stomach pains and when to get help from a doctor.

Aches and pains: tonsillitis
L743 – Years 5–7

Students explore the symptoms and causes of tonsillitis. They learn how bacteria can infect the tonsils, causing tonsillitis. They find out how antibiotics can be used to treat tonsillitis and that in severe cases, the tonsils must be removed by a doctor.

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Rainforest life series (Years 5–8)

Students help a scientist carry out field work, identify specimens and explore ecological interactions in a rainforest environment.

Features include:

- worksheets for activities on insect identification, examining plants and animals, and detecting starch.

Students:

- explore the characteristics of a range of rainforest animals and plants including feeding patterns and cell structure.

**Rainforest life: identifying living things**

L3079 – Years 5–8

Students explore the characteristics of a range of rainforest animals and plants. They identify and classify insects.

Students explore photosynthesis in a flowering plant and label the parts of a dicotyledon flower.

**Rainforest life: interaction with living things**

L3080 – Years 5–8

Students explore the feeding patterns of a range of rainforest animals and plants. They build food chains and food webs and classify organisms as producers, first order consumers or second order consumers.

Students measure and record data using a thermometer, hygrometer and rain gauge.

**Rainforest life: looking at cells**

L3081 – Years 5–8

Students examine cell structure and the function of organelles within unicellular organisms. They explore characteristics of protists and compare them with characteristics of animals and plants.

Students compare the operation of microscopes: light, transmission electron microscope and scanning electron microscope.

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Feral peril (Years 5–8)
Students help a scientist carry out field work, identify specimens and explore ecological interactions in a rainforest environment.

Features include:
- multiple-choice questions to test understanding and score points in a game scenario.

Students:
- explore the ecology of introduced species in Australia
- explore the impact of introduced species on native animals and plants.

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The transport system in a plant (Years 5–8)
This is a short interactive task that allows students to examine how water is absorbed and transported through a plant.

Features include:
- questions can be printed for class use.

Students:
- conduct an experiment then observe and record the results
- answer a set of questions related to the experiment they have conducted.
Microscopes (Years 5–8)
These are short interactive tasks that allow students to explore microscopes.

Features include:
• questions to test student understanding
• a labelled image of a microscope.

Students:
• identify and position parts of a light microscope
• relate how to adjust microscope settings to best view images of cells.

Microscopes
L3082 – Years 5–9
Students examine and compare different types of microscopes: a light microscope, transmission electron microscope and scanning electron microscope. They assemble a light microscope and find out how to prepare slides. Worksheets are provided about using microscopes and examining cells and micro-organisms.

What can you see under the microscope?
L7572 – Years 5–6
Students use a microscope to examine and compare slides of four different plant and animal cells: human cheek cells, onion skin, elodea (pond weed) and wheat kernel. They adjust the light, focus and magnification to get the best image.
Supports printing of the conclusion questions for classroom use.

Ecosystem balance (Years 5–10)
In the Ecosystem balance, students explore characteristics and ecology of Tasmanian plants and animals. Students explore the impact of a change in population of a range of species on other animals and plants.

Features include:
• species descriptions of plants and animals.

Students:
• explore characteristics and ecology of Tasmanian plants and animals
• explore population interactions in three Tasmanian ecosystems: a dry forest, rainforest and seaweed community
• compare how population changes of a range of species affect other animals and plants.
Students explore how plants and animals interact in three Tasmanian ecosystems: a dry forest, rainforest and seaweed community. They look at plant and animal species that live there and compare the effects of population increases and decreases on other species within the ecosystem.

**Eco series (Years 6–10)**

Students explore the balance between biodiversity and economic return in primary production. They manage the environment to achieve sustainable production while preserving biodiversity.

**Features include:**
- ecological details on different areas, animal species and habitats
- yearly statistics on economic return and effects on biodiversity
- descriptions of different types of logging and the effects of each on biodiversity and economic return
- information on old-growth and regrowth forests and biodiversity within them
- a report showing the outcomes of the student's decisions.

**Students:**
- distinguish between old-growth and regrowth forests
- connect environmental factors to the survival of animal species
- identify the beneficial roles of natural vegetation and watercourses in maintaining biodiversity.

**Eco forest**

L10764 – Years 6–10

Students take on the role of forest manager. They learn about the biodiversity of the forest and the animals that live there. They choose the best method of sustainably logging the forest to balance the survival of five particular animal species with the need for jobs in the local community.

**Eco farm**

L10765 – Years 6–10

Students take on the role of farm manager. They learn about the different habitats and communities found on farmland and make decisions about the management of four areas on the farm (cropped and grazed paddocks, woodland remnants and dams and creeks) to increase profits while improving biodiversity.
**Osmosis in potatoes** (Years 7–8)

This is a short digital activity experiment which introduces students to the process of osmosis and its effect on the turgidity (swelling up) of plants.

**Features include:**
- digital vernier callipers to measure length
- test questions with answers that indicate a conclusion.

**Students:**
- predict the effect of osmosis in potatoes placed in pure water compared with those placed in varying concentrations of sugar solutions
- relate the process of osmosis to the turgidity of plant cells.

**Osmosis in potatoes**  
L7571 – Years 7–8

Students place strips of peeled potato into dishes of pure water, 20% sugar solution and 40% sugar solution. In each case they measure the change in length of the peel using a digital vernier calliper. They then work out whether water has flowed into or out of the strips.

This series contains non-TLF content. See Acknowledgements in the learning objects.

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**Effects of light intensity on photosynthesis** (Years 7–8)

This is a short digital activity that enables students to test the effects of light intensity on photosynthesis.

**Features include:**
- an experiment in which the oxygen production of a water plant can be measured as the light intensity is continuously varied
- a graph facility so the data can be viewed in graph form
- test questions with answers that indicate a conclusion
- the option to print the conclusion questions for classroom use.

**Students:**
- relate the effect of increased light intensity on the amount of oxygen produced by a water plant
- explain the relationship between light intensity and the rate of photosynthesis in a water plant.

**Effects of light intensity on photosynthesis**  
L7577 – Years 7–8

Students adjust the light intensity of a torch beaming on a water plant and observe how this affects its oxygen flow. They measure the amount of oxygen produced by the plant at various light intensity rates using an oxygen flow meter. They record their data which can also be viewed in graph form.

This series contains non-TLF content. See Acknowledgements in the learning objects.
EagleCat: plants (Years 8–10)

Students explore the optimum growth conditions for five different Australian plants.

Features include:
- five simulated Australian biomes in which students can test hypotheses about which plants are best adapted for a particular biome
- a mechanism to record experimental data and print it out
- a research challenge idea for students to investigate.

Students:
- manipulate variables of temperature, soil moisture and salinity and observe the effects on plant growth for five different plants
- collect data on plant growth and test hypotheses about which plants are best suited to particular biomes.

EagleCat: cell division (Years 10–12)

Students explore the differences between meiosis and mitosis.

Features include:
- a demonstration of the differences between meiosis and mitosis
- ideas for learning the differences and similarities between the different stages of meiosis and mitosis
- an option to print a still image and accompanying explanation from cell division animations.

Students:
- observe the processes of meiotic and mitotic cell division
- distinguish the main differences between meiosis and mitosis
- identify the different phases of meiosis and mitosis by their correct name
- identify the cellular processes that occur in each phase of meiosis and mitosis.
Evolution series (Years 11–12)

Students explore the effects of mutation and natural or artificial selection over many generations for a population of fictitious bugs.

Features include:
- inheritance of colour occurring according to Mendel's laws and probability
- an exploration guide and set of assessment questions
- an option to copy and print the activity screen.

Students:
- explore the effects of random mutation and natural selection on the evolution of camouflage
- simulate artificial selection to compare with natural selection
- view the genotype, phenotype and fitness of individual insects.

Life science: evolution: mutation and selection
L9000 – Years 11–12

Students adjust the colour of the environment and observe the process of natural selection over many generations as bugs develop camouflage to avoid predation by birds. Mutations occur at random, and probability of capture by birds is determined by the insect's camouflage.

Life science: evolution: natural and artificial selection
L9004 – Years 11–12

Students compare natural and artificial selection in a fictitious population of bugs. They can adjust the colour of the environment. Students can also explore the effect of changing the mutation rate on adaptation and evolution.
Genetics series (Years 11–12)

Students investigate the inheritance of recessive and dominant genes by breeding mice or chickens with known genotypes and examining the resulting phenotype in the offspring.

Features include:

- an exploration guide and set of assessment questions
- an option to copy and print the activity screen.

Students:

- select then breed mice or chickens with known genotypes
- examine the statistics of feather or fur colour every time a pair of mice or chickens is bred
- relate the statistics of fur colour in mice or feather colours in chickens to the inheritance of recessive and dominant genes
- use a Punnett Square to model and predict possible genotypes of the offspring.

Life science: mouse genetics: one trait
L8990 – Years 11–12

Students breed white and black mice and observe the fur colour of the offspring to identify how traits are passed on via dominant and recessive genes.

Life science: mouse genetics: two traits
L8980 – Years 11–12

Students breed mice with known genotypes that exhibit different fur colours (black or white) and different eye colours (red or black) to identify how two traits are passed on via dominant and recessive genes.

Life science: chicken genetics
L8991 – Years 11–12

Students breed red- or white-feathered chickens and observe the feather colours of the offspring to identify how traits are passed on via co-dominant genes.
Microevolution series (Years 11–12)

Students manipulate genotype frequency and fitness levels in a parrot population.

Features include:
- an exploration guide
- five summative multiple-choice assessment questions with printable results and explanations of correct answers per activity
- an option to copy and print the activity screen.

Students:
- investigate how genotype and allele percentages evolve over time.

**Life science: Hardy-Weinberg Equilibrium**
L8996 – Years 11–12

Students set the initial number of three types of parrots in a population and track changes in genotype and allele frequency through several generations. They analyse population data to develop an understanding of the Hardy-Weinberg equilibrium. They determine how initial allele percentages will affect the equilibrium state of the population.

**Life science: microevolution**
L8999 – Years 11–12

Students explore how genotype percentages and fitness levels in a parrot population change over time as a result of predation. Students set fitness levels and genotype percentages for the parrots. They monitor the results via data tables and graphs and identify the conditions that lead to equilibrium, and those which lead to extinction.

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Photosynthesis (Years 11–12)

Students explore the impact of environmental factors on photosynthesis in an aquatic plant.

**Features include:**
- an exploration guide
- data, displayed in table and graphic form
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen.

**Students:**
- manipulate a number of environmental factors to determine their effect on the rate of photosynthesis.

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**Life science: photosynthesis lab**

L8982 – Years 11–12

Students manipulate light intensity, carbon dioxide levels, temperature and the wavelength of light to find out how each affect the rate of photosynthesis. Students identify the ideal conditions for photosynthesis and determine the limiting factors that affect how fast photosynthesis occurs.

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Diffusion (Years 11–12)

Students explore particle diffusion in a room with an adjustable gap.

**Features include:**
- data displayed in both table and graphic form
- an exploration guide
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen.

**Students:**
- investigate the motion of particles as they bounce around from one side of a room to the other through an adjustable gap or partition
- learn about how odours travel and fluids move through gaps, as well as the thermodynamics of gases and statistical probability.

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**Life science: diffusion**

L8986 – Years 11–12

Students can alter the initial number of particles, the mass of the particles and the temperature of the room to see how these variables affect the diffusion process.

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**Osmosis (Years 11–12)**

Students investigate osmosis through a cell membrane.

**Features include:**
- an exploration guide.
- data, displayed in table and graphic form
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen.

**Students:**
- manipulate cell volume and solute concentrations to explore osmosis.

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**Cell division (Years 11–12)**

Students explore the process of cell division through an animated simulation of the cell cycle.

**Features include:**
- an exploration guide
- data displayed in table form
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen.

**Students:**
- observe the six phases of the cell cycle as they occur over time.
Homeostasis (Years 11–12)
Students explore how the body regulates body temperature in real-time.

Features include:
- an exploration guide.
- data, displayed in table and graphic form
- five summative multiple-choice assessment questions with printable results and explanations of correct answers.
- an option to copy and print the activity screen.

Students:
- are challenged to manipulate variables that affect homeostasis in order to maintain a stable internal body temperature as the external temperature changes
- apply variables to a simulated man while he is at rest and during exercise.

Life science: human homeostasis
L8998 – Years 11–12
Students monitor the fatigue, water and sugar levels of a simulated man. Students progressively adjust levels of clothing, exercise, perspiration and body position as well as choose when to replenish water and blood sugar levels.

Drug dosage (Years 11–12)
Students investigate drug dosage by administering different drug prescriptions and monitoring body chemistry.

Features include:
- an exploration guide
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen
- data, displayed in table and graphic form.

Students:
- investigate drug dosage by administering different drug prescriptions and monitoring levels of medication in the body over a period of time.

Life science: drug dosage
L9003 – Years 11–12
Students test four different types of pills. They observe the reaction of the patient and determine the ideal levels of medication. Students analyse data and interpret graphs on drug level in the blood and organs to create and/or revise dosage schedules for different pills.
**Greenhouse (Years 11–12)**

Students use a greenhouse model to examine why the Earth's temperatures are relatively steady.

**Features include:**
- an exploration guide
- data, displayed in table, bar chart and graphic form
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen.

**Students:**
- observe daytime's rising temperature and the falling temperature at night, along with heat flow in and out of the system
- investigate the causes of global warming.

**Life science: greenhouse effect**
L8977 – Years 11–12

Students monitor the Earth's daily energy inflows and outflows. Students can vary the amount of greenhouse gases present in the atmosphere to simulate global warming and investigate the long-term effects.

**Germination (Years 11–12)**

Students explore the impact of environmental factors on germination rates of different seeds.

**Features include:**
- data, displayed in table and graphic form
- an exploration guide
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- an option to copy and print the activity screen.

**Students:**
- manipulate a number of environmental factors to determine their effect on how seeds germinate.

**Life science: seed germination**
L8978 – Years 11–12

Students run a series of experiments for each seed varying the temperature, water and light levels in the germination chamber. Students identify which conditions produce the highest germination rate for each seed type.
Food chain (Years 11–12)

Students explore how changes in the populations of species that are part of a food chain affect an ecosystem.

Features include:
- five summative multiple-choice assessment questions with printable results and explanations of correct answers
- data, displayed in table and graphic form
- an option to copy and print the activity screen.
- an exploration guide.

Students:
- examine an ecosystem consisting of hawks, snakes, rabbits and grass.

Life science: food chain
L8979 – Years 11–12

Students manipulate disease and population numbers in the ecosystem. They examine the resulting effects over time.
Digital resources

Australian Children's Television Foundation

The Australian Children's Television Foundation is committed to developing and producing high-quality, innovative, entertaining and educational television programs for children. TLF has licensed clips from various ACTF productions for inclusion in the national digital curriculum content pool. The productions that the clips are drawn from include: 'I Think ...', 'Kaboodle', 'Lift Off', 'Noah and Saskia', 'Round the Twist' and 'Yolngu Boy'.

'I Think ...'– Beneath the skin

In this animated short, children discuss human similarities and differences, heredity, identity, family resemblance and family connectedness. Hand-drawn animation and sound effects, backed by a slow piano melody, illustrate, reinforce and often expand on the children's comments.

With permission of the Australian Children's Television Foundation, Film Finance Corporation Australia Limited and Heytesbury Pty Ltd. Animation by Maggie Geddes and Neil Robertson.

'Lift Off'– Upwardly mobile frogs

This animated film draws attention to the impact of human activities upon the creatures of the natural world and their environment. The destruction of the frogs' habitat and the pollution of other possible homes for them form the basis of the adventure.

With permission of the Australian Children's Television Foundation, Film Finance Corporation Australia Limited and Heytesbury Pty Ltd. Produced by Mickey Duck Animation Co. Animation by Peter Viska.

'I Think ...'– Cycle of life

This richly animated clip features the unscripted voices of a group of 5- to 9-year-old children discussing the concepts of mortality, of death itself and the cycle of life by referring to their own experiences and the natural world.

With permission of the Australian Children’s Television Foundation, Film Finance Corporation Australia Limited and Heytesbury Pty Ltd. Animation by Julian Wigley.
The Australian Museum has an international reputation in the fields of natural history and research, community programs and exhibitions. The Museum has made some of its natural science and cultural artefacts available in digitised form to TLF for distribution to schools.

**Mating seahorses, 'Hippocampus whitei'**
This image shows the unusual mode of reproduction of seahorses in which the female deposits her eggs into the male's pouch. In White's Seahorse the male fertilises the eggs and then cares for them for about three weeks. The eggs embed into the pouch wall where a placental-like fluid supplies oxygen and removes wastes. At the end of the 'pregnancy' the male gives birth to 100–250 fully formed seahorses of about 1 cm in length, which swim away and take care of themselves.

**Numbats, 'Myrmecobius fasciatus’**
This is a colour image of two juvenile Numbats, one with its long thin red tongue fully extended. The Numbats have red-brown fur with prominent white transverse bars on their lower back and a bushy tail. They have pointed snouts with a dark horizontal stripe that extends from the mouth to the ears. Their body length is about 24cm and their tail measures about 17 cm.

**Sugar Glider, 'Petaurus breviceps’**
This is a colour image of a Sugar Glider, 'Petaurus breviceps', with its gliding membrane extended. The Sugar Glider is one of several volplaning (gliding) possums in Australia. It can glide up to 50 m between trees. It launches itself from a branch and spreads its limbs to expose a membrane that extends from the fifth finger to the ankle. When gliding it steers by using its front and hind legs to alter the position and tension of the membrane while the tail provides balance.
Australian Voices

The Australian Voices project is a collection of recorded interviews commissioned by TLF that relate directly to other sound, still or moving image items in TLF's pool of digital curriculum content. The interviews include first-hand accounts from people in fields such as creative arts, science, medicine, sport and politics. They speak about experiences such as war, natural disasters, working and everyday life.

Refer to the Index of Science digital curriculum content for a complete listing of Australian Voices recordings available for Science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

Mick Ratcliff recalls the Menindee Lakes disaster, 2006

Disaster struck the Menindee Lakes system on 1 May 1962 when the levee bank at the outlet regulator at Lake Cawndilla was breached and the water flow was too strong to block. Ratcliff highlights the problem of water going to waste in a dry inland region of Australia. The volume of water lost in the 1962 incident was enough to supply Broken Hill for a year.
**australiansscreen online**

Created by the Australian Film Commission and now managed by the National Film and Sound Archive, *australiansscreen* online (ASO) is an innovative website with more than 2,000 moving-image clips from Australian feature films, documentaries, newsreels, short films, home movies and animations. As the education partner in this major project, TLF has selected hundreds of clips and provided accompanying teachers’ notes.

Refer to the Index of Science digital curriculum content for a complete list of ASO clips available for Science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

<table>
<thead>
<tr>
<th>TLF ID: Echidna the Survivor, 1995: Echidna birth</th>
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<tbody>
<tr>
<td>R7357</td>
<td></td>
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<td></td>
<td>The clip shows an infant echidna, a puggle, newly hatched from an egg. The female echidna lays a single soft-shelled egg directly into her pouch, and this hatches 10 days later. The tiny, hairless puggle is shown pulling itself up through the pouch to find its mother's milk. The echidna is a monotreme, a type of egg-laying mammal that dates back to prehistoric times. Like birds and some reptiles, monotremes produce their young from eggs that are hatched outside their body but like mammals, they suckle their young.</td>
</tr>
</tbody>
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<thead>
<tr>
<th>TLF ID: Compass – Paws for Thought, 2000: Do animals feel?</th>
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<tbody>
<tr>
<td>R9306</td>
<td></td>
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<td></td>
<td>The clip introduces the subject of whether animals feel emotions. Charles Darwin (1809–82) concluded that animals did have emotions. However, many scientists since his time believe that although animals may behave as though they feel emotions, this is an interpretation based on ascribing human qualities to instinctive behaviours in animals. Dr Gisela Kaplan is shown with birds she is rearing, explaining how birds are able to demonstrate a range of emotions.</td>
</tr>
</tbody>
</table>

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<tr>
<th>TLF ID: Eco House Challenge – Stop Your Gassing, 2007: Two Aussie families</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>R9316</td>
<td></td>
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<tr>
<td></td>
<td>'Eco House Challenge' addresses the issue of global warming, which is caused by human activity that involves burning fossil fuels such as petrol, gas and oil. This clip introduces the Edwards and the Shepherds, two families participating in the challenge to live in an environmentally sustainable way.</td>
</tr>
</tbody>
</table>

Images reproduced courtesy of australiansscreen online.
The Commonwealth Scientific and Industrial Research Organisation (CSIRO) is Australia's national science agency. TLF makes available hundreds of CSIRO's scientific still and moving images in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of digital items available for Science. You can or use the search options in your educational jurisdiction's gateway to TLF to view the content.

**Green-headed ant**
The green-headed worker ant, also known as a metallic pony ant, is typically 4–6 mm long with a metallic green head and black–green thorax and abdomen. It can inflict a painful sting by grabbing the victim's flesh with its mandibles, then bending its abdomen under to inject formic acid into the wound.

**Threats to cassowary survival**
This clip shows a scientist collecting cassowary dung for analysis to gain information about the cassowary population. The survival of the cassowary is crucial for the survival of the rainforest it inhabits. Cassowaries eat fallen fruit whole and, through their droppings, disperse seeds on the rainforest floor over a wide area. Cassowaries are able to safely eat some toxic seeds that would not be dispersed by other animals.

**Spider fangs**
This is a scanning electron micrograph of a pair of spider fangs and, above them, a row of eyes. The horizontal bar at the bottom represents 1 mm.

(Classification – Phylum: Arthropoda, Class: Arachnida, Order: Araneida.)
Getty Images

TLF has licensed hundreds of high-quality images from the extensive Getty Images collection to include in the digital curriculum content pool.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

**First genetically modified primate, 2001**
In 2000 the world's first genetically modified primate, a rhesus monkey, was born. Named ANDi ('iDNA' for 'inserted DNA' spelt backwards) this transgenic monkey was created by scientists at the Oregon Regional Primate Research Center in Portland, Oregon.

**Genetically modified cell**
This image came from investigations into the formation of stress granules within stressed cells, in which a green fluorescent protein tagged proteins within the cell.

**Early stage human embryo**
The embryo seen here has formed after the fertilised egg, or zygote, has divided twice, about 1–2 days following fertilisation. The cells continue undifferentiated division for another few days until definite inner and outer cell masses appear. The inner cell mass becomes the developing embryo and the outer becomes the placenta.
Museum of New Zealand Te Papa Tongarewa

Museum of New Zealand Te Papa Tongarewa’s key tasks are to preserve and present the taonga (treasures) of New Zealand’s peoples and to interpret the country’s heritage for national and international audiences. TLF has licensed many digitised exhibits from the Museum to include in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

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**North Island brown kiwi**

This is a North Island brown kiwi (*Apteryx mantelli*) preserved by taxidermy. A flightless bird, it has brown feathers streaked with a reddish tinge. The long thin bill is ivory in colour with nostrils located at the end. The bird here is a male, about 40 cm high, and would have weighed about 2.2 kg.  

**Kākāpō, preserved by taxidermy in 1992**

This is a kākāpō (*Strigops habroptilus*), the giant nocturnal parrot native to New Zealand. The kākāpō has soft, light-green feathers flecked with black, with pale yellow–green feathers on its underside.  

**Phar Lap’s skeleton**

This is the skeleton of Phar Lap, the famous racehorse. Phar Lap was born in New Zealand, raced mostly in Australia and died in unexplained circumstances in USA in 1932.
Museum Victoria

Museum Victoria is responsible for Victoria’s scientific and cultural collections. TLF has licensed many digitised items from the Museum’s science, Indigenous, history and technology collections for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction’s gateway to TLF to view the content.

### Giant sea spider

**TLF ID:** R6865

This is a preserved specimen of a giant sea spider (‘Dodecalopoda mawsoni’) that has lost its original red colouration and faded to orange due to the preserving liquid. ‘Dodecalopoda mawsoni’ is a deep-sea species, one of only two known species with 12 legs.

Reproduced courtesy of Museum Victoria. Photograph by Mark Norman.

### Leadbeater's possum

**TLF ID:** R6866

The Leadbeater’s possum is a small marsupial first collected in 1867, and named after Victorian taxidermist John Leadbeater. This species was believed extinct as a result of land clearing and fires for much of the 19th century. It has persisted, however, and is listed as endangered by the international conservation organisation IUCN.

Reproduced courtesy of Museum Victoria. Photograph by Michelle McFarlane.

### Thylacine pup

**TLF ID:** R6896

The thylacine was a large carnivorous marsupial, now extinct, with the last known specimen dying in captivity in 1936. This is a preserved underdeveloped thylacine pup (‘Thylacinus cynocephalus’). It is a museum specimen preserved in a glass container.

Reproduced courtesy of Museum Victoria. Photograph by Benjamin Healley.
National Archives of Australia

The vast collection of items in the National Archives of Australia reflects the actions, decisions and interactions of the Australian Government. TLF has licensed hundreds of items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of items available for Science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

### Echidna rolled into a defensive ball, 1965

This is an example of the short-beaked or short-nosed echidna ("Tachyglossus aculeatus"), also known as the spiny anteater, rolled into a defensive ball to protect itself from predators.

From the collection of the National Archives of Australia. Photograph by the Australian News and Information Bureau.

### Section showing the lung structure of the lungfish

This image illustrates various parts of the Australian lungfish. At the time it was named the lungfish or 'ceratodus' was known only in the fossil record and so it was called 'Neoceratodus forsteri' or 'Foster's new ceratodus' by Gerard Krefft, Director of the Australian Museum.

From the collection of the National Archives of Australia.

### Dr Victor Chang's artificial heart valve, 1991

This photograph shows the artificial heart valve pioneered by Dr Victor Chang (1936–91). Artificial heart valves are used to replace damaged heart valves. Four valves control the flow of blood into and out of the heart, each of them permitting the flow of blood in one direction only. A deteriorating heart valve can allow a backflow of blood and cause a heart attack. The valve seen here uses a disc that swivels back and forth to
control the flow of blood.

The National Film and Sound Archive

The National Film and Sound Archive holds more than 1 million audiovisual items dating from the 1890s to the present day. Newsreels, songs, home-movie footage and early silent-era films that document aspects of the Australian experience are represented within the collection. TLF has licensed hundreds of items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

Tasmanian tiger in captivity

This shows the last captive Tasmanian tiger. Following the introduction of sheep into Tasmania, the hunting of thylacines was encouraged by a bounty system from 1830 until 1909. It shows that by the 1930s thylacines had become objects of curiosity.

Child polio victims, 1941 – asset 1

This is from newsreel footage made in 1941. It shows the Austin Hospital in Heidelberg, Victoria, and child polio sufferers in iron lungs. Children partially paralysed by polio are shown in bed painting, using their mouths and feet to hold their paintbrushes.

Camel trains in the north

Camels were used in the Australian outback to transport goods prior to the expansion of road and rail systems. Camel trains were a fast, reliable and economical mode of transport. Camels could go for eight days without water, carry four times more than a horse, travel up to 32 kilometres a day and cross rough ground inaccessible to wagons.
National Library of Australia

As Australia's largest reference library, the National Library of Australia preserves a wide variety of Australian artefacts and national treasures. It holds a comprehensive collection ranging from iconic photographs and prints to sheet music and ephemera. TLF has licensed hundreds of items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

**Consignment of whalebone on the wharf at Eden, early 1900s**
The first shore-based whaling station on mainland Australia was established in Eden. The Davidson Whaling Station operated at Twofold Bay from the 1860s to the late 1920s. This image shows bundles of whalebone ready to be shipped.


**Twofold Bay whaling, early 20th century**
This depicts the type of boat used for generations by the Davidsons, a Twofold Bay whaling family. It was the captain's responsibility to decide when the harpoon would be thrown and to tie off the harpoon rope; from this point, the boat would be at the mercy of the whale until it died.

Powerhouse Museum

Powerhouse Museum holds a unique and diverse collection of more than 385,000 items that span history, science, technology, design, industry, decorative arts, music, transport and space exploration. TLF has licensed hundreds of these items for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

**Forest clear-felling, c1905**
Clear-felling removes all the trees in a particular area to leave it fully cleared. It also removes much of the organic materials from an area, stripping the soil of nutrients and leading to erosion. This image depicts clearing of Australia’s natural environment by European settlers. It shows an extensive forest of large trees that would be difficult to find today.

Reproduced courtesy of Powerhouse Museum. Photograph by Charles Kerry and Co, Sydney

**IVF embryo freezing**
The embryo freezing process in IVF takes about 3 hours. Embryos are first treated with a special solution to protect them during the process, and are then drawn into a specially designed sterile, labelled straw. The straws containing the embryos are placed into a freezing machine, slowly cooled to -35 degrees Celsius, then placed into long-term storage in liquid nitrogen at -196 degrees Celsius.

With permission of Professor C Wood, Monash IVF.
State Library of Queensland

The State Library of Queensland has made available to TLF digitised items from its extensive collection for inclusion in the pool of digital curriculum content.

Refer to the Index of Science digital curriculum content for a complete list of images available for Science. You can use the search options in your educational jurisdiction's gateway to TLF to view the content.

**Humpback whale carcass, Tangalooma Whaling Station, c1957 – item 1 of 2**
This shows a newly killed humpback whale ready for processing at the onshore Tangalooma Whaling Station. All bone, meat and blubber would be cut to fit into the factory digesters, where it would be cooked under steam pressure and the oil collected.

Reproduced courtesy of State Library of Queensland. Photograph by Rosemary Spenceley.

**Humpback whale carcass, Tangalooma Whaling Station, c1957 – item 2 of 2**
The photograph shows the process of flensing – manually stripping blubber from a whale carcass using 1.5-m-long knives. After being killed the whales were inflated, taken back to the onshore Whaling Station and winched onto the flensing deck.

Reproduced courtesy of State Library of Queensland. Photograph by Rosemary Spenceley.
Themes

Creature features (Years 5–6)

This collection of learning objects and CSIRO Entomology images provide opportunities for students in Years 5 and 6 to understand the structure and characteristics of a range of small invertebrates.

In the two interactive learning objects, students use a dynamic tool to match features of given creatures and to construct their own creatures.

The range of scientific images allows students to examine, identify and compare features and attributes of real insects.

Some Australian grasshoppers, cockroaches, a mantid and an earwig

This is a group of colour scientific illustrations of some Australian insects of the Orders Mantodea (mantids), Blattodea (cockroaches), Dermaptera (earwigs) and Orthoptera (grasshoppers and katydids).

Common mud dauber wasp

This is a black-and-white scientific illustration of a common mud dauber wasp ("Sceliphron laetum"). It illustrates a characteristic feature of the winged members of the Order Hymenoptera – two pairs of membranous wings showing relatively few veins, with the forewings longer than the hindwings.

Green tree ant

This is a colour photograph of a green tree ant ("Oecophylla smaragdina") showing its distinctive colouration.
<table>
<thead>
<tr>
<th>Illustration</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Bush fly scientific illustration</td>
<td>This is a black-and-white scientific illustration of a bush fly ('Musca vetustissima') showing body segments, legs and compound eyes.</td>
</tr>
<tr>
<td>Little marbled scorpion</td>
<td>This is a colour photograph of a little marbled scorpion ('Lychas marmoreus') showing the characteristic features of scorpions – scorpions have four pairs of legs and one pair of palps adapted into pincer-like claws.</td>
</tr>
<tr>
<td>Silverfish</td>
<td>This is a colour photograph of an adult silverfish showing its characteristic long antennae and three distinctive tail filaments.</td>
</tr>
<tr>
<td>Bull ant worker</td>
<td>This is a black-and-white scientific illustration of a bull ant worker ('Myrmecia nigriceps') showing characteristics such as the large compound eyes and long straight toothed mandibles.</td>
</tr>
<tr>
<td>Adult cicada</td>
<td>This is a colour photograph of a mounted specimen of a cicada ('Cicadetta'sp.') showing the well-developed wing venation typical of cicadas.</td>
</tr>
<tr>
<td>Animal</td>
<td>Description</td>
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</tr>
<tr>
<td>'Amerila rubripes' moth</td>
<td>This is a colour photograph of a moth ('Amerila rubripes') showing the large, veined wings of a moth of the Order Lepidoptera.</td>
</tr>
<tr>
<td>Praying mantid</td>
<td>This is a colour photograph of a praying mantid in the 'prayerlike' stance for which it is named.</td>
</tr>
</tbody>
</table>

**Create a creature: match a creature**
Students discover the identity of a creature displayed in the work area by matching each of its body parts with corresponding elements from the palette of body parts, and by reading the descriptions. As each body part is matched, its attributes are listed to aid identification of the creature. When all body parts have been correctly matched, they are asked a series of questions about the anatomy of the creature to identify it.

**Create a creature: my creature**
Students explore descriptions of the features of small creatures, including the body parts and uses for these body parts. They then use the palette of body parts to create their own creature in the work area. Students are asked to describe the name, habitat, food requirements and size of the creature they have created. Their creations can be printed.