TUMUT PUBLIC SCHOOL
SCIENCE AND TECHNOLOGY PROGRAM

Stage:	2	Year:	3&4	Unit Name:	Living World - Life Cycles and Survival	Term:	3	Duration:	10 Weeks

Unit Description	Inquiry Questions
This unit focuses on exploring the similarities and differences between the life cycles of living things, with a particular focus on fruit producing plants. Students will investigate the interrelationship between the environment and the survival of a range of flowering plants and the humble bee. Students will engage in a design challenge to propose a bee friendly garden for the school.	What are the similarities and differences between the life cycles of living things? How are environments and living things interdependent?

Outcomes	Working Scientifically → ST2-1WS-S	Design and Production → ST2-2DP-T
A student: ● questions, plans and conducts scientific investigations, collects and summarises data and communicates using scientific representations **ST2-1WS-S** ● selects and uses materials, tools and equipment to develop solutions for a need or opportunity **ST2-2DP-T** ● compares features and characteristics of living and non-living things **ST2-4LW-S** ○ identify that living things have life cycles ○ conduct an investigation into the life cycle of plants and/or animals ○ describe how living things depend on each other and the environment to survive, for example: ■ bees and flowers ■ birds eat and disperse seeds	The following **working scientifically skills** have been integrated into the unit: **Questioning and predicting** ● **Planning and conducting investigations** ● *plan scientific investigations with guidance* ● *conduct scientific investigations to find answers to questions* ● *use appropriate materials and equipment safely* ● *consider and apply the elements of fair tests* ● *collect and record accurate, honest observations using labelled observational drawings, basic formal measurements and digital technologies as appropriate* ● *reflect on investigations, including whether testing was fair or not* ● *participate individually and collaboratively with clear roles and goals* **Processing and analysing data** ● *use a range of methods to represent data, including tables and column graphs* ● *identify patterns and trends in gathered data* ● *compare results with predictions* ● *suggest possible reasons for findings* **Communicating** ● *represent and communicate observations, ideas and findings, using formal and informal representations*	The following **design and production skills** have been integrated into the unit: **Identifying and defining** ● *consider potential resources in defining design needs and opportunities* ● *investigate and research materials, components, tools and techniques to produce design solutions* **Researching and planning** ● *identify and define a design problem with consideration of practical and aesthetic needs* ● *consider sustainable use of resources and time constraints in planning design solutions* ● *develop, record and communicate design ideas and decisions using appropriate technical terms* ● *produce labelled and annotated drawings including digital graphic representations* **Producing and implementing** ● **Testing and evaluating** ●

Learning Across the Curriculum

The following highlighted Cross-Curriculum Priorities are embedded in this inquiry unit:

- Aboriginal and Torres Strait Islander Histories and Cultures
- Asia and Australia's engagement with Asia
- Sustainability

The following highlighted General Capabilities are embedded in this inquiry unit:

- Information and Communication Technologies
- Literacy
- Numeracy
- Critical and Creative Thinking
- Work and Enterprise
- Ethical Understanding
- Intercultural Understanding
- Difference and Diversity
- Personal and social capability
- Civics and citizenship

Thinking Skills

The following highlighted Thinking Skills are embedded in this inquiry unit:

Computational thinking – ComT

Computational thinking is a process where a problem is analysed and solved so that a human, machine or computer can effectively implement the solution. It involves using strategies to organise data logically, break down problems into parts, interpret patterns and design and implement algorithms to solve problems.

Design thinking – DesT

Design thinking is a process where a need or opportunity is identified and a design solution is developed. The consideration of economic, environmental and social impacts that result from designed solutions are core to design thinking. Design thinking methods can be used when trying to understand a problem, generate ideas and refine a design based on evaluation and testing.

Scientific thinking – SciT

Scientific thinking is purposeful thinking that has the objective to enhance knowledge. A scientific thinker raises questions and problems, observes and gathers data, draws conclusions based on evidence, tests conclusions, thinks with an open mind and communicates research findings appropriately.

Systems thinking – SysT

Systems thinking is an understanding of how related objects or components interact to influence how a system functions. Students are provided with opportunities to recognise the connectedness of, and interactions between phenomena, people, places and events in local and wider contexts and consider the impact of their decisions. Understanding the complexity of systems and the interdependence of components is important for scientific research and for the creation of solutions to technical, economic and social issues.

Curriculum Learning Links

Outcomes from other Key Learning Areas have been integrated to support the development of understanding and skills in this inquiry unit:

English:

→ Speaking and Listening 1 EN2-1A
→ Writing and Representing I EN2-2A
→ Grammar, Punctuation and Vocabulary EN2-9B
→ Thinking Imaginatively, Creatively and Interpretively EN2-10C

Mathematics:

→ Length MA2-9MG
→ Area MA2-10MG
→ Multiplication and Division MA2-6NA
→ Fractions and Decimals MA2-7NA
→ Position MA2-17MG
→ Addition and Subtraction MA2-5NA

Assessment For/ As/ Of Learning

Learning Sequence 1
Investigation - Cherry Tomatoes **Assessment For Learning ST2-1WS-S ST2-4LW-S**
Research Task: Life Cycles of Fruit Producing Plants **Assessment For Learning** and comparisons of life cycles **Assessment Of Learning ST2-1WS-S ST2-4LW-S**
Connect Extend Challenge reflection **Assessment As Learning ST2-4LW-S**
Learning Sequence 2
Research Task: The Honey Bee **Assessment For Learning ST2-1WS-S ST2-4LW-S**
Examining causal effects of the honey bee **Assessment Of Learning ST2-1WS-S ST2-4LW-S**
Bee Friendly Garden: Design Challenge **Assessment For Learning ST2-1WS-S ST2-4LW-S ST2-2DP-T**
Proposal to the Principal **Assessment Of Learning ST2-1WS-S ST2-4LW-S ST2-2DP-T**
3 2 1 Bridge reflection **Assessment As Learning ST2-4LW-S**

CONTENT FOCUS	LEARNING & TEACHING SEQUENCE - 1	EVALUATION	RESOURCES
What are the similarities and differences between the life cycles of living things? Students: ● identify that living things have life cycles ● conduct an investigation into the life cycle of plants and/or animals Curriculum Links: **English:** → Speaking and Listening 1 EN2-1A → Writing and Representing I EN2-2A → Grammar, Punctuation and Vocabulary EN2-9B → Thinking Imaginatively, Creatively and Interpretively EN2-10C	***Life Cycles of Living Things*** **Tuning In:** *What learning experiences will be used to spark curiosity, ascertain prior knowledge and understand student wonderings?* ❏ Watch the video Paper to Plants ❏ Display an image of the life cycle of a blackberry and use the thinking routine See Think Wonder to scaffold a discussion using the guiding prompts: ❏ *What do you see, observe or notice?* ❏ *Why do you think this was represented this way?* ❏ *What other plants do you think follow this same pattern of growth?* ❏ *What do you wonder?*  ❏ Display the term life cycle and use the thinking routine Think Puzzle Explore to unpack its meaning and student understanding using the following guiding prompts: ❏ *What do you think the term 'life cycle' means? **exploring the meaning of both words*** ❏ *What questions or puzzles do you have about 'life cycles'?* ❏ *How might we explore the similarities and differences between the life cycle of familiar living things?* ❏ Exploring Vocabulary: Develop a shared definition for the term Life Cycles and display. (**LINK: English**) **Shared Inquiry:** *What learning experiences and questions will be used to develop understanding and skills? What assessment opportunities will help us monitor student learning and inform future practice? What differentiation (Support/ Extension) will be needed?* ❏ Introduce the inquiry question: *What are the similarities and differences between the life cycles of living things?* ❏ Pose the questions: *What makes fruit appealing to you and animals? Why do plants grow fruit?* Record initial thinking ❏ Watch the ABC Education video Why do plants make fruit? And discuss the key themes. The thinking routine Chalk Talk would be a useful tool to support all students sharing ideas. (**LINK: English**) ❏ *What do we know about fruits?* ❏ *Why are some vegetables considered fruit?* ❏ *Why are the seeds in the fruit important to the survival of the plant?* ❏ *Do all fruits contain seeds? Explain why or why not.* ❏ *Do all plants that produce fruit begin by producing a flower first?* ❏ Compile a list of fruit (and vegetables that are actually fruit) and determine ways to categorise them, e.g. warm/tropical climate, cool climate. Share categories and provide reasonings for choices. The thinking routine Explanation Game would provide a useful scaffold. (**LINK: English**)		video Paper to Plants Blackberry image thinking routine See Think Wonder thinking routine Think Puzzle Explore video Why do plants make fruit? thinking routine Chalk Talk Digital devices

	Investigation: **Cherry Tomatoes** ❏ Examine a punnet of cherry tomatoes. Pose the question: *Why do you think tomatoes are considered a fruit? Why do we call them vegetables?* **Assessment For Learning** ❏ Carefully slice a cherry tomato open and use the thinking routine See Think Wonder to scaffold discussion. ❏ *What do you see, observe or notice?* ❏ *Why do you think tomatoes contain seeds?* ❏ *How do you think we could grow cherry tomatoes from these seeds?* ❏ *What do you wonder?* ❏ Watch ABC Education video How seeds become plants ❏ Investigate how cherry tomatoes grow from seeds inside the fruit. ❏ List the key components required to successfully grow a plant, e.g. sunlight, water, air, soil ❏ Make predictions about how long it will take for the seeds to sprout and then become seedlings ready to plant. ❏ Plant some seeds from inside a cherry tomato into a plastic cup or other container ❏ Write a procedure for how to grow tomatoes from a cherry tomato plant (**LINK: English**) ❏ Document the growth of the plant over the course of the term (drawings/ journal/ photographs), creating a flowchart or ebook to highlight it's life cycle. (**LINK: English**) Research Task: **Life Cycles of Fruit Producing Plants** ❏ Investigate the life cycles of two plants, with one producing fruit. **Assessment For Learning** ❏ Choose two plants that produce fruit ❏ Research and gather information about their life cycles using pictures and words ❏ Make a flowchart, cartoon strip or animation to represent the stages of a plant that produces fruit. ❏ Compare and contrast the similarities and differences between the life cycles of a range of plants **Assessment Of Learning** ❏ Compare and contrast the similarities and differences between the two plants using a template (see appendix) ❏ Share research with a partner who explored different plants and compare the similarities and differences between the four plants using 4-way comparison template (see appendix) Reflecting On Learning **Assessment As Learning** ❏ Re-examine the Think Puzzle Explore from the beginning of the learning sequence using the thinking routine Connect Extend Challenge to explore the development of understanding. ❏ How did our learning connect to what you already knew about the life cycles of living things? ❏ How was your understanding of the life cycles of living things extended by our learning? ❏ What still challenges you about the life cycles of living things? What do you still wonder?		thinking routine Explanation Game thinking routine See Think Wonder Cherry tomato punnet video How seeds become plants Paper towel Plastic cup Soil - potting mix gloves Spray bottle Spoons Compare and contrast template (see appendix) 4-way compare and contrast template (see appendix) thinking routine Connect Extend Challenge

CONTENT FOCUS	LEARNING & TEACHING SEQUENCE - 2	EVALUATION	RESOURCES
How are environments and living things interdependent? Students: ● describe how living things depend on each other and the environment to survive, for example: ○ bees and flowers ○ birds eat and disperse seeds Curriculum Links: **English:** → Speaking and Listening 1 EN2-1A → Writing and Representing I EN2-2A → Grammar, Punctuation and Vocabulary EN2-9B → Thinking Imaginatively, Creatively and Interpretively EN2-10C **Mathematics:** → Length MA2-9MG → Area MA2-10MG → Multiplication and Division MA2-6NA → Fractions and Decimals MA2-7NA	***Survival of Living Things*** **Tuning In:** *What learning experiences will be used to spark curiosity, ascertain prior knowledge and understand student wonderings?* ❏ Watch the YouTube video The reason for a flower and Discover flower power, and use the thinking routine 3 2 1 Bridge to uncover initial thinking about the interdependent relationship between plants, some animals and the environment. Record thinking ❏ 3 things you think you know ❏ 2 questions you have ❏ 1 thing that challenges or puzzles you **Shared Inquiry:** *What learning experiences and questions will be used to develop understanding and skills? What assessment opportunities will help us monitor student learning and inform future practice? What differentiation (Support/ Extension) will be needed?* ❏ Introduce the inquiry question: *How are environments and living things interdependent?* ❏ Exploring Vocabulary: Develop a shared definition of the terms Interdependent, Relationship and Environment and display on the wonderwall. (**LINK: English**) Research Task: **The Bee** ❏ Research the European Honey Bee and consider their impact on our lives, agriculture and food production. **Assessment For Learning** ❏ Gather information using a variety of sources to answer the following questions individually, pairs or small groups: ❏ *Why do we need bees?* ❏ *What happens when bees collect nectar?* ❏ *Where did our honey bees come from? Why?* ❏ *What are three types of honey bees living in a beehive?* ❏ *Why are our honey bees in danger?* ❏ *What impact would this have on other living things?* ❏ *Why might the honey bee be important to the survival of plants?* ❏ *How might we protect and reduce the threat to honey bees across Australia?* ❏ Useful information sources to support investigation ❏ Read the fact sheet on Honey Bees (see appendix) ❏ Examine Australian Honey Bee Industry Council website ❏ Watch the YouTube video How do bees make honey? ❏ Watch the ABC Education Meet the European Honey Bee ❏ Watch the Agriculture in Education video Where would we be without them ❏ Bee Heroes Digibook - Chapter 5 - Bee's role in the ecosystem ❏ Present information in an informative brochure about the importance of bees to other living things, including: (**LINK: English**)		video The reason for a flower Discover flower power thinking routine 3 2 1 Bridge Digital devices fact sheet on Honey Bees (see appendix) Australian Honey Bee Industry Council website video How do bees make honey? Meet the European Honey Bee Where would we be without them

→ Position MA2-17MG → Addition and Subtraction MA2-5NA	❏ Explanation of the role of the honey bee in food production and the impact on us and other living things if it disappeared ❏ Outline ways to protect the honey bee ❏ Appropriate information, facts and statistics gathered and recorded in students own words ❏ Use of informative text features, such as headings, subheadings and technical vocabulary ❏ Use of appropriate images, text and/or multimedia to support the informative text ❏ List sources used ❏ Examine the causal effects of the honey bee using the thinking routine The 3 Y's. Recording student thinking. **Assessment Of Learning** ❏ *Why do honey bees matter to me?* ❏ *Why do honey bees matter to my community?* ❏ *Why might honey bees matter to the world?* <u>Bee Friendly Garden: Design Challenge</u> **Assessment For Learning** ❏ Task: Investigate and develop a proposal for a school garden that is bee friendly. ❏ Brainstorm the key considerations for a bee friendly garden, e.g. types of plants, location, allergies ❏ Undertake an exploration of the school grounds, capturing photographs of potential places a bee friendly garden could be established. Record locations on a blank school map. (**LINK: Mathematics**) ❏ Use the Agrifutures Bee Friendly planting guide to examine suitable plants for our climate zone, including herbs, fruits and vegetable plants. ❏ Use grid paper to represent the garden, including measurements and labels (**LINK: Mathematics**) ❏ Write a proposal to the Principal explaining why this garden should be built in our school and the benefits to us, our community and to bees, including the garden design. (**LINK: English**) **Assessment Of Learning** ❏ <u>Challenge:</u> Use a range of sources, including digital technologies, to determine the cost of building the bee friendly garden. <u>Reflecting On Learning</u> **Assessment As Learning** ❏ Re-examine the 3 2 1 Bridge responses from the beginning of the learning sequence and undertake the thinking routine again exploring the bridge or learning that helped to shift thinking ❏ 3 things you know now ❏ 2 questions you still have ❏ 1 thing that still challenges or puzzles you ❏ How does your thinking now connect to or has shifted from your initial thinking? What makes you say that?		Bee Heroes Digibook - Chapter 5 - Bee's role in the ecosystem thinking routine The 3 Y's iPad devices Bee Friendly planting guide Grid paper Thinking routine 3 2 1 Bridge Thinking routine What makes you say that?

Compare and Contrast

Plant:

Differences:

Similarities:

Plant:

Differences:

4-way Compare and Contrast

Plant:

Differences:

Plant:

Differences:

Similarities:

Plant:

Differences:

Plant:

Differences:

Honey Bee

Scientific name: Apis mellifera
Alternative name/s: European Honey Bee
Size Range: 1.3 cm - 1.6 cm

Identification

Honey Bees are one of the most recognisable insects and are the most commonly domesticated bee species in the world. They are somewhat variable in colour but are usually brown with a banded dull yellow and brown abdomen. The head, thorax and abdomen are densely covered in hair. The legs and around the eyes are also hairy. These highly social insects live in large hives dominated by a single queen. The queen is larger than workers or the male drones, and is responsible for egg laying and for controlling the hive using pheromones. The majority of the hive is made up of worker bees that build and maintain the hive, and collect nectar and pollen to feed the developing bee larvae.
Native bees and wasps and some flies can look superficially similar to honey bees. The only native bees to form large social hives are the stingless bees (Tetragonula and Austroplebia). These bees are very dark coloured, and are much smaller than honey bees (less than 5mm long), and do not sting. Other solitary native bees and wasps may look like honey bees, but are not aggressive, and do not have a barbed sting. Some flies are excellent mimics of honey bees, but have only one pair of wings and not sting.

Habitat

Honey Bees live in urban areas, forests, woodlands and heath. Honey bees have successfully established feral hives throughout Australia

Distribution

Honey Bees are found throughout Australia.

Feeding and diet

European Honey Bees can be found foraging on the flowers of many different native and introduced plant species.

Other behaviours and adaptations

Australia's early European settlers introduced Honey Bees to ensure a good supply of honey. Naturally a few escaped and they are now wild throughout most of Australia's southern States. Honey Bees play an important role as pollinators of crops and wild flowers. But some wild flowers have suffered from the presence of Honey Bees as these flowers can only be pollinated by native bees. Some native bees use a special pollination technique required by certain flowers called buzz pollination. Honey Bees do not use this technique and remove pollen without pollinating the flowers.
Honey Bees defend their nest aggressively. If a bee is driven to sting, the action is fatal as it rips out the bee's lower abdomen. The sting, with venom gland pumping, is left in the victim.

Interesting Facts

- We rely on bees for much of our food.
- Honey from bees was used as a sweetener in Ancient Egypt over 6000 years ago.
- Bees are amazing flying machines - a worker bee can fly while carrying almost her own body weight in pollen and nectar.
- Bees have two stomachs in their abdomen. The main one is for digesting nectar for food and energy. The other is the special honey stomach that processes nectar into honey.
- Bees are clever engineers - each wax cell in the honeycomb fits snugly against the six others around it.
- Bees can tell when it is going to rain, so they stay in the hive.

Source: Australian Museum https://australian.museum/learn/animals/insects/honey-bee/ and Agrifood Skills Australia https://www.primezone.edu.au/uploaded_files/resource_uploads/import/TeachersGuide_Bees-2A.pdf

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Teacher Background Information -

Importance of bees in Australia

The honey bee is one of the best-known of all insects and can be easily recognised. Honey bees perform a vital role in pollination. About 65% of our horticultural and agricultural crops are dependent upon bee pollination and this activity is valued at over $1.2b pa. Honey and hive products in Australia generate between $70-$90 million pa. There are two main types of bees in Australia - the European honey bee - (genus - Apis and species - mellifera)1 and the less well known native bee of which there are over 1,500 species. Beekeeping in Australia is a relatively small industry, but it has an enormous impact on

Australian agriculture.

Australia is one of the world's most sought after sources of honey, producing about 30,000 tonnes of honey pa. Our long hours of sunshine and many varieties of native trees with nectar laden blooms result in honeys with a range of unique flavours. Australia's honey industry is also one of the healthiest. Honey bee breeders have produced pure strains from the European bees that were originally introduced into Australia. Bee breeding programs on Rottnest and Kangaroo Islands, off the coasts of WA and SA respectively, provide high quality brood stock. These supplies are increasingly sought after by overseas countries, in the face of declining bee populations worldwide. There are over 524,000 honey bee hives in Australia today with about 180,000 used for pollinating Australia's growing almond industry. The health of our bees is of critical importance.

Food security needs bee security

Bee security is a major concern in Australia as bees play an important role in the pollination of flowering plants and in ensuring that farmers can produce crops, fruit and vegetables, nuts and healthy pastures. Australia is fortunate being an island continent, but with more frequent and rapid movement of people and goods around the world, the risk of introduced pests and diseases is growing. Scientists, farmers and beekeepers are worried about the Varroa mite which is devastating honey bee populations around the world. This tiny mite, the size of a pinhead, feeds on the blood of adult honey bees and their larvae and can destroy entire colonies. This threat is highlighted in the accompanying video Where would we Bee without them? (https://youtu.be/2GoecH2VzvQ).
The Varroa mite has been in nearby countries such as New Zealand, Indonesia and PNG for some time. Unfortunately, in mid 2016, two mites were detected on two bees in a hive of Asian bees found within a hollow metal support of a container stand at the Port of Townsville in Queensland. The hive and all the bees have been destroyed. Australia has well established biosecurity arrangements in place for responding to exotic pests. The Varroa mite is a nationally significant pest and authorities are on the alert to ensure that everything possible is being done to prevent the Varroa mite from establishing in Australia.