

Fully aligned  
with the Australian  
Curriculum

# Watch it grow!

## Year 2

### *Biological sciences*



#### **About this unit** Watch it grow

All living things have their own life story, but all species share in the same cycle of growth, change, reproduction and death. Understanding more about the life cycles of various species can help us in many ways. It might help us to protect and preserve endangered species, to manage and control unwanted species like insect pests, or to improve animal husbandry.

The *Watch it grow!* unit is an ideal way to link science with literacy in the classroom. It provides opportunities for students to explore the growth of a range of living things and explore the processes of growth and change, of reproduction and death that apply to all animals. Through hands-on activities and investigations, students compare the growth of living things under different conditions.

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### **Published by the Australian Academy of Science.**

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[www.primaryconnections.org.au](http://www.primaryconnections.org.au)

Typesetter: Sharyn Raggett  
Font: Helvetica Neue, DIN  
Print house: Daniels Printing Craftsmen  
Cover images: Stock.xchng. [www.sxc.hu](http://www.sxc.hu)

ISBN 978 0 85847 692 9

### **Acknowledgments**

The Primary**Connections** – Linking Science with Literacy project is supported by the Australian Government.

Thanks to the trial teachers and students of the trial schools Australia-wide and Fellows of the Australian Academy of Science who contributed to this unit.

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## Foreword

Never has there been a more important time for science in Australia. More than ever, we need a scientifically-literate community to engage in debates about issues that affect us all. We also need imaginative thinkers to discover the opportunities in our exponentially expanding knowledge base. Teachers play a vital role in nurturing the minds of our future citizens and scientists.

The Australian Academy of Science has a long, proud history of supporting science education. Our primary education program, **PrimaryConnections**: linking science with literacy, now has over 15 years' experience in supporting teachers to facilitate quality learning experiences in their classrooms. Regular evaluations demonstrate the significant impact the program can have on both teacher confidence and student outcomes.

**PrimaryConnections** has been developed with the financial support of the Australian Government and endorsed by education authorities across the country. It has been guided by its Steering Committee, with members from the Australian Government and the Australian Academy of Science, and benefitted from input by its Reference Group, with representatives from all states and territories.

Key achievements of the program include engaging over 24,000 Australian teachers in professional learning workshops, producing multi award-winning curriculum resources, and developing an Indigenous perspective framework that acknowledges the diversity of perspectives in Australian classrooms.

The **PrimaryConnections** teaching and learning approach combines guided inquiry, using the 5Es model, with hands-on investigations. It encourages students to explore and test their own, and others', ideas and to use evidence to support their claims. It focuses on developing the literacies of science and fosters lasting conceptual change by encouraging students to represent and re-represent their developing understandings. Students are not only engaged in science, they feel that they can do science.

This is one of 40 curriculum units developed to provide practical advice on implementing the teaching and learning approach while meeting the requirements of the Australian Curriculum: Science. Trialled in classrooms across the country and revised based on teacher feedback, and with the accuracy of the teacher background information verified by Fellows of the Academy, the experience of many brings this unit to you today.

I commend **PrimaryConnections** to you and wish you well in your teaching.

**Professor John Shine, AC Pres AA**

President (2018–2022)

Australian Academy of Science



# The PrimaryConnections teaching and learning approach

PrimaryConnections units embed inquiry-based learning into a modified 5Es instructional model. The relationship between the 5Es phases, investigations, literacy products and assessment is illustrated below:

PrimaryConnections 5Es teaching and learning model

Phase	Focus	Assessment focus
<b>ENGAGE</b>	Engage students and elicit prior knowledge	<b>Diagnostic assessment</b>
<b>EXPLORE</b>	Provide hands-on experience of the phenomenon	<b>Formative assessment</b>
<b>EXPLAIN</b>	Develop scientific explanations for observations and represent developing conceptual understanding Consider current scientific explanations	<b>Formative assessment</b>
<b>ELABORATE</b>	Extend understanding to a new context or make connections to additional concepts through a student-planned investigation	<b>Summative assessment</b> of the Science Inquiry Skills
<b>EVALUATE</b>	Students re-represent their understanding and reflect on their learning journey, and teachers collect evidence about the achievement of outcomes	<b>Summative assessment</b> of the Science Understanding

More information on PrimaryConnections 5Es teaching and learning model can be found at:  
[www.primaryconnections.org.au](http://www.primaryconnections.org.au)

**Reference:** Bybee, R.W. (1997). *Achieving scientific literacy: from purposes to practical action*. Portsmouth, NH: Heinemann.

## Developing students' scientific literacy

The PrimaryConnections program supports teachers in developing students' scientific literacy. Scientific literacy is considered the main purpose of school science education and has been described as an individual's:

- scientific knowledge and use of that knowledge to identify questions, acquire new knowledge, explain scientific phenomena and draw evidence-based conclusions about science-related issues
- understanding of the characteristic features of science as a form of human knowledge and enquiry
- awareness of how science and technology shape our material, intellectual and cultural environments
- willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.

**Reference:** Programme for International Student Assessment & Organisation for Economic Co-operation and Development. (2009). *PISA 2009 assessment framework: key competencies in reading, mathematics and science*. Paris: OECD Publishing.

## Linking science with literacy

PrimaryConnections has an explicit focus on developing students' knowledge, skills, understanding and capacities in science and literacy. Units employ a range of strategies to encourage students to think about and to represent science.

PrimaryConnections develops the literacies of science that students need to learn and to represent their understanding of science concepts, processes and skills. Representations in PrimaryConnections are multi-modal and include text, tables, graphs, models, drawings and embodied forms, such as gesture and role-play. Students use their everyday literacies to learn the new literacies of science. Science provides authentic contexts and meaningful purposes for literacy learning, and also provides opportunities to develop a wider range of literacies. Teaching science with literacy improves learning outcomes in both areas.

## Assessment

Science is ongoing and embedded in PrimaryConnections units. Assessment is linked to the development of literacy practices and products. Relevant understandings and skills are highlighted at the beginning of each lesson. Different types of assessment are emphasised in different phases:



**Diagnostic assessment** occurs in the *Engage* phase. This assessment is to elicit students' prior knowledge so that the teacher can take account of this when planning how the *Explore* and *Explain* lessons will be implemented.



**Formative assessment** occurs in the *Explore* and *Explain* phases. This enables the teacher to monitor students' developing understanding and provide feedback that can extend and deepen students' learning.




**Summative assessment** of the students' achievement developed throughout the unit occurs in the *Elaborate* phase for the Science Inquiry Skills, and in the *Evaluate* phase for the Science Understanding.

Rubrics to help you make judgments against the relevant achievement standards of the Australian Curriculum are available on our website:

[www.primaryconnections.org.au](http://www.primaryconnections.org.au)



## Safety

Learning to use materials and equipment safely is central to working scientifically. It is important, however, for teachers to review each lesson before teaching, to identify and manage safety issues specific to a group of students. A safety icon  is included in lessons where there is a need to pay particular attention to potential safety hazards.

The following guidelines will help minimise risks:

- Be aware of the school's policy on safety in the classroom and for excursions.
- Check students' health records for allergies or other health issues.
- Be aware of potential dangers by trying out activities before students do them.
- Caution students about potential dangers before they begin an activity.
- Clean up spills immediately as slippery floors are dangerous.
- Instruct students never to smell, taste or eat anything unless they are given permission.
- Discuss and display a list of safe practices for science activities.

## Teaching to the Australian Curriculum: Science

The Australian Curriculum: Science has three interrelated strands—Science Understanding, Science as a Human Endeavour and Science Inquiry Skills—that together ‘provide students with understanding, knowledge and skills through which they can develop a scientific view of the world’ (ACARA 2020).

The content of these strands is described by the Australian Curriculum as:

Science Understanding	
Biological sciences	Understanding living things
Chemical sciences	Understanding the composition and behaviour of substances
Earth and space sciences	Understanding Earth's dynamic structure and its place in the cosmos
Physical sciences	Understanding the nature of forces and motion, and matter and energy
Science as a Human Endeavour	
Nature and development of science	An appreciation of the unique nature of science and scientific knowledge including how current knowledge has developed over time through the actions of many people
Use and influence of science	How science knowledge, and applications affect people's lives, including their work, and how science is influenced by society and can be used to inform decisions and actions
Science Inquiry Skills	
Questioning and predicting	Identifying and constructing questions, proposing hypotheses and suggesting possible outcomes
Planning and conducting	Making decisions about how to investigate or solve a problem and carrying out an investigation, including the collection of data
Processing and analysing data and information	Representing data in meaningful and useful ways, identifying trends, patterns and relationships in data, and using this evidence to justify conclusions
Evaluating	Considering the quality of available evidence and the merit or significance of a claim, proposition or conclusion with reference to that evidence
Communicating	Conveying information or ideas to others through appropriate representations, text types and modes

 Above material is sourced from the Australian Curriculum: Australian Curriculum Assessment and Reporting Authority (ACARA). (2020). *Australian Curriculum: Science*. [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au)

Primary**Connections** units support teachers to teach each Science Understanding detailed in the Australian Curriculum: Science from Foundation to Year 6. Units also develop students' skills and knowledge of the Science as a Human Endeavour and Science Inquiry Skills sub-strands, as well as specific sub-strands within the Australian Curriculum: English, Mathematics and Design and Technologies. Detailed information about its alignment with the Australian Curriculum is provided in each unit.

## Unit at a glance

*Watch it grow!*

Phase	Lesson	At a glance
<b>ENGAGE</b>	<b>Lesson 1</b> How do they grow? <b>Session 1</b> Young and old <b>Session 2</b> Agree to disagree?	To capture students' interest and find out what they think they know about the way living things grow, change and have offspring similar to themselves.  To elicit students' questions about the life stages of living things.
	<b>Lesson 2</b> Diary of a mealworm	To provide hands-on, shared experiences of the life stages of an invertebrate animal through investigating the growth of a mealworm under different temperature conditions.
<b>EXPLORE</b>	<b>Lesson 3</b> Now and then	To provide shared experiences of similarities and differences between features of babies and children.
	<b>Lesson 4</b> Egg detectives	To provide shared experiences of matching eggs with parents, using evidence.
<b>EXPLAIN</b>	<b>Lesson 5</b> Life stories <b>Session 1</b> One step at a time <b>Session 2</b> Playing the game	To support students to represent and explain their understanding about the way living things grow, change and have offspring similar to themselves, and to introduce current scientific views.
<b>ELABORATE</b>	<b>Lesson 6</b> How many days?	To support students to represent and discuss their investigation of the growth of a mealworm under different temperature conditions.
<b>EVALUATE</b>	<b>Lesson 7</b> Life stage models	To provide opportunities for students to represent what they know about the way living things grow, change and have offspring similar to themselves, and to reflect on their learning during the unit.

A unit overview can be found in Appendix 6, page 62.

## Watch it grow!—Alignment with the Australian Curriculum

*Watch it grow!* is written to align to the Year 2 level of the Australian Curriculum: Science. The Science Understanding, Science Inquiry Skills, and Science as a Human Endeavour strands are interrelated and embedded throughout the unit (see page xi for further details). This unit focuses on the Biological sciences sub-strand.

Year 2 Science Understanding for the Biological Sciences:	Living things grow, change and have offspring similar to themselves (ACSSU030)
Incorporation in <i>Watch it grow!</i> :	Students use direct observations to gather information, describe and make comparisons of the way living things, including themselves, grow and change over time.

 All the material in the first row of this table is sourced from the Australian Curriculum.

### Year 2 Achievement Standard

The Australian Curriculum: Science Year 2 achievement standard indicates the quality of learning that students should demonstrate by the end of Year 2.

**By the end of Year 2, students describe changes to** objects, materials and **living things**. They identify that certain materials and resources have different uses and describe examples of where science is used in people's daily lives.

**Students pose and respond to questions about their experiences and predict outcomes of investigations. They use informal measurements to make and compare observations. They record and represent observations and communicate ideas in a variety of ways.**

The sections relevant to *Watch it grow!* are bolded above. By the end of the unit, teachers will be able to make evidence-based judgements on whether the students are achieving below, at or above the achievement standard for the sections bolded above. To assist teachers in making these judgements, assessment rubrics and work samples are provided on the PrimaryConnections website:

[www.primaryconnections.org.au](http://www.primaryconnections.org.au)



## ***Watch it grow!*—Australian Curriculum: Key ideas**

In the Australian Curriculum: Science, there are six key ideas that represent key aspects of a scientific view of the world and bridge knowledge and understanding across the disciplines of science. The below table explains how these are represented in *Watch it grow!*

Overarching idea	Incorporation in <i>Watch it grow!</i>
<b>Patterns, order and organisation</b>	Students make observations and discuss patterns of similarity and difference of individuals over time. Through sorting activities, students organise living things by their stage of life and identify growth patterns among different living things.
<b>Form and function</b>	Students identify key features of life stages and how the form it takes in a stage influences what it can do and how it behaves.
<b>Stability and change</b>	Students recognise key features of living things that change over time and those features which remain stable over time.
<b>Scale and measurement</b>	Students compare the sizes of living things over time. Through use of a calendar, students measure the growth of living things according to time.
<b>Matter and energy</b>	Students compare changes in living things through direct observation.
<b>Systems</b>	Students describe differing life stage systems of living things, such as animals that do or don't metamorphose.

## Watch it grow—Australian Curriculum: Science

*Watch it grow!* embeds all three strands of the Australian Curriculum: Science.

For ease of reference, the table below outlines the sub-strands covered in *Watch it grow!*, the content descriptions for Year 2 and the aligned lessons.

Strand	Sub-strand	Code	Year 2 content descriptions	Lessons
<b>Science Understanding</b>	<b>Biological sciences</b>	ACSSU030	Living things grow, change and have offspring similar to themselves	1–7
<b>Science as a Human Endeavour</b>	<b>Nature and development of science</b>	ACSHE034	Science involves observing, asking questions about, and describing changes in, objects and events	2
	<b>Use and influence of science</b>	ACSHE035	People use science in their daily lives, including when caring for their environment and living things	5
<b>Science Inquiry Skills</b>	<b>Questioning and predicting</b>	AC SIS037	Pose and respond to questions, and make predictions about familiar objects and events	1, 2, 6
	<b>Planning and conducting</b>	AC SIS038	Participate in guided investigations to explore and answer questions	2, 6
		AC SIS039	Use informal measurements to collect and record observations, using digital technologies as appropriate	2
	<b>Processing and analysing data and information</b>	AC SIS040	Use a range of methods to sort information, including drawings and provided tables and through discussion, compare observations with predictions	2, 3, 6
	<b>Evaluating</b>	AC SIS041	Compare observations with those of others	3, 6
	<b>Communicating</b>	AC SIS042	Represent and communicate observations and ideas in a variety of ways	7

 All the material in the first four columns of this table is sourced from the Australian Curriculum.

### General capabilities





The skills, behaviours and attributes that students need to succeed in life and work in the 21st century have been identified in the Australian Curriculum as general capabilities.


There are seven general capabilities and they are embedded throughout the curriculum.

For further information see: [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au)

For examples of our unit-specific general capabilities information see the next page.

## 'Watch it grow!' - Australian Curriculum General capabilities

General capabilities	Australian Curriculum description	Watch it grow! examples
<b>Literacy</b>	Literacy knowledge specific to the study of science develops along with scientific understanding and skills. PrimaryConnections learning activities explicitly introduce literacy focuses and provide students with the opportunity to use them as they think about, reason and represent their understanding of science.	In <i>Watch it grow!</i> the literacy focuses are <ul style="list-style-type: none"> <li>• annotated drawings</li> <li>• science journals</li> <li>• word walls</li> <li>• line drawings</li> <li>• labelled diagrams</li> <li>• timelines.</li> </ul>
 <b>Numeracy</b>	Elements of numeracy are particularly evident in Science Inquiry Skills. These include practical measurement and the collection, representation and interpretation of data.	Students <ul style="list-style-type: none"> <li>• collect, interpret and represent data through calendars, drawings and timelines</li> <li>• use measurement of time to record growth.</li> </ul>
<b>Information and communication technology (ICT) competence</b>	ICT competence is particularly evident in Science Inquiry Skills. Students use digital technologies to investigate, create, communicate, and share ideas and results.	Students are given optional opportunities to <ul style="list-style-type: none"> <li>• use Interactive Resource technology to view, record and analyse information</li> <li>• use the internet to research further information about animal life stages.</li> </ul>
 <b>Critical and creative thinking</b>	Students develop critical and creative thinking as they speculate and solve problems through investigations, make evidence-based decisions, and analyse and evaluate information sources to draw conclusions. They develop creative questions and suggest novel solutions.	Students <ul style="list-style-type: none"> <li>• use reasoning to develop questions for inquiry</li> <li>• formulate, pose and respond to questions</li> <li>• develop evidence-based claims.</li> </ul>
<b>Ethical behaviour</b>	Students develop ethical behaviour as they explore ethical principles and guidelines in gathering evidence and consider the ethical implications of their investigations on others and the environment.	Students <ul style="list-style-type: none"> <li>• ask questions of others respecting each other's point of view</li> <li>• develop and use a 'Code for caring' when observing and handling animals.</li> </ul>
 <b>Personal and social competence</b>	Students develop personal and social competence as they learn to work effectively in teams, develop collaborative methods of inquiry, work safely, and use their scientific knowledge to make informed choices.	Students <ul style="list-style-type: none"> <li>• work collaboratively in teams</li> <li>• listen to and abide by rules to a new game</li> <li>• participate in discussions.</li> </ul>
 <b>Intercultural understanding</b>	Intercultural understanding is particularly evident in Science as a Human Endeavour. Students learn about the influence of people from a variety of cultures on the development of scientific understanding.	<ul style="list-style-type: none"> <li>• Cultural perspectives opportunities are highlighted where relevant</li> <li>• Important contributions made to science by people from a range of cultures are highlighted where relevant.</li> </ul>

 All the material in the first two columns of this table is sourced from the Australian Curriculum.

# Alignment with the Australian Curriculum: English and Maths

Strand	Sub-strand	Code	Year 2 content descriptions	Lessons
<b>English–Language</b>	<b>Language variation and change</b>	ACELA1460	Understand that spoken, visual and written forms of language are different modes of communication with different features and their use varies according to the audience, purpose, context and cultural background.	5
	<b>Language for interaction</b>	ACELA1461	Understand that language varies when people take on different roles in social and classroom interactions and how the use of key interpersonal language resources varies depending on context.	1, 6
	<b>Text structure and organisation</b>	ACELA1463	Understand that different types of texts have identifiable text structures and language features that help the text serve its purpose.	1, 3, 5
		ACELA1466	Know some of the features of text organisation including page and screen layouts, alphabetical order, and different types of diagrams, for example, timelines.	5
	<b>Expressing and developing ideas</b>	ACELA1470	Understand the use of vocabulary about familiar and new topics and experiment with and begin to make conscious choices of vocabulary to suit audience and purpose.	2, 3, 4, 7
<b>English–Literacy</b>	<b>Texts in context</b>	ACELY1665	Discuss different texts on a similar topic, identifying similarities and differences between the texts.	3
	<b>Interaction with others</b>	ACELY1666	Listen for specific purposes and information, including instructions, and extend students' own and others' ideas in discussions.	5
		ACELY1789	Use interaction skills including initiating topics, making positive statements and voicing disagreement in an appropriate manner, speaking clearly and varying tone, volume and pace appropriately.	1, 3, 4
		ACELY1667	Rehearse and deliver short presentations on familiar and new topics.	7
	<b>Creating texts</b>	ACELY1671	Create short imaginative, informative and persuasive texts using growing knowledge of text structures and language features for familiar and some less familiar audiences, selecting print and multimodal elements appropriate to the audience and purpose.	2, 7
<b>Mathematics</b>	<b>Number and Algebra</b>	ACMNA032	Recognise and represent division as grouping into equal sets and solve simple problems using these representations.	2
	<b>Measurement and Geometry</b>	ACMMG041	Use a calendar to identify the date and determine the number of days in each month.	2, 6
	<b>Statistics and probability</b>	ACMSP048	Identify a question of interest based on one categorical variable. Gather data relevant to the question.	6
		ACMSP049	Collect, check and classify data.	4, 6
		ACMSP050	Create displays of data using lists, tables and picture graphs, and interpret them.	6

 All the material in the first four columns of this table is sourced from the Australian Curriculum.

## Cross curriculum priorities

There are three cross curriculum priorities identified by the Australian Curriculum:

- Aboriginal and Torres Strait Islander histories and cultures
- Asia and Australia's engagement with Asia
- Sustainability.

Two of these are embedded within this unit as described below. For further information see: [www.australiancurriculum.edu.au](http://www.australiancurriculum.edu.au)



### Aboriginal and Torres Strait Islander histories and cultures

Primary**Connections** has developed an Indigenous perspective framework which has informed practical reflections on intercultural understanding. It can be accessed at:

[www.primaryconnections.org.au](http://www.primaryconnections.org.au)

*Watch it grow!* focuses on the Western science way of making evidence-based claims about the way living things grow, change and have off-spring similar to themselves.

Indigenous cultures might have different explanations for why growth and change occurs. Dreamtime stories sometimes involve metamorphosis of animals into a different species of animal, including humans. Dreamtime stories can be specific to particular people or communities or can be shared across different groups.

Primary**Connections** recommends working with Indigenous community members to access contextualised, relevant Indigenous perspectives. Protocols on seeking out and engaging Indigenous community members are discussed in state and territory Indigenous education policy documents and can be found on the Primary**Connections** website.

### Sustainability

Through their investigation, students explore how temperature can affect the growth of mealworm larvae. This provides opportunities for students to develop an understanding of how the growth of some living things can be impacted by environmental conditions, including changes due to human impact. This can assist them to develop knowledge, skills and values for making decisions about individual and community actions that contribute to sustainable patterns of use of the Earth's natural resources.



# Introduction to life stages

## Teacher background information

All living things have the potential to reproduce and the offspring grow and develop through a series of stages. In some, the offspring look like small versions of their parents from the outset, but in others there are very different stages as the young develop. Many insects in particular go through a series of amazing changes.

Students need to be provided with a variety of living organisms in the classroom to learn about life stages. Growth and development are necessary parts of understanding life stages. For this age group, growth is understood at the macroscopic level and connected to the needs of organisms, such as food being a requirement for growth. Through immersion students begin to understand that every type of living thing goes through life stages. Students also come to understand that although a developmental pattern is predictable for most animals each kind of living thing has a unique sequence of life stages. By understanding life stages students gain an appreciation of the diversity among living things.

## Students' conceptions

Taking account of students existing ideas is important in planning effective teaching approaches which help students learn science. Students develop their own ideas during their experiences in everyday life and might hold more than one idea about an event or phenomenon.

Life cycle diagrams might cause some confusion for some students. These students might not appreciate that the diagrams are very simplistic and do not account for the numbers of offspring involved or mortality rates. The circular nature of the diagrams might also result in misunderstanding. For example, some students might think that a frog becomes frog's eggs because that is what many diagrams depict. However, an adult frog lays eggs rather than transforms into them and each individual will eventually die.

Some students might believe that eggs are not alive. They do not consider the egg to be a part of the life cycle. Similarly, some students might not consider death as part of the cycle, perhaps because it is often not included in simple life cycle diagrams.

Some students might make inaccurate generalisations between life stages. For example, some might believe a chicken will be born without eyesight, like some mammals. Others might say the chicken is kicking in the egg, like a human baby in the womb.

Many students believe that daughters inherit most of their characteristics from their mothers and boys inherit most of their characteristics from their fathers. However, babies obtain genetic material from both their parents. It is the nature of this combined genetic material rather than its source that determines the appearance of the offspring.

## References

Skamp, K. (Ed.). (2012). *Teaching Primary Science Constructively* (4th Ed.). South Melbourne: Cengage Learning Australia.

To access more in-depth science information in the form of text, diagrams and animations, refer to the Primary**Connections** Science Background Resource available on the Primary**Connections** website:

**[www.primaryconnections.org.au](http://www.primaryconnections.org.au)**

Note that this background information is intended for the teacher only.

# Lesson 1 How do they grow?

## AT A GLANCE

To capture students' interest and find out what they think they know about the way living things grow, change and have offspring similar to themselves.

To elicit students' questions about the life stages of living things.

### Session 1 Young and old

Students

- predict how living things will grow and change
- create drawings of living things when they were younger and older.

### Session 2 Agree to disagree?

Students

- record their ideas about how living things grow, change and have offspring similar to themselves.

ENGAGE

## Lesson focus

The focus of the *Engage* phase is to spark students' interest, stimulate their curiosity, raise questions for inquiry and elicit their existing beliefs about the topic. These existing ideas can then be taken account of in future lessons.

## Assessment focus



**Diagnostic assessment** is an important aspect of the *Engage* phase. In this lesson you will elicit what students already know and understand about:

- how living things grow, change and have offspring similar to themselves.

## Key lesson outcomes

**Students will be able to represent their current understanding as they:**

- explain and draw their ideas of the way living things grow and change
- contribute to discussions about living things and how they grow and change
- identify the purpose and features of a science journal, annotated drawing and word wall
- identify questions about how mealworms and humans grow and change.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

## Teacher background information

Some types of living things go through many different life stages. For example, a mealworm experiences significant changes in its body structure from egg to larva to pupa to adult. Other living things do not experience the same changes. For example, rabbits maintain the same body structure throughout their lives. When they are young and as they get older, they gradually grow larger to a certain point. Then they remain roughly the same size for the rest of their lives. Sometimes the proportions of their bodies change but the basic form remains the same. Humans grow in the same way as rabbits—the growth is gradual and does not change the basic body structure.

### Caring for mealworms

The optimal temperature range for growing mealworms is 20-25 degrees Celsius. Mealworms can be purchased from pet shops, fish bait suppliers or biological supply companies. They can be kept in many different types of container. However, they will chew through paper or cardboard enclosures. The beetles do not fly but it is recommended that a lid with air holes be used to prevent them climbing out.

Mealworms generally eat decaying plant matter and dead insects. However, they can be fed on any type of grain including bran, cornmeal, flour, oatmeal and cereal flakes. A small piece of potato or carrot should also be placed in the container as a source of moisture. This should be changed regularly to prevent the development of mould.

Place a few centimetres of food in the bottom of the container with the mealworms and cover them with a folded paper towel. When the colony is first started it should be left undisturbed for a few weeks to allow some of the larvae to develop into beetles and begin to lay eggs. The colony will require little maintenance apart from feeding. Every six months the worms, pupae and beetles should be transferred to a new container to refresh the colony. See lesson 2 'Teacher background information' for further care instructions.

## Agree/Disagree claims

### Claim 1: All animals stay the same shape as they get older, and they get bigger.

Some animals are born or hatch with similar shape and features as their parents and change very little apart from getting larger as they get older, such as turtles, crabs and humans. Some animals go through dramatic changes as they grow in a process called metamorphosis, such as frogs, butterflies and mealworms.

### Claim 2: All baby animals look a lot like their parents when they grow up

When two individuals of a species reproduce, they both pass on genetic material to their offspring. The new individual displays characteristics of both its parents. Although a young animal may look dramatically different from its parents, as it develops into an adult it will look similar in shape and features. There are some exceptions to the rule, such as when an animal is born with physical defects or is the hybrid of two species, such as a liger (with a lion and tiger as parents).

## Students' conceptions

Students tend to recall life stages of living things that they have observed in real life. Students sometimes make generalisations about the life stages of all living things after only observing the life stages of one or two animals. By introducing a broad range of living things into the classroom to observe, students will gain a greater appreciation for the diversity of growth cycles.

## Session 1 Young and old

### Equipment

#### FOR THE CLASS

- class science journal
- word wall
- 1 enlarged copy of 'From young to old' (Resource sheet 1)
- 1 enlarged copy of 'Information note for families' (Resource sheet 2)
- *Optional:* eggs or sample of animal early life stage

#### FOR EACH STUDENT

- science journal
- 1 copy of 'From young to old' (Resource sheet 1)
- 1 copy of 'Information note for families' (Resource sheet 2)
- container with mealworms



## Preparation

- The optimal temperature range for growing mealworms is 20-25 degrees Celsius so it is recommended this unit be implemented in warmer months.
  - Read 'How to use a science journal' (Appendix 2).
  - Read 'How to use a word wall' (Appendix 3).
  - Prepare headings on separate pages in the class science journal:
    - What we think we know about mealworms
    - Our questions about mealworms
    - What we think we know about how we grow
    - Our questions about how we grow
  - Prepare an enlarged copy of 'From young to old' (Resource sheet 1).
  - Prepare an enlarged copy of 'Information note for families' (Resource sheet 2).
  - Prepare an enlarged copy of 'From young to old' (Resource sheet 1).
  - Ask staff members if they can provide a photo from when they were a baby or school child for Lesson 3.
  - Source large mealworms and supplies (see 'Teacher background information'). Remove any moulted exoskeletons (shed 'skin'), pupae or adult beetles before showing the class.
- Note:** It is important that you source large mealworms so that they will grow and change in the time frame of the unit. Avoid 'giant' mealworms as these have been treated with growth hormones that prevent them from pupating, and 'superworms' which look similar but are a different species that require different conditions.
- *Optional:* Source eggs or early life stages of other animals, for example, frogs, stick insects, silkworms, flies, brine shrimp (sea monkeys), and chickens to observe their growth over the unit.
  - *Optional:* Display 'From young to old' (Resource sheet 1) in a digital format.

## Lesson steps



- 1 Invite students to sit with a partner and carefully observe a container of mealworms (or any other animals the class will study over the unit). Ask students to talk with their partner about what they can see, what they think and what they are wondering about.
- 2 Ask students to share their observations and thoughts with the class.
- 3 Discuss with students that these animals are called mealworms. Ask students what they think they know about mealworms. Ask questions such as:
  - What do you think the mealworms will turn into?
  - What do you think they will look like?

- How do you think the mealworms began life?
- What will they need to help them to grow? (Food, water and shelter.)
- What changes do you think they will go through before they become an adult?
- How long do you think they will take to grow into an adult?

**Note:** In the *Engage* phase, do not provide any formal definitions or correct students' answers as the purpose is to elicit students' prior knowledge.

- 4 Introduce the class science journal and discuss its purpose and features.

### Literacy focus

#### Why do we use a science journal?

We use a **science journal** to record what we see, hear, feel, and think so that we can look at it later to help us with our claims and evidence.

#### What does a science journal include?

A **science journal** might include dates and times, written text, drawings, measurements, labelled diagrams, photographs, tables and graphs.

Record students' thoughts about mealworms under the heading 'What we think we know about mealworms' in the class science journal (see 'Preparation').



- 5 Explain that students will be observing the mealworms over the next few weeks. Ask students what questions they might have about the mealworms. Record the questions under the heading 'Our questions about mealworms' in the class science journal.



- 6 Explain that while the mealworms grow over the next weeks, students will also explore how other animals grow including themselves. Discuss with students about what they think they know about how they started life and what they will look like as they grow up. Record students' ideas under the heading 'What we think we know about how we grow' in the class science journal.
- 7 Introduce the enlarged copy of 'From young to old' (Resource sheet 1). Explain to students that they will draw one or more pictures with words on either side of the mealworm or picture of themselves to show how they started life and what they might look like when they grow older. Discuss the purpose and features of an annotated drawing.

### Literacy focus

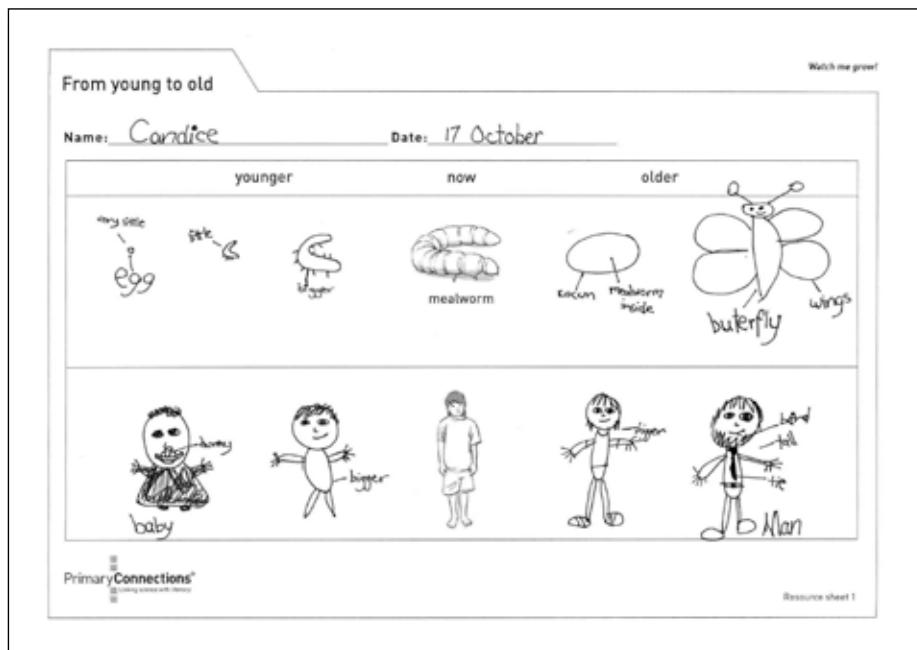
#### Why do we use an annotated drawing?

We use an **annotated drawing** to show an idea or object.

#### What does an annotated drawing include?

An **annotated drawing** includes a picture and words or descriptions about the idea or object.

Allow students time to complete the activity individually.



Work sample of 'From young to old'

*Optional:* Cut and paste the image of the mealworm and person into their science journal if they need more room for their annotated drawings.



- 8 As a whole class, discuss with students the pictures they have drawn and how they are alike and different. Record students' responses in the class science journal.
- 9 Introduce the word wall and its title 'Watch it grow!' Discuss the purpose and features of a word wall.

### Literacy focus

#### Why do we use a word wall?

We use a **word wall** to record words we know or learn about a topic. We display the **word wall** in the classroom so that we can look up words we are learning about and see how they are spelt.

#### What does a word wall include?

A **word wall** might include a topic title or picture and words which we have seen or heard about the topic.

- 10 Ask students what words they would like to place on the word wall from today's lesson.
- 11 Introduce the enlarged copy of 'From young to old' (Resource sheet 1). Read through and discuss with students. Explain that students are asked to bring to school a photo of themselves when they were a baby so they can think about themselves and how they have grown. Tell students that if they don't have one they can discuss with their parents what they looked like and do a drawing. Hand out the 'Information note for families' (Resource sheet 2) for students to take home.

## Session 2 Agree to disagree?

### Equipment

#### FOR THE CLASS

- class science journal
- word wall
- 3 A4 cards (see 'Preparation')
- 2 Agree/Disagree charts (see 'Preparation')

#### FOR EACH STUDENT

- science journal

### Preparation

- Read the Teacher background information on Agree/Disagree claims.
- Make three A4 cards with one heading on each ('Agree', 'Disagree', 'Not sure'). Place the three cards around the classroom in areas where there is enough space for a group of students to stand near each.
- Make a large chart with the headings:

#### **Claim 1: All animals stay the same shape as they get older, and they get bigger.**

Agree	Disagree	Not sure
-------	----------	----------

- Make a large chart, with the headings:



#### **Claim 2: All baby animals will look a lot like their parents when they grow up.**

Agree	Disagree	Not sure
-------	----------	----------

- *Optional:* Display 'Agree/Disagree' charts in a digital format.

### Lesson steps

- 1 Review the previous session using the class science journal and word wall. Discuss students' ideas about how mealworms and people grow and the comparisons of how they are alike and different.
- 2 Ask students to stand and explain that you will read a statement to them. If they agree with the statement they will move towards the A4 card labelled 'Agree'. If they disagree they will move to the opposite side of the space which is labelled 'Disagree'. If they are not sure they will move to the space labelled 'Not sure'.

- 3 Begin with an easy claim, such as one about themselves or the weather, so that they know what is expected of them when you commence the task about growing.
- 4 Introduce the first chart (see 'Preparation') and read the claim 'All animals stay the same shape as they get older, and they get bigger'. Allow time for students to think about the statement and stand under the heading of their choice.
-  5 Ask students to discuss the reasons for their choices with other students who have chosen the same choice.
-  6 Record students' names or ask students to write their name in the appropriate column according to whether they agree, disagree or are unsure about the claim.
- 7 Repeat lesson steps 4, 5 and 6 for the second chart (see 'Preparation').
- 8 Discuss with students that scientists' ideas change as they find evidence about their ideas. Explain that in this unit they will be working like scientists and will be able to change their ideas as they explore the unit. Display the Agree/Disagree charts in the classroom so that they are visible to students throughout the unit.
- 9 Update the class word wall with words and images.

## Australian Curriculum links

### English

- Start reading 'The Ugly Duckling' by Hans Christian Anderson and ask students for their opinions about why the ugly duckling looks different to the other ducklings.



### History

- Discuss younger, now and older in terms of past present and future.



# From young to old

Name:
Date:

younger	now	older
	 <div>mealworm</div>	
		

# Information note for families

**Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

## Introducing the 'From young to old' project

This term our class is studying the way living things grow and change and have offspring similar to themselves.

In this unit students will be looking at their own growth from when they were a baby. To help with this students are asked, if at all possible, to bring to school a photo of themselves taken when they were a baby.

It would also be helpful if students could bring the following information from when they were born. For example:

- Birth mass (weight) in kg
- Birth length (height) in cm
- Head circumference at birth in cm

**Important:** Please send in copies of photos or documents only.

Those students who, for various reasons, are not able to bring in photos or birth information, may like to discuss what they looked with you and bring a drawing of themselves as a baby.

Students are asked to bring their baby photo or drawing to school by:

\_\_\_\_\_

Class teacher \_\_\_\_\_



# Lesson 2 Diary of a mealworm

## AT A GLANCE

To provide hands-on, shared experiences of the life stages of an invertebrate animal through investigating the growth of a mealworm under different temperature conditions.

Students

- discuss variables that might affect growth of mealworms
- work in collaborative learning teams to plan and conduct the investigation.

## Lesson focus

The *Explore* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records such as science journal entries. The *Explore* phase ensures all students have a shared experience that can be discussed and explained in the *Explain* phase.

## Assessment focus



**Formative assessment** is an ongoing aspect of the *Explore* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. In this lesson you will monitor students' developing understanding of:

- the growth and change of an invertebrate animal.

## Key lesson outcomes

Students will be able to:
<ul style="list-style-type: none"> <li>• observe and describe the way a living thing changes as it grows</li> </ul>
<ul style="list-style-type: none"> <li>• respond to and pose questions about how a mealworm develops</li> </ul>
<ul style="list-style-type: none"> <li>• predict how temperature might affect the growth of an animal</li> </ul>
<ul style="list-style-type: none"> <li>• participate in a guided investigation about the growth of mealworms under different temperature conditions</li> </ul>
<ul style="list-style-type: none"> <li>• use appropriate measurement techniques to record their observations, including use of a calendar and annotated drawings.</li> </ul>

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

## Teacher background information

### Maintaining mealworms

Large mealworms kept at a constant temperature of about 25°C should develop into pupae within 1-3 weeks of buying them from a pet shop. Within this time the mealworms may moult their outer 'skin' (exoskeleton) a number of times.

Mealworms are often sold by pet shops as a food source for other animals, such as birds, lizards and spiders. The mealworm is no longer a good food source once it turns into a darkling beetle, so pet shops and pet owners will often keep mealworms in a refrigerator to delay their development. It is likely that the mealworms kept in the refrigerator during this unit will not progress to pupae or adult beetles.

Mealworms are very resilient insects and can survive in the refrigerator as long as they do not dehydrate. Mealworms can go through their complete life cycle without any added water as they are very efficient at extracting water from their food. It is therefore very important that the piece of moist carrot or potato is changed every few days. For ease of routine, chop carrots or potatoes into 1 cm segments and keep in water in a sealed container in the refrigerator.

Mealworms kept together in containers should have different life stages separated. Large mealworms and the adult beetles will sometimes eat the pupae or eggs.

Mould can develop in the container, particularly in humid climates. It is important to transfer the mealworms to a new container with fresh food if mould develops.





### Monitoring mealworms

The first changes that you might observe will be some moulted skin and a change in colour of the mealworm. Mealworms have an exoskeleton which is flexible and light in colour when new, but becomes hard and darkens in colour over time. As the mealworm grows larger, the exoskeleton becomes too small and is shed and the process begins again. From the time they hatch, mealworms moult 8-12 times before they change into pupae.

The pupa is shorter and fatter than the larva, with a broad head region. The pupa does not move or feed. This stage will last for about 10 to 20 days at 25-30°C.

The mealworms kept in the refrigerator will develop at a slower rate, as their biochemical reactions (metabolism) have slowed down.

Life stages of a darkling beetle

Stage	egg → larva (mealworm) → pupa → adult (darkling beetle)
	   
How long? Full stages	7–14 days      30–90 days (8–12 moults)      10–20 days      60–90 days
When bought from pet shop	7–21 days left of stage      10–20 days      60–90 days

EXPLORE

Equipment

**FOR THE CLASS**

- class science journal
- word wall
- team skills chart
- team roles chart
- 1 enlarged copy of 'Mealworm calendar' (Resource sheet 3)
- equipment and materials to house and feed the mealworms (see 'Teacher background information' from Lesson 1)
- marker pen for labelling containers
- self-adhesive notes
- *Optional:* digital camera

**FOR EACH TEAM**

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 2 plastic cups or yoghurt tubs
- 2 large mealworms
- ¼ cup of bran or crushed oats
- fresh piece of carrot or potato
- magnifying glass
- 2 enlarged copies of 'Mealworm calendar' (Resource sheet 3)

# Preparation

- Read ‘How to organise collaborative learning teams’ (Appendix 1). Display an enlarged copy of the team skills chart and the team roles chart in the classroom. Prepare role wristbands or badges and the equipment table.
- Prepare a separate plastic cup or yoghurt tub for each student. Source bran or crushed oats and carrots or potatoes for the mealworms’ food (see ‘Teacher background information’). Prepare labels for the containers with students’ name.
- Draw an investigation planner in the class science journal, for example:

## ‘Watch it grow!’ Investigation planner

<b>Question:</b> What happens to the growth of mealworms when we change the temperature?		
We will <b>change</b>		
We will <b>observe</b> growth of mealworms		
We will keep the <b>same</b>		

- Prepare a blank poster with the title ‘Code for caring’ (see Lesson step 10).
- Find a dark place in the classroom where the temperature is around a constant 25 degrees, for example, a cupboard.
- Prepare an enlarged copy of ‘Mealworm calendar’ (Resource sheet 3) and write the days of the month on it. Copy for each student.
- *Optional:* Display ‘Code for caring’ and ‘Mealworm calendar’ (Resource sheet 3) in a digital format.

# Lesson steps



- 1 Review the previous lesson using the class science journal and word wall, focusing on students’ ideas and questions about mealworms. Explain that the person at the pet shop kept the mealworms in the refrigerator. Ask students why they think the pet shop person did that.

- 2 Discuss the difference between a classroom environment and a refrigerator. Ask students to classify them as cold, warm or hot and discuss how those terms are related to the temperature of the room. Add ‘temperature’ to the word wall.



- 3 Ask students if they think the temperature of the room might affect how quickly mealworms grow up to be adults. Record students’ predictions in the class science journal, and discuss how they could investigate their ideas



- 4 Brainstorm things that might affect the growth of mealworms and record students’ answers on self-adhesive notes. Suggestions might include the amount of food they eat, the type of food they eat, the temperature of their environment, access to water, and how crowded they are.

- 5 Explain that students will work in collaborative learning teams to observe the growth of two mealworms at different temperatures. Explain that one team member will be responsible for observing and recording information about a mealworm that will be kept in the refrigerator and the other team member will look after a mealworm kept in the classroom.
- 6 Introduce the investigation planner in the class journal and read the question: 'What happens to the growth of mealworms when we change the temperature?' Discuss and record on the investigation planner things teams will:
  - **change:** the temperature
  - **observe:** the growth of the mealworm over time
  - **keep the same:** the amount of food, the type of food, the place the container is kept so that it has the same temperature, light and humidity conditions), the amount of carrot or potato they are given for moisture, size of the mealworms at the beginning.

**Note:** The variables on self-adhesive notes brainstormed in Lesson step 5 can be moved to the relevant sections on the planner.

For students with limited experience of planning investigations, provide the information for the investigation question and the 'We will observe' section, as these are the hardest part of the planner to complete.



- 7 Explain that scientists do tests very carefully and that they are going to work like scientists. Ask why is it important to change only one thing at a time (so we know what caused the changes). Discuss why it is necessary to keep everything else the same in order for a test to be fair, asking questions such as:
  - Would it be fair to give them different amount of carrot/potato?
  - Would it be fair to feed the mealworms in the classroom twice a day and the mealworms in the refrigerator once a day?
  - Would it be fair to start with large mealworms in the refrigerator and tiny ones in the classroom?

Ask students why they think that to keep the test fair the mealworms that won't be in the refrigerator will be kept in a dark place?



- 8 Ask students for ideas about how they can collect and record information about the growth of mealworms. Record students' suggestions in the class science journal. Discuss ideas with students such as:
  - drawing pictures
  - taking photos
  - measuring the mealworm's size as it grows
  - observing and recording regularly.



- 9 Form teams and allocate roles.  
If students are using collaborative learning teams for the first time, introduce and explain the team skills chart and team roles chart. Explain that students will use role wristbands or badges to help them (and you) know which role each member has.
- 10 Ask Managers to collect team equipment. Allow time for teams to set up their investigation.

- 11 Introduce the enlarged copy of the 'Mealworm calendar' (Resource sheet 3) and discuss it with students. Explain to students that they will be using the calendar to record their observations of their mealworm each day.
- 12 Model circling 'refrigerator' or 'classroom' on the enlarged copy of 'Mealworm calendar' (Resource sheet 3) in order to indicate environmental conditions under which each mealworm container will be kept.
- 13 Explain that students will create a line drawing of the mealworm each day. Discuss the purpose and features of a line drawing.

### Literacy focus

#### Why do we use a line drawing?

We use a **line drawing** to show what an object looks like without lots of detail.

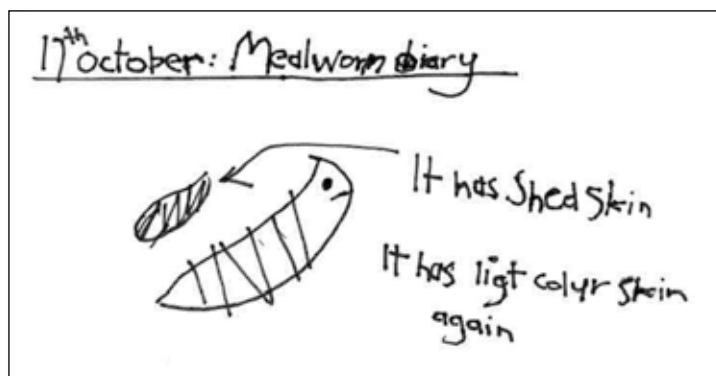
#### What does a line drawing include?

A **line drawing** includes simple lines usually using a pencil.

### Work sample of 'Mealworm calendar'

- Ask students why they think scientists check what they are testing and carefully record what they see. Model how to complete the first day's observation for today's date.
- 14 Ask teams to complete their line drawings for the first day on their copies of 'Mealworm calendar' (Resource sheet 3).  
**Note:** Allow students time to complete their line drawings each day or at other regular intervals and supply students with a new calendar sheet when a new month begins.
  - 15 Ask team members to record the date, observations and an annotated drawing in their science journals when any significant changes are observed with their mealworms, such as a moult or a life stage change to a pupa or adult. Review the features and purpose of an annotated diagram (see Lesson 1, Session 1).



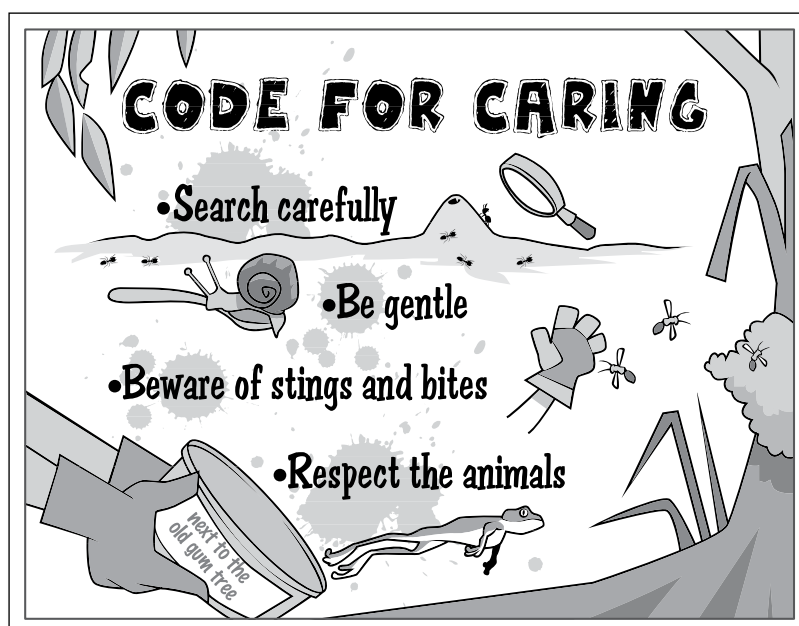


**Sample annotated drawing of a diary entry**

*Optional:* Use a digital camera to keep a photo diary of significant changes in the mealworm development.

- 16** Introduce the blank poster with the title 'Code for caring'. Discuss what a code is. Negotiate and record on the poster ways for students to care for the mealworms (see 'Teacher background information').

*Optional:* Ask students to place a small carrot or potato symbol on Mondays, Wednesdays and Fridays on their calendar as a reminder to change the carrot or potato.



**Sample 'Code for caring' poster**

- 17** Update the word wall with words and images.

# Mealworm calendar

**Name:** \_\_\_\_\_  
**Month:** \_\_\_\_\_  
**Mealworm kept in:** refrigerator/classroom

[illegible]

# Lesson 3 Now and then

## AT A GLANCE

To provide shared experiences of similarities and differences between features of babies and children.

Students

- compare similarities and differences of their features from when they were a baby to now.

## Lesson focus

The *Explore* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records such as science journal entries. The *Explore* phase ensures all students have a shared experience that can be discussed and explained in the *Explain* phase.

## Assessment focus



**Formative assessment** is an ongoing aspect of the *Explore* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. In this lesson you will monitor students' developing understanding of:

- their personal growth and change of from babyhood until now.

## Key lesson outcomes

### Students will be able to:

- identify and describe personal features of babies and children
- discuss and compare personal features with others
- represent personal growth and changes from birth through labelled diagrams.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

## Teacher background information

### Human growth

Some features change very little as a person grows. This can help when matching photos of people at different ages. For example, the shape of a person's eyes remains relatively constant as they grow. Similarly, some people will have similar facial expressions as they age. For example, the particular muscles used to smile will affect the shape of the lips and eyes. These particular shapes often will not change significantly as a person ages.

### Common features

Every type of living thing shares a set of common features. It is these features that distinguish it from other types of living things. For example, all types of birds have feathers. Within each broad group of living things are smaller groups which share characteristics which are different to the other groups. For example, pelicans are large birds with white and black feathers, large yellow eyes and a large pouch under their beaks. Individuals within a species will have many features in common but there is some variation.

### Inheritance of characteristics

Each living thing is made up of cells. These cells contain genes which define the features of the individual. When two individuals within a species reproduce, they both pass on some of their genetic material to the new individual. This combination means that the offspring displays some characteristics similar to its father and some similar to its mother. There are multiple factors that determine which characteristics appear in the offspring, including statistical chance and the dominance of some characteristics over others.

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- photos of students and teachers when they were younger
- photos of animals as babies and adults

### FOR EACH STUDENT

- science journal
- their own baby photo and birth information (see 'Information note for families' Resource sheet 2)
- 1 plastic mirror
- *Optional:* tape measures to measure student height, class set of scales to measure mass

## Preparation

- Read 'How to facilitate evidence-based discussions' (Appendix 4).
- Collate files, photocopy and/or scan the baby photos or drawings of students and staff members and print a copy of each or display in a digital format.

For students who do not have a photo or drawing of when they were a baby, provide them with an extra copy of a class member's baby photo and ask them to draw that class member for the activity in lesson step 6.

- Prepare two pages in the class science journal entitled 'My face now' and 'My baby face'.

## Lesson steps



- 1 Review students' thoughts about people from Lesson 1 in the class science journal.
- 2 Display students' baby photos. Choose one photo at a time and ask students to identify who they think it is. Discuss with students how they think they can identify each person. Ask questions such as:
  - In what ways do you think that each person is the same as when they were young?
  - In what ways do you think that each person is different now?
- 3 Show students the photos of other staff members and ask them to try to identify the people in the photos. Discuss the fact that the photos were taken several years ago. Ask students how they think they can tell who the staff members are. Discuss how the staff members have changed and how they are the same in the photos.
- 4 Explain that students will be looking closely at their own face and that of their baby photo. Students will be comparing their features from when they were a baby to their features now to look for what is the same and what is different. Ask students what they think 'features' means and add to the class word wall.
- 5 Ask students for their ideas about why there would be similarities and differences from the time they were babies and now and record responses in the class science journal.
- 6 Explain that students will draw their features and label them. Discuss the purpose and features of a labelled diagram.



### Literacy focus

#### Why do we use a labelled diagram?

We use a **labelled diagram** to show the shape, size and features of an object.

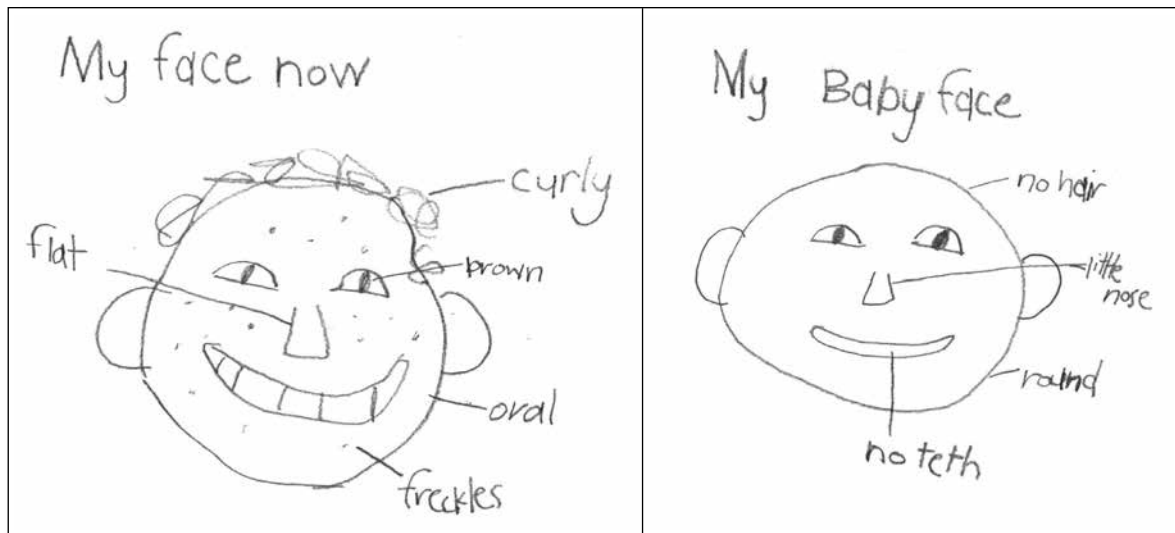
#### What does a labelled diagram include?

A **labelled diagram** might include a title, a drawing, a scale to show the object's size and labels showing the main features. A line or arrow connects the label to the feature.

- 7 Model in the class science journal how students will draw their own features on one page of their science journal using a mirror. Discuss with students which features they might focus on, such as:
  - hair colour
  - eye colour
  - nose shape
  - freckles.

Explain that students will then draw their features from their baby photo on the next page of their science journal.

- 8 Provide students with a mirror and allow time to complete the activity.



Work sample of a labelled diagram of faces

- 9 Ask students to record their birth information below their baby drawings.



*Optional:* Ask students measure their height and mass and add to their drawings of themselves today.



- 10 Invite students to share corresponding descriptions of one of their features and that of their baby photo or height and weight information. For example, 'I have lots of freckles on my nose but when I was a baby I had none.' 'I was only 43cm when I was a baby and I am now 120cm tall.'



- 11 Ask students questions such as:

- Which features were similar between your baby photo and your face now?
- Which features were different?
- Why do you think you have different features?
- What features will change when you get older?
- Do you think you will ever stop growing? When? Why?
- Why was your birth length recorded and not height?

Encourage students in the audience to use 'Science question starters' (see Appendix 4) to ask students about their conclusions. Record students' answers in the class science journal.

- 12 Update the word wall with words and images.

## Australian Curriculum links

### Mathematics

- Model the weight of students as babies with books on a set of scales and compare with their current weight.
- Record students heights on a chart and compare to measurements taken later in the year.

# Lesson 4 Egg detectives

## AT A GLANCE

To provide shared experiences of matching eggs with parents, using evidence.

Students

- work in collaborative learning teams to match eggs with their parents
- discuss evidence for which eggs match with which parents.

## Lesson focus

The *Explore* phase is designed to provide students with hands-on experiences of the science phenomenon. Students explore ideas, collect evidence, discuss their observations and keep records such as science journal entries. The *Explore* phase ensures all students have a shared experience that can be discussed and explained in the *Explain* phase.

EXPLORE

## Assessment focus



**Formative assessment** is an ongoing aspect of the *Explore* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. In this lesson you will monitor students' developing understanding of:

- how living things have offspring that grow into adults similar to themselves.

## Key lesson outcomes

Students will be able to:
• sort images of animal parents and their eggs
• describe similarities and differences between animals and their parents
• work in collaborative learning teams to discuss, using picture cards, which parents laid which eggs, using clues from the environment
• discuss similarities and differences between the early life stages of different animals.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii).

## Teacher background information

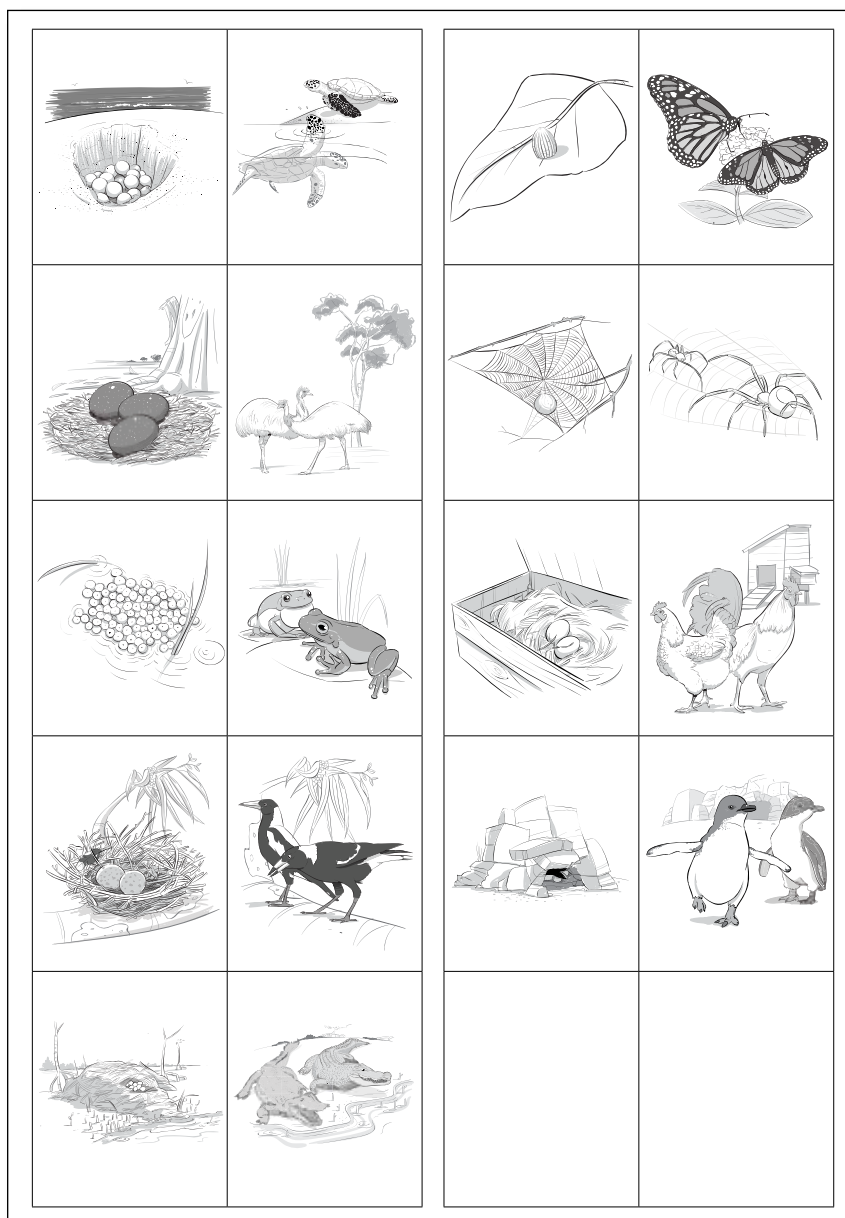
### Eggs

All animals begin life as eggs, sometimes this egg develops and changes inside the mother, and sometimes the egg is laid by the mother and continues development in the outside environment.

Most animals require the egg to be fertilised by a male of the same species before the egg can develop into an individual. Some animals such as chickens will lay eggs without a male present, but these eggs are not fertilised and therefore do not contain a developing chick.

Scientists sometimes discover eggs and need to use clues such as the nest site, size of the egg and the animal that comes to protect them to work out which animal the eggs belong to. Some animals, such as the cuckoo are sneaky and lay their eggs in other birds' nests for them to raise, so observing the adult that nurtures the egg is not always a sure way to know what animal will hatch from the egg. In order to determine what animal the egg comes from they need to wait and see the individual that emerges from the egg and track its development all the way through to an adult.

### Solutions to 'Whose egg?' (Resource sheet 4)





## Equipment

### FOR THE CLASS

- class science journal
- word wall
- team skills chart
- team roles chart
- 1 enlarged copy of 'Whose egg?' (Resource sheet 4)

### FOR EACH TEAM

- each team member's science journal
- role wristbands or badges for Manager and Speaker
- 1 copy of 'Whose egg?' (Resource sheet 4)

## Preparation

- Enlarge a copy of 'Whose egg?' (Resource sheet 4).
- *Optional:* Source animal eggs from a farm or unfertilized eggs from the supermarket, for example, chicken eggs, fish eggs (roe), duck eggs, or quail eggs.
- *Optional:* Display egg and parent images in a digital format.

## Lesson steps



- 1 Review the previous lesson using the class science journal and word wall, focusing students' attention on discussions about whether they look similar to when they were babies. Ask questions such as:
  - Do all animals have babies? Why do you think that?
  - Where do babies of different animals come from? (from eggs or from their mothers).

Record students' answers in the class science journal.



- 2 Introduce the first page of the enlarged copy of 'Whose egg?' (Resource sheet 4) and ask students questions about the eggs, such as:
  - What animal do you think laid this egg?
  - What do you think it looks like inside the egg?
  - Does an egg grow? (The outer shell of an egg remains the same size, but the animal within grows until it becomes too large for the shell to contain)
  - Where did the egg(s) come from?

*Optional:* Display some real eggs (see 'Preparation').

- 3 Introduce the second page of the enlarged copy of 'Whose egg?' (Resource sheet 4) and ask students questions about the animals, such as:
  - Which animals do you think produced the eggs?
  - Why do you think that?



- Explain that each egg card has a matching animal card but that there are more animal cards than egg cards.
- 4** Explain that students are going to work in collaborative learning teams to discuss which eggs came from which parents by looking for clues in the pictures. Ask students to cut out the cards and group the eggs with their parents.

- 5** Form teams and allocate roles. Ask Managers to collect team equipment. Allow time for teams to complete the activity.



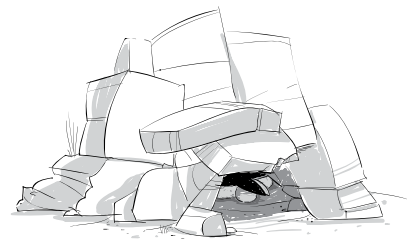
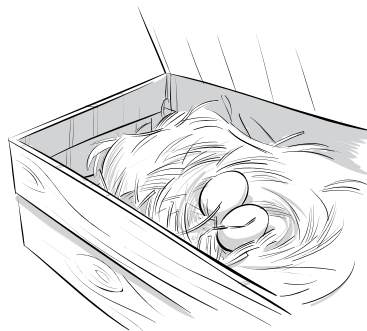
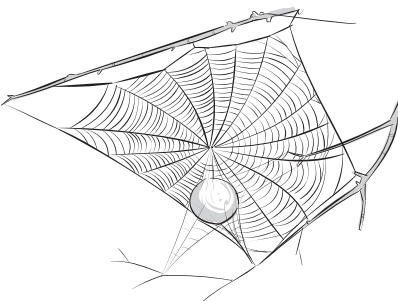
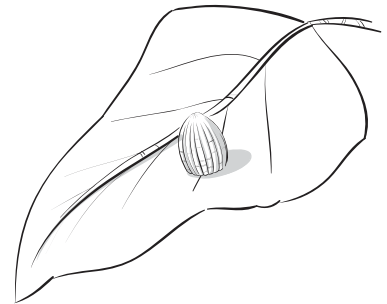
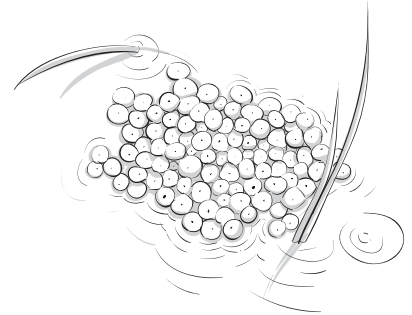
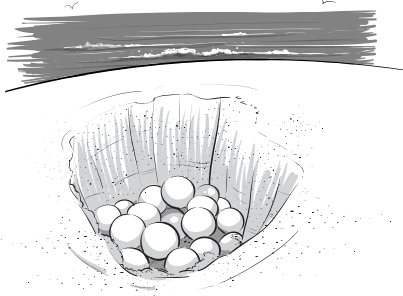
- 6** Invite teams to share their evidence for why they matched each egg and parents. Ask teams questions such as:

- What evidence helped you decide which animal the egg came from?
- Are there any animals you think don't lay eggs? Why do you think that?
- If you found an egg, how could you find out what its parents looked like? (By waiting to see what it grows into)
- What other animals lay eggs or don't lay eggs?

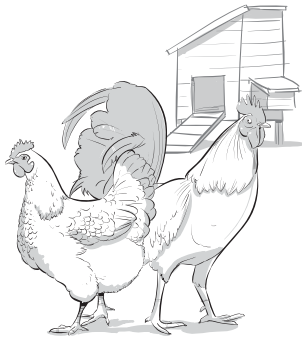
Encourage students in the audience to use 'Science question starters' (see Appendix 4) to ask students about their conclusions. Record students' answers in the science journal.

- 7** Update the word wall with words and images.

# Whose egg?



# Whose egg?



**chicken**



**emu**



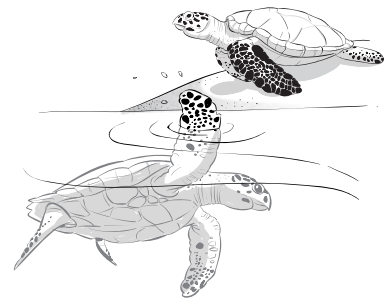
**cat**



**magpie**



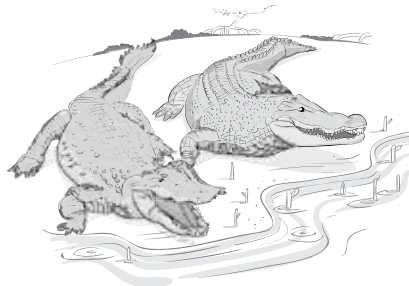
**frog**



**turtle**



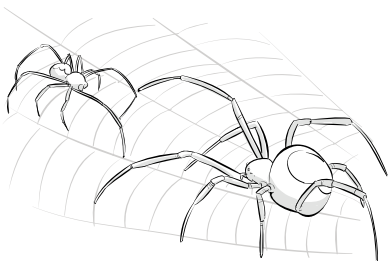
**butterfly**



**crocodile**



**little penguin**



**spider**



**possum**



**kangaroo**

# Lesson 5 Life stage stories

## AT A GLANCE

To support students to represent and explain their understanding about the way living things grow, change and have offspring similar to themselves, and to introduce current scientific views.

### Session 1 One step at a time

Students

- produce a visual representation of the life stages of mealworms and humans
- arrange the life stages of different animals in order and present to the class
- discuss how some animals change a lot as they grow but others don't.

### Session 2 Playing the game

Students

- sort different stages in animals' lives through a card game
- review their answers on the Agree/Disagree charts.

EXPLAIN

## Lesson focus

In the *Explain* phase students develop a literacy product to represent their developing understanding. They discuss and identify patterns and relationships within their observations. Students consider the current views of scientists and deepen their own understanding.

## Assessment focus



**Formative assessment** is an important aspect of the *Explain* phase. It involves monitoring students' developing understanding and giving feedback that extends their learning. In this lesson you are looking for evidence that students are developing an understanding about how:

- living things grow, change and have offspring similar to themselves.

You are also able to look for evidence of students' sorted images to represent what they know about different life stages, and give them feedback on how they can improve their representations.

# Key lesson outcomes

Students will be able to:
• sort life stages of living things into linear sequences
• observe and compare the similarities and differences among the life stages of different animals, including those that metamorphose
• identify the pattern of birth, growth and development, reproduction and death of animals
• listen to and follow a set of rules when learning a new game
• describe life stages using formal terms such as egg, larva, pupa and adult or baby, child, adult.
• identify the stage of growth of the giant wood moth that Indigenous people sometimes eat.

This lesson also provides opportunities to monitor the development of students’ general capabilities (highlighted through icons, see page xii).

## Teacher background information

### Different life stages

Different types of living things experience different stages in their life cycles. Some animals, such as humans, have simple life stages. When they are born they have a very similar body structure to when they are fully grown. Similarly, animals such as snakes and birds maintain their structure after hatching from their eggs.

Other animals undergo a more dramatic change during their lives. This is called metamorphosis. Examples of animals that undergo metamorphosis are frogs, butterflies and cicadas. Frogs and other amphibians experience metamorphosis which changes their body systems from living in water to living on land. This allows them to take advantage of different habitats.

Many insects undergo incomplete metamorphosis because the young are relatively similar to the adults. However, they shed their skins or moult as they grow and change slightly with each moult. The changes might be as simple as a change in the number of segments in the body. Grasshoppers, cockroaches and dragonflies all experience incomplete metamorphosis.

Some insects, such as silkworms, experience complete metamorphosis. After hatching from eggs they spend some time as larvae, which are often like caterpillars. During this time, the insects are active; they often eat large amounts of food and grow rapidly. They then experience an inactive period where they form pupae. In this phase the insects change from the larval forms to adults. Some species, including silkworms, spin a protective covering for the pupa, called a cocoon. The adult insect emerges from the pupa after a period of duration between two weeks and several months.

EXPLAIN

# Session 1 One step at a time

## Equipment

### FOR THE CLASS

- word wall
- class science journal
- 1 enlarged copy of 'Mixed up lives' (Resource sheet 5)
- 1 enlarged copy of 'Different life stages' (Resource sheet 6)
- 1 large picture of a witjuti grub

### FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- 1 copy of 'Different life stages' (Resource sheet 6)
- 1 A3 sheet of paper per team member

## Preparation

- Prepare an enlarged copy of 'Mixed up lives' (Resource sheet 5) and cut the pictures into cards that can be sorted.
- Prepare an enlarged copy of 'Difference life stages' (Resource sheet 6). Note that on Sheet 1 there are four life stages shown vertically these all undergo metamorphosis, and on Sheet 2 there are three life stages shown horizontally.
- Find a large picture of a witjuti grub.
- *Optional:* Display 'Mixed up lives' (Resource sheet 5) and the picture of the witjuti grub in a digital format.

## Lesson steps



- 1 Review the previous lessons using the class science journal and word wall, focussing students' attention on the observations they have made of the mealworms and themselves since Lesson 2. Ask students what is similar and different about the life stages of the mealworms and themselves. Record students' ideas in the class science journal.
- 2 Introduce the cut up pictures from the enlarged copy of 'Mixed up lives' (Resource sheet 5, see 'Preparation'). Ask students which pictures they think show life stages of a mealworm and which show life stages of a human.
- 3 Ask students which picture they think shows the first stage of the life of a mealworm. Ask students to discuss why they think that. Paste it in the class science journal.
- 4 Ask students which picture they think shows the next stage of the mealworm's life and why they think that. Paste it next to the first picture. Ask students if they know what these are called (caterpillars or larvae). Draw a connecting arrow from the picture of the eggs to the picture of the larvae.





**5** Continue until all four pictures have been added to the science journal. Ask students questions such as:

- Why are there arrows between the stages?
- What eventually happens to the adult mealworm?
- Where do the eggs come from?

**6** Repeat Lesson steps 4–6 for the pictures of human life stages.



**7** Introduce the enlarged copy of 'Different life stages' (Resource sheet 6). Explain that each strip of pictures shows stages in the life cycle of an animal but they are mixed up. Explain that students will be working in collaborative learning teams to put the pictures in the correct order to show the life stages of the animal. Each team member will use blue tack to stick their pictures onto an A3 sheet of paper.

**8** Model the way to complete one animal's life story in the class science journal. Discuss words students might use to label their life stories and write them on the word wall. For example, egg, larva, pupa and adult; or newborn, young and adult.

**9** Form teams and allocate roles. Allow teams time to complete the activity.



**10** Allow time for each team to present one of the life stories. Encourage students in the audience to use 'Science question starters' (see Appendix 4) to ask students about their conclusions, and to explain if they agree or disagree.



**11** As a class, compare the life stories of different animals by asking questions such as:

- Which life story is similar to this one? Why do you think that?
- Which animals have very different life stories? What is different about them?

Discuss with students how some adults look very different from when they are young, for example, mealworms. Explain that their bodies change to adult form while they are inside a casing during the pupa stage. Explain that scientists call this change 'metamorphosis'. Ask students which animals that they have looked at go through metamorphosis. Add the term 'metamorphosis' to the class word wall.

**12** Record what students have learned in the class science journal.

**13** Show the students a picture of a witjuti grub. Explain to students that these are called witjuti grubs and are eaten by some Indigenous people either raw or roasted. Explain to students that Indigenous people have worked out which stage of an animal's life is the best time to eat it. Explain to students that the witjuti grub is one of the life stages of a giant wood moth. Ask students which part of the giant wood moth's life stages the witjuti grub is from (larva).

*Optional:* Watch a video on Indigenous people digging, roasting and eating witjuti grubs.

**14** Update the word wall with words and images.

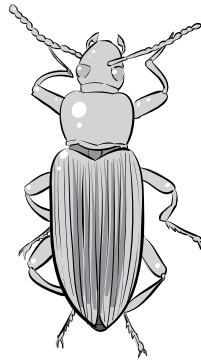
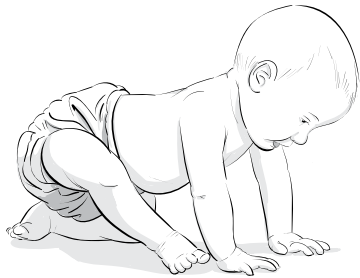
## Australian Curriculum links

### Information and communication technology

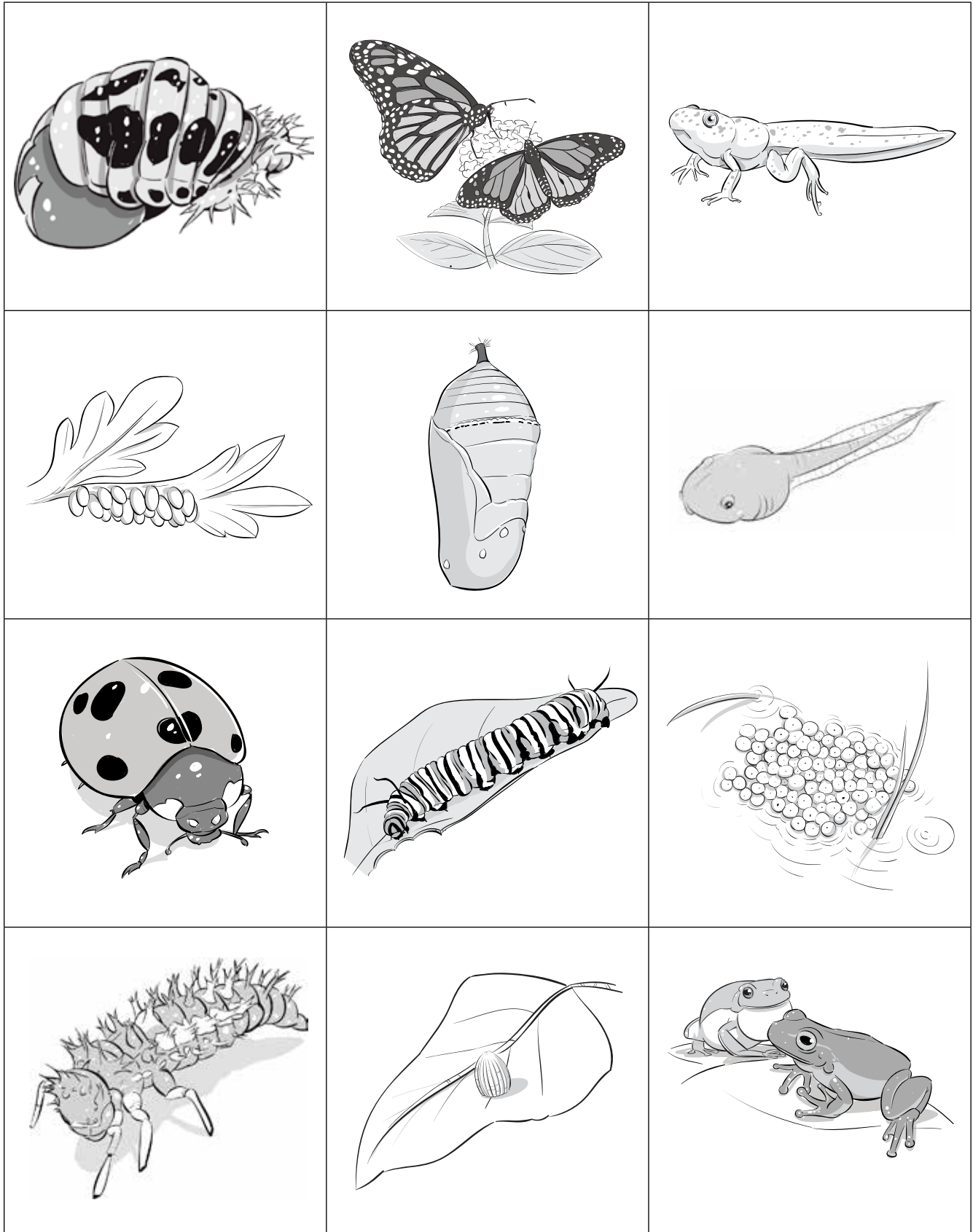
- Take photos of life stages of mealworms or any other animals studied in the classroom and present a PowerPoint presentation of the animal's life stages.



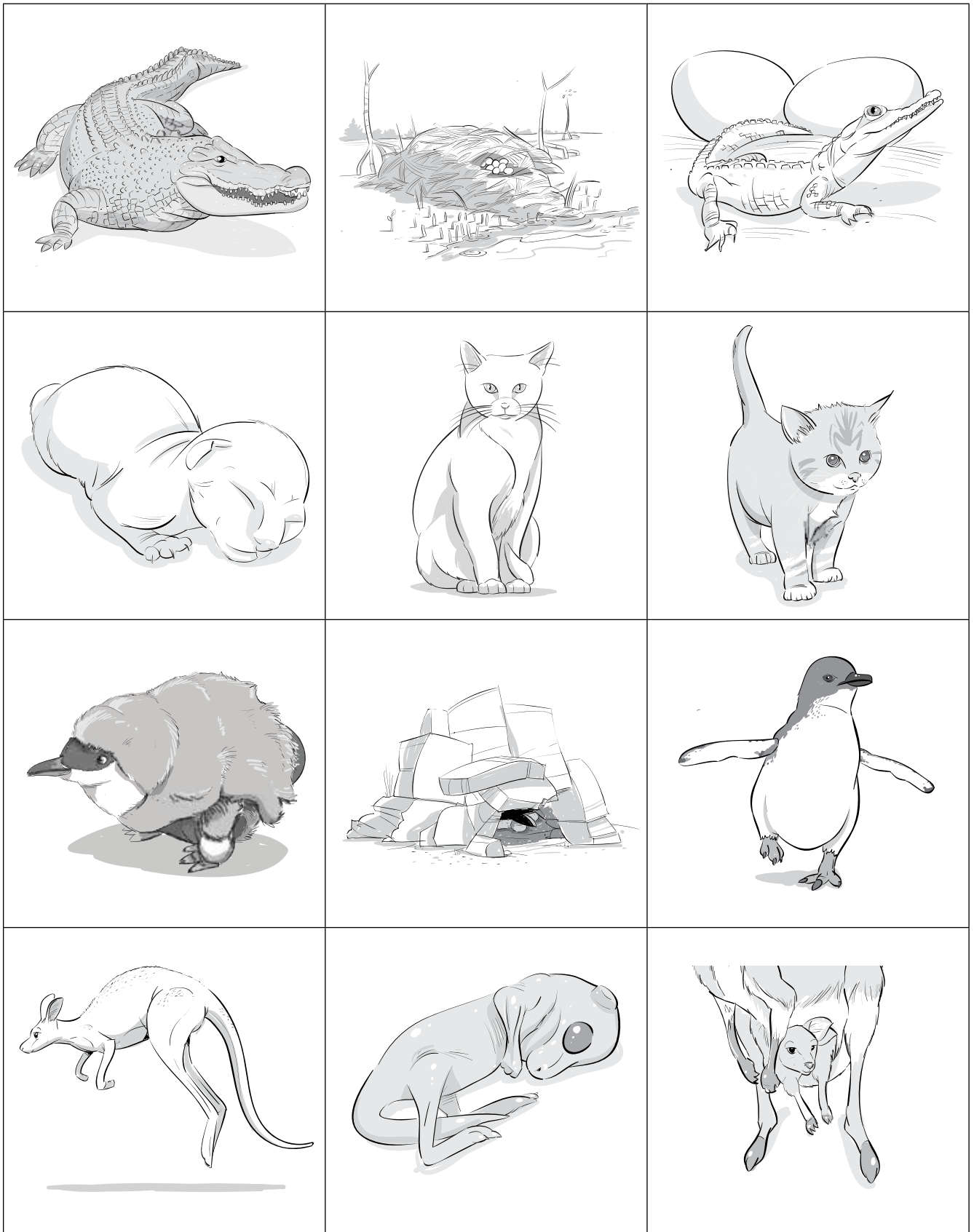
# Mixed up lives



## Different life stages



## Different life stages



# Session 2 Playing the game

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- research materials (see 'Preparation')

### FOR EACH TWO TEAMS

- each team member's science journal
- role wristbands or badges or Manager and Speaker
- 1 set of 'Animal life stages' cards (see 'Preparation')

## Preparation

- Prepare one set of 'Animal life stages' cards for each pair of teams by combining cards from 'Mixed up lives' (Resource sheet 5) and 'Different life stages' cards (Resource sheet 6).
- Prepare research materials for students to learn about life stages of different animals. Include different text types including books, posters and multimedia materials.
- Read the following instructions on how to play the game:
  - 1 Shuffle all the cards.
  - 2 Put all the cards face down in a pile in front of the players.
  - 3 Choose who will go first.
  - 4 The first player turns over one card and places it in front of them.
  - 5 The player then turns over another card. If the card shows the next stage of the animal's life, the player keeps the card and plays again. If it is not the next stage, the player puts that card back at the bottom of the pile, and then it is the next person's turn.
  - 6 The next player has a turn. If they turn over a card showing an animal that another player has already collected they must put the card back and try again.
  - 7 The game continues until one player has collected all the stages of one animal's life in order.

## Lesson steps



- 1 Review the previous session using the class science journal and word wall, focusing students' attention on the different life stories of different animals. Ask questions such as:

- What are life stages?
- Why do you think they are called life stages?
- Is there a life stage after being an adult?

Record students' answers in the class science journal.

- 2 Explain that the class will be playing a card game about living things and their life stages. Introduce the compiled 'Animal life stages cards' (see 'Preparation') and discuss the pictures and which animals' life stages are represented.
- 3 Ask students what they know about card matching games that they have played at home or at school.

4 Discuss and model the rules of the game with the students (see 'Preparation').



5 Form teams and allocate roles. Organise pairs of teams to join together to play the game. Allow teams time to complete the game.



6 Discuss the game with the students. Ask students which animal they collected pictures of, what problems they had in the game, if they disagreed with anyone's collection of cards and why. Record students' thoughts in the class science journal.

7 Introduce the collected research materials (see 'Preparation'). Explain that students can use the materials to look at life stages of animals that they are interested in. Explain that students will have the opportunity to present information about an animal of their choice in the *Evaluate* lesson.



8 Review the Agree/Disagree charts from Lesson 1. Ask students if they agree with their original ideas or if they would like to change their mind. Discuss with students why they are changing their mind and ask them to write their name in the column under the answer they now agree with.

9 Update the word wall with words and images.

# Lesson 6 How many days?

## AT A GLANCE

To support students to represent and discuss their investigation of the growth of a mealworm under different temperature conditions.

Students

- share their observations of the growth of mealworms
- create class timelines to present patterns of mealworm growth
- discuss and interpret their observations.

## Lesson focus

In the *Elaborate* phase students plan and conduct an open investigation to apply and extend their new conceptual understanding in a new context. It is designed to challenge and extend students' Science Understanding and Science Inquiry Skills.

## Assessment focus



**Summative assessment** of the Science Inquiry Skills is an important focus of the *Elaborate* phase. Rubrics are available on the **PrimaryConnections** website to help you monitor students' inquiry skills.

## Key lesson outcomes

Students will be able to:
<ul style="list-style-type: none"><li>• use a range of methods to represent and sort information, including drawings, calendars and timelines</li></ul>
<ul style="list-style-type: none"><li>• through discussion, compare observations with predictions</li></ul>
<ul style="list-style-type: none"><li>• compare observations with those of others</li></ul>
<ul style="list-style-type: none"><li>• identify how temperature affects the growth of a mealworm</li></ul>
<ul style="list-style-type: none"><li>• discuss future questions for investigation.</li></ul>

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page v and xii).

## Teacher background information

Temperature is one factor that can affect the growth of living things. If the temperature is too low or too high the metabolic systems within the animal vary reducing the amount the animal will eat, so much so that it may lead to its death. The optimum growing temperature will vary for different organisms and different life stages. Some organisms and life stages require very specific temperatures between 33°C and 35°C for growth to occur, such as the eggs of the brush turkey. For other animals temperature can determine the gender of the offspring, for example, Green sea turtle eggs if incubated at less than 28.5°C will become males whilst those incubated at temperatures greater than 30.3°C become mostly females. In between these two temperatures there will be both genders.

Mealworms have an optimum growing temperature between 20°C and 25°C.

## Equipment

### FOR THE CLASS

- class science journal
- word wall
- team skills chart
- team roles chart
- mealworm stages cards (see 'Preparation')

### FOR EACH TEAM

- role wristbands or badges for Manager and Speaker
- each team member's science journal
- completed 'Mealworm calendar' (Resource sheet 3)

## Preparation

- Draw a table in the class science journal with the following headings:

Stage	Classroom	Refrigerator
larva		
pupa		
adult		

- Prepare mealworm stages cards by photocopying enough copies of 'Mealworm cards' (Resource sheet 7) to represent two timelines (see Lesson step 10). Depending on how quickly the mealworms have progressed in your classroom you will need between 2 and 4 copies of the Resource sheet per timeline.

Cut out the cards and place in sorted piles ready to create timelines. Prepare headings for the timelines, for example, 'Timeline of a mealworm in the classroom' and 'Timeline of a mealworm in the refrigerator'.

## Lesson steps



- 1 Review previous lessons using the class science journal and word wall, focusing students' attention on the investigation that they have been conducting since Lesson 2. Ask questions such as:

- Why did we start our investigation?
- What is our question for investigation?
- What did we change, measure and keep the same?



- 2 Review the mealworm life stages glued in the class science journal and the names for the different stages. Ask teams to review their observations recorded in their 'Mealworm calendar' (Resource sheet 3) and identify which drawings correspond to which stages of the mealworms' life story. Ask students to circle the different stages in different colours, for example, to circle the larva in red, the pupa in blue and the adult in green.



- 3 Explain that students will need to think about what the larvae looked like on the days they did not observe them, for example, weekends, and put a circle. Discuss how to decide what stage the mealworm was at, for example, if it was a larva on Friday and on Monday then it was a larva over the weekend. If students have a mealworm that changed stage between Friday and Monday, ask them to imagine it changed overnight on the Saturday.



- 4 Allow time for teams to complete the activity. Ask questions such as:

- That's interesting. Have you thought about...?
- Scientists think that .... What do you think now?

- 5 Introduce the table in the class science journal (see 'Preparation') and discuss the purpose and features of a table.

### Literacy focus

#### Why do we use a table?

We use a **table** to organise information so that we can understand it more easily.

#### What does a table include?

A **table** includes a title, columns with headings and information organised under each heading.



- 6 Indicate the cell of the table beneath 'classroom' and next to 'larva' and ask teams who have examined a mealworm at classroom temperature to count how many days their mealworm was a larva, for example, by counting the number of red circles. Record teams' answers in the table in the class science journal.

- 7 Repeat Lesson step 5 for each cell in the table.



- 8 As a class, review the table and discuss which number in each cell was the most popular/common (the mode). Highlight that number and explain that the class will use those numbers in order to represent the timelines of a mealworm in the classroom and a mealworm in the refrigerator.



- 9 Introduce the mealworm cards (see 'Preparation'). Explain that the class will be creating a timeline. Discuss the purpose and features of a timeline.

### Literacy focus

#### Why do we use a timeline?

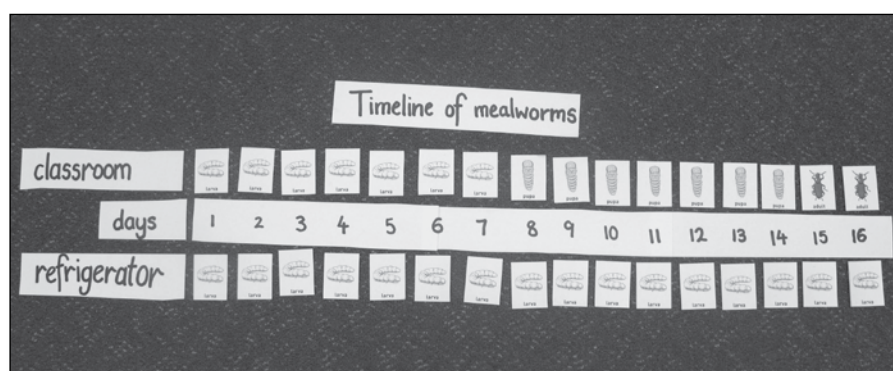
We use a **timeline** to show events in the order they happened and when they happened.

#### What does a timeline include?

A **timeline** includes a heading and an indication of the period of time covered. Each event is indicated on the **timeline** using words or symbols.



- 10 Create a timeline of a mealworm in the classroom on the floor, using the title (see 'Preparation'). Ask students to collect the same number of mealworm larva cards as the number of days highlighted in the relevant cell of the class table. Repeat for each stage.



Work sample of a timeline

- 11 Create a timeline of a mealworm in the refrigerator underneath the first timeline. As a class, compare the two timelines and ask questions such as:
- What is similar about the two timelines? (the number of stages, what the mealworms look like at each stage)
  - What is different about the two timelines? (the time spent in each stage)
  - What might explain the differences between the two timelines? (one mealworm was kept at a colder temperature than the other)

*Optional:* Ask each team to create a timeline of their own information.



- 12 Review the question for investigation 'What happens to the growth of mealworms when we change the temperature?' and discuss possible claims to answer the question, for example, 'When the temperature gets colder, mealworms take longer to grow'. Ask questions such as:
- If you want your mealworms to grow and change quickly, where would you keep them?
  - What season would be best to grow mealworms? Why do you think that?
  - Why do you think that pet shop owners, who need the mealworms to feed to other animals, keep their mealworms in the refrigerator?



- 13** Review the investigation, asking questions such as:
- What went well with our investigation?
  - What didn't go well? How could we have done it better?
  - What ideas do you have for another investigation about variables that affect the growth of animals?

Record students' ideas in the class science journal.

- 14** Update the word wall with words and images.

## Australian Curriculum links















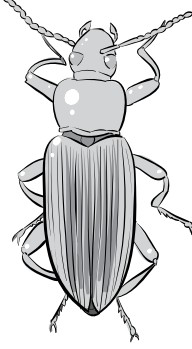
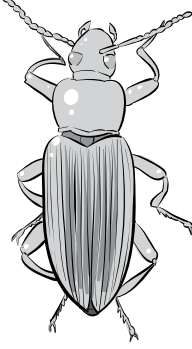
### Mathematics

- Sort animals from the life stages cards into those that metamorphose and those that don't and represent in a table.

### Information and communication technology

- Take photos of life stages of mealworms or any other animals studied in the classroom and present a PowerPoint presentation of the animal's life stages.

# Mealworm cards

			
<b>larva</b>	<b>larva</b>	<b>larva</b>	<b>larva</b>
			
<b>larva</b>	<b>larva</b>	<b>larva</b>	<b>larva</b>
			
<b>larva</b>	<b>larva</b>	<b>larva</b>	<b>pupa</b>
			
<b>pupa</b>	<b>pupa</b>	<b>adult</b>	<b>adult</b>

# Lesson 7 Life stage models

## AT A GLANCE

To provide opportunities for students to represent what they know about the way living things grow, change and have offspring similar to themselves, and to reflect on their learning during the unit.

Students

- produce a visual representation of the life stages of an animal
- present their information to the class.

## Lesson focus

In the *Evaluate* phase students reflect on their learning journey and create a literacy product to re-represent their conceptual understanding.

## Assessment focus



**Summative assessment** of the Science Understanding descriptions is an important aspect of the *Evaluate* phase. In this lesson you will be looking for evidence of the extent to which students understand the way:

- living things grow, change and have offspring similar to themselves.

Literacy products in this lesson provide useful work samples for assessment using the rubrics provided on the Primary**Connections** website.

## Key lesson outcomes

### Students will be able to:

- create and label 3D models to show their understanding of life stages
- present their models to others
- contribute to discussions and express their thoughts about their learning journey.

This lesson also provides opportunities to monitor the development of students' general capabilities (highlighted through icons, see page xii)

## Equipment

### FOR THE CLASS

- class science journal
- team skills chart
- team roles chart
- word wall
- 1 enlarged copy of 'Lots of labels' (Resource sheet 8)
- plasticine or play dough of different colours
- resource materials from Lesson 5, Session 2

### FOR EACH STUDENT

- science journal
- 1 copy of 'Lots of labels' (Resource sheet 8)
- A4 sheet of card or shoe box lid

## Preparation

- Prepare an area for each team to set up their 3D model display.

## Lesson steps



- 1 Review previous lessons using the class science journal and word wall. Review the Agree/Disagree charts from Lesson 1 and ask students if they agree with their original ideas or if they would like to change their mind. Discuss with students why they changed their mind and that learning is about developing new ideas.

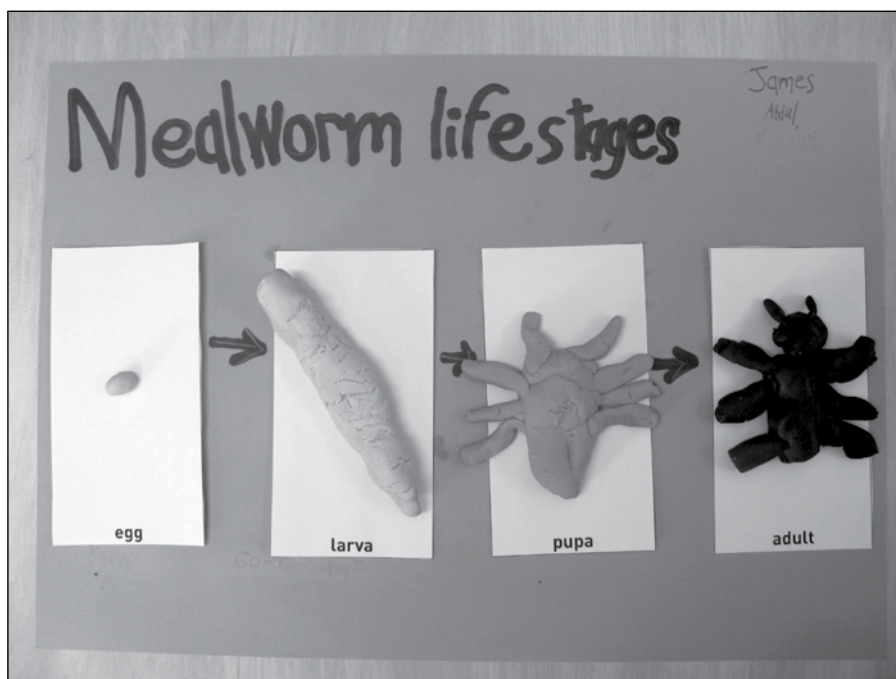


- 2 Explain that students will be working in collaborative learning teams to show what they have learnt by creating a 3D model of the life stages of an animal. Explain that it can be one of the animals they studied in Explain or another animal that they are interested in, for example, an animal they looked at in Lesson 5, Session 2.

- 3 Ask students to create a model of each of the life stages of the animal that they choose. Discuss the importance of accuracy when creating models, for example, if the animal has grown bigger then the model also needs to be bigger than the previous stage.

Explain that a model can be larger than a real life specimen so that its features can be shown easily.

- 4 Introduce the enlarged copy of 'Lots of labels' (Resource sheet 8) and explain that students will choose the label that fits each life stage that they have modelled. Ask students to place their 3D models on their label and then arrange them in order on their A4 sheet of card or shoebox lid. Advise students that not all labels will be used. Ask students to draw arrows to show how the animal passes from one stage to another.



**Work sample of 3D models with labels**

- 5 Introduce the research materials from Lesson 5, Session 2 and explain that students may refer to them when constructing their models.



- 6 Form teams and allocate roles. Ask Managers to collect team equipment.



- 7 Allow students time to plan, prepare and create their representations.

- 8 Invite teams to share their labelled models with the class. Encourage other students to ask questions and agree or disagree with the information given by the teams. Ask questions such as:

- What can you tell us about how your animal grows and changes?
- Does your animal undergo metamorphosis? Why do you think that?
- What would the baby of your animal look like?
- What would the adult of your animal look like?

Encourage students in the audience to use 'Science question starters' (see Appendix 4) to ask students about their conclusions.

*Optional:* Display the teams' models in the school library.



- 9 Discuss the unit with the class, asking questions such as:

- What were the most interesting things you have learned about how things grow and change?
- What helped you to learn?
- What are you still wondering about?

## Australian Curriculum links

### English

- Ask students to construct videos, for example, using Claymation, of the life stages of their model.

### Science

- Present a mime of an animal developing through its life stages.

## Lots of labels

<b>adult</b>	<b>egg</b>	<b>young</b>
<b>newborn</b>	<b>larva</b>	<b>pupa</b>



## Appendix 1

### How to organise collaborative learning teams (Foundation–Year 2)

#### Introduction

Students working in collaborative teams is a key feature of the Primary **Connections** inquiry-based program. By working in collaborative teams students are able to:

- communicate and compare their ideas with one another
- build on one another's ideas
- discuss and debate these ideas
- revise and rethink their reasoning
- present their final team understanding through multi-modal representations.

Opportunities for working in collaborative learning teams are highlighted throughout the unit.

Students need to be taught how to work collaboratively. They need to work together regularly to develop effective group learning skills.

#### Team structure

The first step towards teaching students to work collaboratively is to organise the team composition, roles and skills. Use the following ideas when planning collaborative learning with your class:

- Assign students to teams rather than allowing them to choose partners.
- Vary the composition of each team. Give students opportunities to work with others who might be of a different ability level, gender or cultural background.
- Keep teams together for two or more lessons so that students have enough time to learn to work together successfully.
- If you cannot divide the students in your class into teams of three, form two teams of two students rather than one team of four. It is difficult for students to work together effectively in larger groups.
- Keep a record of the students who have worked together as a team so that by the end of the year each student has worked with as many others as possible.

#### Team roles

Students are assigned roles within their team (see below). Each team member has a specific role but all members share leadership responsibilities. Each member is accountable for the performance of the team and should be able to explain how the team obtained its results. Students must therefore be concerned with the performance of all team members. It is important to rotate team jobs each time a team works together so that all students have an opportunity to perform different roles.

For Foundation–Year 2, teams consist of two students—Manager and Speaker. (For Year 3–Year 6, the teams consist of three students—Director, Manager and Speaker). Each member of the team should wear something that identifies them as belonging to that role, for example, a colour-coded peg, badge or wristband. This makes it easier for you to identify which role each student is doing and it is easier for the students to remember what they and their team members should be doing.

### Manager

The Manager is responsible for collecting and returning the team's equipment.

The Manager also tells the teacher if any equipment is damaged or broken. All team members are responsible for clearing up after an activity and getting the equipment ready to return to the equipment table.

### Speaker

The Speaker is responsible for asking the teacher or another team's Speaker for help.

If the team cannot resolve a question or decide how to follow a procedure, the Speaker is the only person who may leave the team and seek help. The Speaker shares any information they obtain with team members. The teacher may speak to all team members, not just to the Speaker. The Speaker is not the only person who reports to the class; each team member should be able to report on the team's results.

### Director (Year 3–Year 6)

The Director is responsible for making sure that the team understands the team investigation and helps team members focus on each step. The Director is also responsible for offering encouragement and support. When the team has finished, the Director helps team members check that they have accomplished the investigation successfully. The Director provides guidance but is not the team leader.

## Team skills

PrimaryConnections focuses on social skills that will help students work in collaborative teams and communicate more effectively.

Students will practise the following team skills throughout the year:

- Move into your teams quickly and quietly
- Speak softly
- Stay with your team
- Take turns
- Perform your role

To help reinforce these skills, display enlarged copies of the team skills chart (see the end of this Appendix) in a prominent place in the classroom.

The development of these team skills aligns to descriptions in the Australian Curriculum: English. See page 7.



### Supporting equity

In science lessons, there can be a tendency for boys to manipulate materials and girls to record results. PrimaryConnections tries to avoid traditional social stereotyping by encouraging all students, irrespective of their gender, to maximise their learning potential. Collaborative learning encourages each student to participate in all aspects of team activities, including handling the equipment and taking intellectual risks.

Observe students when they are working in their collaborative teams and ensure that both girls and boys are participating in the hands-on activities.

# **TEAM SKILLS**

- 1 Move into your teams quickly and quietly**
- 2 Speak softly**
- 3 Stay with your team**
- 4 Take turns**
- 5 Perform your role**

# TEAM ROLES

## **Manager**

Collects and returns all materials the team needs

## **Speaker**

Asks the teacher and other team speakers for help

## Appendix 2

### How to use a science journal

#### Introduction

A science journal is a record of observations, experiences and reflections. It contains a series of dated, chronological entries. It can include written text, drawings, labelled diagrams, photographs, tables and graphs.

Using a science journal provides an opportunity for students to be engaged in a real science situation as they keep a record of their observations, ideas and thoughts about science activities. Students can use their science journals as a useful self-assessment tool as they reflect on their learning and how their ideas have changed and developed during a unit.

Monitoring students' journals allows you to identify students' alternative conceptions, find evidence of students' learning and plan future learning activities in science and literacy.

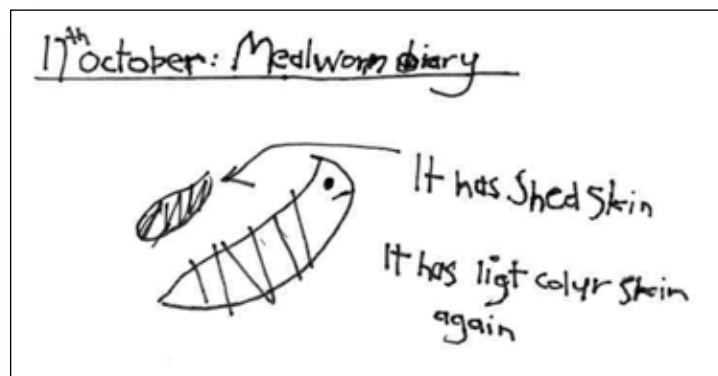
Representing their ideas in a science journal gives students a purposeful task for writing and reading in English. For additional information on how to help students who are learners of English as an additional language or dialect, please see the Australian Curriculum resources.

#### Using a science journal

- 1** At the start of the year, or before starting a science unit, provide each student with a notebook or exercise book for their science journal or use an electronic format. Tailor the type of journal to fit the needs of your classroom. Explain to students that they will use their journals to keep a record of their observations, ideas and thoughts about science activities. Emphasise the importance of including pictorial representations as well as written entries.
- 2** Use a large project book or A3 paper to make a class science journal. This can be used at all Stages to model journal entries. With younger students, the class science journal can be used more frequently than individual journals and can take the place of individual journals.
- 3** Make time to use the science journal. Provide opportunities for students to plan procedures and record predictions, and their reasons for predictions, before an activity. Use the journal to record observations during an activity and reflect afterwards, including comparing ideas and findings with initial predictions and reasons. It is important to encourage students to provide evidence that supports their ideas, reasons and reflections.
- 4** Provide guidelines in the form of questions and headings and facilitate discussion about recording strategies, for example, note-making, lists, tables and concept maps. Use the class science journal to show students how they can modify and improve their recording strategies.
- 5** Science journal entries can include narrative, poetry and prose as students represent their ideas in a range of styles and forms.
- 6** In science journal work, you can refer students to display charts, pictures, diagrams, word walls and phrases about the topic displayed around the classroom. Revisit and revise this material during the unit. Explore the vocabulary, visual texts and ideas that have developed from the science unit, and encourage students to use them in their science journals.

- 7 Combine the use of resource sheets with journal entries. After students have pasted their completed resource sheets in their journal, they might like to add their own drawings and reflections.
- 8 Use the science journal to assess student learning in both science and literacy. For example, during the *Engage* phase, use journal entries for diagnostic assessment as you determine students' prior knowledge.
- 9 Discuss the importance of entries in the science journal during the *Explain* and *Evaluate* phases. Demonstrate how the information in the journal will help students develop literacy products, such as posters, brochures, letters and oral or written presentations.

**Watch it grow!** science journal entries



From young to old Watch me grow!

Name: Candice Date: 17 October

younger		now	older	
very little egg	little larva	mealworm	cocoon pupa inside	butterfly wings
baby	bigger			old man

PrimaryConnections®  
Working towards excellence

Resource sheet 1

## Appendix 3

### How to use a word wall

#### Introduction

A word wall is an organised collection of words and images displayed in the classroom. It supports the development of vocabulary related to a particular topic and provides a reference for students. The content of the word wall can be words that students see, hear and use in their reading, writing, speaking, listening and viewing.

#### Goals in using a word wall

A word wall can be used to:

- support science and literacy experiences of reading, viewing, writing and speaking
- provide support for students during literacy activities across all key learning areas
- promote independence in students as they develop their literacy skills
- provide a visual representation to help students see patterns in words and decode them
- develop a growing bank of words that students can spell, read and/or use in writing tasks
- provide ongoing support for the various levels of academic ability in the class
- teach the strategy of using word sources as a real-life strategy.

#### Organisation

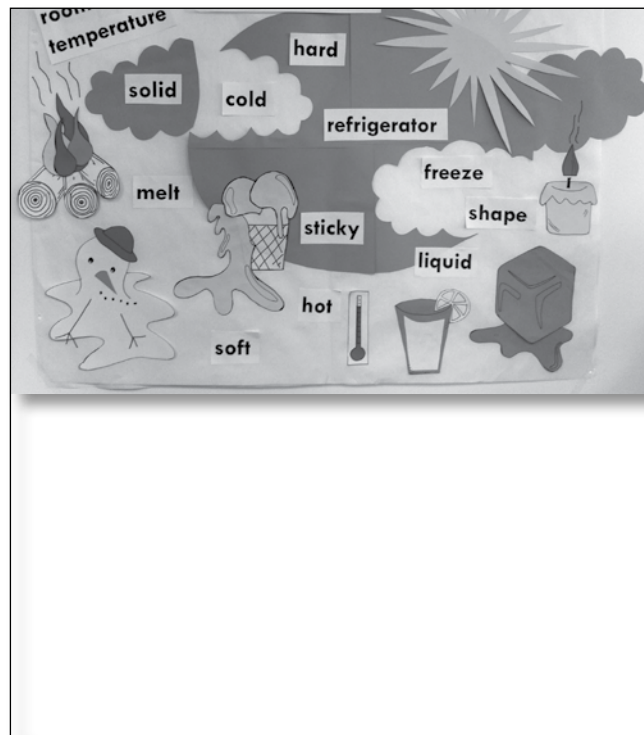
Position the word wall so that students have easy access to the words. They need to be able to see, remove and return word cards to the wall. A classroom could have one main word wall and two or three smaller ones, each with a different focus, for example, high-frequency words.

Choose robust material for the word cards. Write or type words on cardboard and perhaps laminate them. Consider covering the wall with felt-type material and backing each word card with a self-fastening dot to make it easy for students to remove and replace word cards.

Word walls do not need to be confined to a wall. Use a portable wall, display screen, shower curtain or window curtain. Consider a cardboard shape that fits with the unit, for example, an animal silhouette for an animal characteristics unit. The purpose is for students to be exposed to a print-rich environment that supports their science and literacy experiences.

Organise the words on the wall in a variety of ways. Place them alphabetically, or put them in word groups or groups suggested by the unit topic. For example, words for a *Watch it grow!* unit might be organised using headings, such as 'Mealworms', 'Parents and their eggs' or 'How we grow'.

Invite students to contribute words from different languages to the word wall. Group words about the same thing, for example, different names of the same animal, on the word wall so that students can make the connections. Identify the different languages used, for example, by using different coloured cards or pens to record the words.



***Watch it grow! word wall***

## Using a word wall

- 1** Limit the number of words to those needed to support the science and literacy experiences in the classroom.
- 2** Add words gradually, and include images where possible, such as drawings, diagrams or photographs. Build up the number of words on the word wall as students are introduced to the scientific vocabulary of the unit.
- 3** Encourage students to interact with the word wall. Practise using the words with students by reading them and playing word games. Refer to the words during science and literacy experiences and direct students to the wall when they need a word for writing. Encourage students to use the word wall to spell words correctly.
- 4** Use the word wall with the whole class, small groups and individually during literacy experiences. Organise multi-level activities to cater for the individual needs of students.



## Appendix 4

### How to facilitate evidence-based discussions

#### Introduction

Argumentation is at the heart of what scientists do—they pose questions, make claims, collect evidence, debate with other scientists and compare their ideas with others in the field.

In the primary science classroom, argumentation is about students:

- articulating and communicating their thinking and understanding to others
- sharing information and insights
- presenting their ideas and evidence
- receiving feedback (and giving feedback to others)
- finding flaws in their own and other's reasoning
- reflecting on how their ideas have changed.

It is through articulating, communicating and debating their ideas and arguments that students are able to develop a deep understanding of science content.

#### Establish norms

Introduce norms before starting a science discussion activity. For example:

- Listen when others speak
- Ask questions of each other
- Criticise ideas not people
- Discuss all ideas before selecting one.

#### Question, claim, evidence and reasoning

In science, arguments that make claims are supported by evidence. Sophisticated arguments follow the QCER process:

**Q** - What **question** are you trying to answer? For example, 'What happens to the growth of mealworms when we change the temperature?'

**C** - The **claim**. For example, 'Mealworms in colder places grow slower than mealworms in warmer places.'

**E** - The **evidence**. For example, 'We did a fair test and observed that the mealworms in the refrigerator were a larva for \_\_\_\_\_ days and the mealworms in the classroom were larva for \_\_\_\_\_ days.'

**R** - The **reasoning**. How the evidence supports the claim. In this unit, students are required to make claims and collect evidence only.

Students need to be encouraged to move from making claims only, to citing evidence to support their claims. Older students develop full conclusions that include a claim, evidence and reasoning. This is an important characteristic of the nature of science and an aspect of scientific literacy. Using science question starters (see next section) helps to promote evidence-based discussion in the classroom.

## Science question starters

Science question starters can be used to model how to discuss a claim and evidence for students. Teachers encourage team members to ask these questions of each other when preparing their claim and evidence. They might also be used by audience members when a team is presenting its results. (See *The PrimaryConnections* 5Es video, *Elaborate*).

### Science question starters

Question type	Question starter
<b>Asking for evidence</b>	I have a question about...? What is your evidence to support your claim? Do you have any other evidence to support your claim?
<b>Agreeing</b>	I agree with _____ because _____.
<b>Disagreeing</b>	I disagree with _____ because_____. One difference between my idea and yours is _____.
<b>Questioning more</b>	I wonder what would happen if...? I have a question about...? I wonder why...? What caused...? How would it be different if...? What do you think will happen if...?
<b>Clarifying</b>	I'm not sure what you meant there. Could you explain your thinking to me again?

# **DISCUSSION SKILLS**

- 1 Listen when others speak**
- 2 Ask questions of each other**
- 3 Criticise ideas not people**
- 4 Discuss all ideas before selecting one**

Appendix 5  
**Watch it grow! equipment list**

EQUIPMENT ITEM	QUANTITIES	LESSON		1	1	2	3	4	5	5	6	7
		SESSION	1	2	1	2			1	2		
<b>Equipment and materials</b>												
A4 card	3 per class			•								
A4 card	1 per team											•
A3 paper	2 per class			•								
A3 paper	1 per team member								•			
Animal life stages cards 'Mixed up lives' (RS5)	1 set per team									•		
bran	¼ cup per team					•						
butcher's paper	2 per class										•	
butcher's paper <i>optional</i>	1 per team										•	
camera <i>optional</i>	1 per class					•						
card or paper for labels	as required by teams											•
carrot (or potato)	1 piece per team					•						
container (plastic cup or small yoghurt tub)	2 per team		•			•						
eggs (various animals) <i>optional</i>	1 set per class		•					•				
equipment to house mealworms	1 per class					•						
magnifying glass	1 per team					•						
marker pen	1 per class					•						
mealworm (large)	2 per team					•						
'mealworms stages' cards (from RS6)	1 set per class		•								•	
mirror (20cm x 10cm)	1 per team						•					
photos of animals and their babies	1 set per class						•					
photos of younger students and teacher	1 set per class						•					
photo of each student when younger	1 per student						•					
Image of witjuti grub	1 per class								•			
plasticine or playdough (white, tan, brown, or black)	1 set per team											•
poster paper (code for caring)	1 per class					•						
research materials	per team											•
ruler or arbitrary measuring materials	1 per team					•						
scales for measuring body mass <i>optional</i>	1 per class							•				
scissors	1 per student									•		

EQUIPMENT ITEM	QUANTITIES	LESSON		1	2	3	4	5	5	6	7	
		SESSION										1
Equipment and materials (continued)												
self-adhesive notes	1 per student											
tape/glue/blu-tack	1 per student		●					●				
tape measure <i>optional</i>	1 per team			●								
thermometer	1 per class		●									
Resource sheets												
'From young to old' (RS1)	1 per student	●										
'From young to old' (RS1), enlarged	1 per class	●										
'Information note for families' (RS2)	1 per student	●										
'Information note for families' (RS2), enlarged	1 per class	●										
'Mealworm calendar' (RS3)	2 per team		●									
'Mealworm calendar' (RS3), enlarged	1 per class		●									
'Whose egg?' (RS4)	1 per team				●							
'Whose egg?' (RS4), enlarged	1 per class				●							
'Mixed up lives' (RS5), enlarged	1 per class							●				
'Different life stages' (RS6)	1 per team							●				
'Different life stages' (RS6), enlarged	1 per class							●				
'Lots of labels' (RS7)	1 per team									●		
'Lots of labels' (RS7) enlarged	1 per class									●		
Teaching tools												
class science journal	1 per class	●	●							●	●	
collaborative learning role badges	1 set per team		●				●	●	●	●	●	
collaborative learning team roles chart	1 per class				●		●	●	●	●	●	
collaborative learning team skills chart	1 per class				●		●	●	●	●	●	
student science journal	1 per student	●	●		●	●	●	●	●	●	●	
word wall	1 per class	●	●		●	●	●	●	●	●	●	

## Appendix 6

### Watch it grow! unit overview

LESSON SUMMARY		LESSON OUTCOMES*	ASSESSMENT OPPORTUNITIES
	Students	Students will be able to	
<b>ENGAGE</b>	<b>Lesson 1</b> How do they grow?	<ul style="list-style-type: none"> <li>• predict how living things will grow and change</li> <li>• create drawings of living things when they were younger and older</li> <li>• record their ideas about how living things grow, change and have offspring similar to themselves.</li> </ul>	<b>Diagnostic assessment</b> <ul style="list-style-type: none"> <li>• Science journal entries</li> <li>• Class discussions</li> <li>• Annotated drawings</li> <li>• Agree/Disagree charts</li> <li>• 'From young to old' (Resource sheet 1)</li> </ul>
	<b>Lesson 2</b> Diary of a mealworm	<ul style="list-style-type: none"> <li>• observe and describe the way a living thing changes as it grows</li> <li>• respond to and pose questions about how a mealworm develops</li> <li>• predict how temperature might affect the growth of an animal</li> <li>• participate in a guided investigation about the growth of mealworms under different temperature conditions</li> <li>• use appropriate measurement techniques to record their observations, including use of a calendar and accurate annotated drawings.</li> </ul>	<b>Formative assessment</b> <ul style="list-style-type: none"> <li>• Science journal entries</li> <li>• Class discussions</li> <li>• Line drawings</li> <li>• 'Mealworm calendar' (Resource sheet 3)</li> </ul>

\* These outcomes are aligned to relevant descriptions of the Australian Curriculum: Science and are provided at the beginning of each lesson.

	LESSON SUMMARY		LESSON OUTCOMES *	ASSESSMENT OPPORTUNITIES
	Students		Students will be able to	
EXPLORE	Lesson 3 Now and then	<ul style="list-style-type: none"><li>compare similarities and differences of their features from when they were a baby to now.</li></ul>	<ul style="list-style-type: none"><li>identify and describe personal features of babies and children</li><li>discuss and compare personal features with others</li><li>represent personal growth and changes from birth through labelled diagrams.</li></ul>	<b>Formative assessment</b> <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>Labelled diagrams</li><li>'Mealworm calendar' (Resource sheet 3)</li></ul>
EXPLORE	Lesson 4 Egg detectives	<ul style="list-style-type: none"><li>work in collaborative learning teams to match eggs with their parents</li><li>discuss evidence for which eggs match with which parents.</li></ul>	<ul style="list-style-type: none"><li>sort images of animal parents and their eggs</li><li>describe similarities and differences between animals and their parents</li><li>work in collaborative learning teams to discuss which parents laid which eggs, using clues from the environment</li><li>discuss similarities and differences between the early life stages of different animals.</li></ul>	<b>Formative assessment</b> <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>'Mealworm calendar' (Resource sheet 3)</li><li>'Whose egg?' (Resource sheet 4)</li></ul>

\* These outcomes are aligned to relevant descriptions of the Australian Curriculum: Science and are provided at the beginning of each lesson.

	LESSON SUMMARY		LESSON OUTCOMES*	ASSESSMENT OPPORTUNITIES
	Students		Students will be able to	
<div>EXPLAIN</div> <div>Lesson 5 Life stories</div>	<ul style="list-style-type: none"><li>produce a visual representation of the life stages of mealworms and humans</li><li>arrange the life stages of different animals in order and present to the class</li><li>discuss how some animals change a lot as they grow</li><li>sort different stages in animals' lives through a card game</li><li>review their answers on the Agree/Disagree charts.</li></ul>		<p>Students will be able to</p> <ul style="list-style-type: none"><li>sort life stages of living things into linear sequences</li><li>observe and compare the similarities and differences among the life stages of different animals, including those that metamorphose</li><li>identify the pattern of birth, growth and development, reproduction and death of animals</li><li>listen to and follow a set of rules when learning a new game</li><li>describe life stages using formal terms such as egg, larva, pupa and adult or baby, child, adult.</li><li>identify the stage of growth of the giant wood moth that Indigenous people sometimes eat.</li></ul>	<p><b>Formative assessment</b></p> <ul style="list-style-type: none"><li>Science journal entries</li><li>Class discussions</li><li>'Mixed up lives' (Resource sheet 5)</li><li>'Different life stages' (Resource sheet 6)</li><li>Agree/Disagree charts</li></ul>

\* These outcomes are aligned to relevant descriptions of the Australian Curriculum: Science and are provided at the beginning of each lesson.



		LESSON SUMMARY		LESSON OUTCOMES*	ASSESSMENT OPPORTUNITIES
		Students		Students will be able to	
ELABORATE	<b>Lesson 6</b> How many days?	<ul style="list-style-type: none"> <li>share their observations of the growth of mealworms</li> <li>create timelines to present patterns of mealworm growth</li> <li>discuss and interpret their observations.</li> </ul>		<ul style="list-style-type: none"> <li>use a range of methods to represent and sort information, including drawings, calendars and timelines</li> <li>through discussion, compare observations with predictions</li> <li>compare observations with those of others</li> <li>identify that temperature can affect the growth of a mealworm</li> <li>discuss future questions for investigation.</li> </ul>	<b>Summative assessment</b> of the Science Inquiry Skills <ul style="list-style-type: none"> <li>Science journal entries</li> <li>Class discussions</li> <li>'Mealworm calendar' (Resource sheet 3)</li> </ul>
	<b>Lesson 7</b> Life stage models	<ul style="list-style-type: none"> <li>produce a visual representation of the life stages of an animal</li> <li>present their information to the class.</li> </ul>		<ul style="list-style-type: none"> <li>create and label 3D models to show their understanding of life stages</li> <li>present their models to others</li> <li>contribute to discussions and express their thoughts about their learning journey.</li> </ul>	<b>Summative assessment</b> of the Science Understanding <ul style="list-style-type: none"> <li>Science journal entries</li> <li>Class discussions</li> <li>Labelled 3D models</li> <li>Presentations of models</li> </ul>

\* These outcomes are aligned to relevant descriptions of the Australian Curriculum: Science and are provided at the beginning of each lesson.

# PrimaryConnections Units

Year	Biological sciences	Chemical sciences	Earth and space sciences	Physical sciences
F	Staying alive	That's my hat!	Weather in my world	On the move
	Growing well	What's it made of?		
1	Schoolyard safari	Spot the difference	Changes all around	Look! Listen!
	Dinosaurs and more	Bend it! Stretch it!	Up, down and all around	
2	Watch it grow!	All mixed up	Water works	Machine makers
				Push-pull
3	Feathers, fur or leaves?	Melting moments	Night and day	Heating up
4	Plants in action	Material world	Beneath our feet	Magnetic moves
	Friends or foes?			Smooth moves
	Among the gum trees	Package it better		
5	Desert survivors	What's the matter?	Earth's place in space	Light shows
6	Marvellous micro-organisms	Change detectives	Creators and destroyers	Circuits and switches
	Rising salt		Earthquake explorers	Essential energy