Science and Technology sample unit: Which came first…?

Stage 2	Duration: 10 weeks (1.5 hours per week)

Unit context
In response to community concerns about the decline in the local animal or plant population, students describe how changes in the environment caused by humans may affect the survival of living things. They develop their knowledge and understanding of the life cycles of living things and the ways that changes in the environment can affect life cycles. Students use this knowledge to design an information product to raise awareness of the need to protect local places and spaces, so that plants and animals can survive and reproduce.

Target outcomes	
A student:	
ST2-1VA	shows interest in and enthusiasm for science and technology, responding to their curiosity, questions and perceived needs, wants and opportunities
ST2-4WS	investigates their questions and predictions by analysing collected data, suggesting explanations for their findings, and communicating and reflecting on the processes undertaken
ST2-5WT	applies a design process and uses a range of tools, equipment, materials and techniques to produce solutions that address specific design criteria
ST2-10LW	describes that living things have life cycles, can be distinguished from non-living things and grouped, based on their observable features
ST2-11LW	describes ways that science knowledge helps people understand the effect of their actions on the environment and on the survival of living things
ST2-15I	describes ways that information solutions are designed and produced, and factors to consider when people use and interact with information sources and technologies

Unit overview
This unit builds on students' prior knowledge from Stage 1. They extend their understanding of observable features, change and growth of living things to the concept of life cycles, as they observe first-hand the stages in the life cycle of a plant or animal. Students are reintroduced to the design process, prior to developing and evaluating an information product based on this investigation and their research into how changes in the environment could affect the life cycle of an animal or plant population. To help inform their design choices, students work in teams to evaluate existing information products about living things, create their own product, and then reflect on and evaluate the processes used in terms of the needs of the previously identified audience.
It would be preferable to begin observations of the life cycle early in the unit, to provide time and opportunity for students to observe the entire cycle first-hand. If it is not possible to complete the observation of the life cycle (eg due to time constraints or season), students could use a variety of secondary sources to gather information to show how the life cycle progresses.

Content – Skills (Working Scientifically and Working Technologically)	Content – Knowledge and Understanding	Suggested teaching, learning and assessment experiences (include evidence of learning)
Working Scientifically Students question and predict by: • predicting what might happen based on prior knowledge in an investigation (ACSIS053, ACSIS064) 👆 Students conduct investigations by: • safely using appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS055, ACSIS066) 🖥 ✴ 🔲 Students communicate by: • representing and communicating ideas and findings in a variety of ways such as diagrams, physical representations and simple reports, tables, simple column graphs, written and oral factual texts, explanation and argument (ACSIS060, ACSIS071) 👆🔲 • sharing what they did and found out, including identifying some strengths and limitations of the method they used and what could be done differently to improve their investigation, including fairness as appropriate ⚙ 👥	**Natural Environment – Living World** Living things can be grouped on the basis of observable features and can be distinguished from non-living things. (ACSSU044) Students: • identify and use patterns in the observable features of living things to group them, by using tables, diagrams or flowcharts 👆🔢 **Made Environment – Information** There are processes and considerations involved in designing and producing information solutions. Students: • use common digital technologies and applications to organise and communicate information for a specific task, eg word processing and digital presentation software 🖥	**Introducing life cycles** **Teacher background** *To extend students' prior knowledge and understanding from Stage 1 of living things and their interaction with the environment, they are introduced to the concept of 'life cycle' – the continuous process by which new generations of offspring are produced. Students identify why it is important to find out about life cycles and the possible effect of their actions on the survival of living things.* *Throughout the unit, each student will keep a journal to record their plan, actions, progress and findings.* **Group activity** Students use teacher-provided resources showing a variety of living things, eg specimens, pictures and digital images, to share and record their ideas from prior learning about: • the observable features of living things • how living things change and grow • what living things (including humans) look like at the beginning of their lives. **Group activity** The teacher describes the following activity to the class and allocates students to groups. Before beginning the activity, a Y chart could be developed on effective group work, setting the scene for the expectations of cooperation and teamwork while working in a group. Students use teacher-provided pictures or digital images of a familiar animal or plant at different stages of life, eg chicken, frog, sea turtle, butterfly, cicada, flowering plant, to identify a sequence that shows the development of a living thing. The examples provided to each group may be different. Students use the information to: • decide which image they think shows the first stage in the animal's or plant's life and explain why they have reached this decision • arrange the images in a sequence to show the growth and development of the animal or plant over time • construct a visual representation, eg chart, series of diagrams or flowcharts, showing each stage in the life cycle and its observable features. **Class activity** Each group presents their visual representation and shares their findings with the class, which reviews and provides feedback on the quality of the presentation and the information obtained from it. Based on the group presentations, the teacher, through questioning, guides the students to think about the word 'cycle', including its meaning in relation to the stages in the life of living things and the concept of a 'life cycle'. Students use peer feedback to revise, as appropriate, their constructed sequence to include their understanding of the term 'life cycle'. Each student creates a digital representation of the life cycle.

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Working Scientifically Students question and predict by: • using curiosity, prior knowledge, experiences and scientific information with guidance, identifying questions in familiar contexts that can be investigated scientifically (ACSIS053, ACSIS064) ⚙ Students plan investigations by: • working collaboratively and individually, to suggest ways to plan and conduct investigations to find answers to questions (ACSIS054, ACSIS065) ✦ 👥 • suggesting appropriate materials, tools and equipment they could use in conducting their investigations and recording their findings, identifying appropriate safety rules 💻 Students conduct investigations by: • following the planned method, adjusting procedures as necessary, including exploration, fieldwork, surveys and researching secondary sources **Working Technologically** Students generate and develop ideas by: • using creative thinking techniques, including brainstorming, mind-mapping, sketching and modelling ⚙		**Planning and setting up an investigation of a plant or animal life cycle** **Teacher background** *To assist students in developing their understanding about the processes of Working Scientifically, they are guided in selecting a suitable animal or plant, and in planning an investigation to observe and record its life cycle.* **Class activity** Students construct a list of living things with life cycles that might be suitable to investigate. With teacher guidance, they review their ideas and reduce the list to those living things whose life cycles can be observed in the time and with the space and resources available, eg silkworms, mealworms and fast-growing plants such as beans, cress or wheat. With teacher guidance, students discuss and record in their journals: • what they need to find out before they can select an animal or plant life cycle to investigate, eg time allowed to complete the investigation, length of life cycles of various animals and plants, and basic needs of a potential animal or plant • the most suitable conditions under which the plant or animal will thrive and any factors that might affect its survival • the roles and skills needed for effective teamwork. **Project team activity** With teacher guidance, students: • select a suitable animal or plant for their investigation • make and record decisions about how they will set up and observe the plant or animal life cycle • suggest and list the equipment they will need to conduct the investigation, eg transparent containers to be able to observe the growth of a plant seed, sufficient food for the animal, suitable measuring equipment, digital camera • develop a team plan for providing for the needs of the animal or plant during the activity – www.schools.nsw.edu.au/animalsinschools/ • identify, negotiate and allocate team roles for responsibly caring for the animal or plant and for measuring and collecting data • use equipment safely to set up the animal or plant so they can observe its life cycle • identify the data and information they will collect during their investigation and from secondary sources • design a scaffold for the collection and recording of first-hand data/information • discuss the plan for their investigation with the teacher and with guidance, and modify as appropriate. In their individual journals, students record the plan to observe and describe the life cycle of the animal or plant.

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Working Scientifically Students question and predict by: • using curiosity, prior knowledge, experiences and scientific information with guidance, identifying questions in familiar contexts that can be investigated scientifically (ACSIS053, ACSIS064) ⚙ • predicting what might happen based on prior knowledge in an investigation (ACSIS053, ACSIS064) ✊ Students plan investigations by: • working collaboratively and individually, to suggest ways to plan and conduct investigations to find answers to questions (ACSIS054, ACSIS065) ✦ ♟	**Natural Environment – Living World** Living things, including plants and animals, depend on each other and the environment to survive. (ACSSU073) Students: • identify some factors in the local environment that are needed by plants and animals for survival	**Introducing the design project** **Teacher background** *To assist students in applying the design process to the development of an information product, the teacher describes the requirements of the design project and reviews students' prior knowledge about the design process.* **Class activity** The teacher describes the design project in which the students will work collaboratively as a project team, to design and produce an information product for a particular audience based on first-hand observations of the life cycle of a plant or animal. As local animal and plant populations are declining, the information product should raise awareness of the need to protect local places and spaces so that plants and animals can survive and reproduce. Students identify some examples of information products to identify their features. Examples could include posters, advertisements, websites and media presentations. **Project team activity** The teacher allocates students, or students select their own project teams. Students share and discuss their digital representations of the life cycle of an animal or plant to decide what information should be included in the information product, including: • how the observable features of the chosen plant or animal change during different stages of its life cycle • the needs of the animal or plant at each stage in its life cycle • some possible effects of changes in the animal's or plant's environment on different parts of its life cycle, eg change in seasons, food supply, habitat, air or water quality • the importance of people knowing about the life cycles of plants and animals • examples of animals and/or plants in local places and spaces whose survival is threatened by human activity • how science knowledge about life cycles might help people understand the effects of their actions on the survival of living things in local places and spaces. With teacher guidance, students review their ideas/understanding about applying the design process to produce solutions that respond to identified needs, in this case to raise awareness of the need to protect local places and spaces so that plants and animals can survive and reproduce.

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Working Scientifically Students conduct investigations by: • following the planned method, adjusting procedures as necessary, including exploration, fieldwork, surveys and researching secondary sources • safely using appropriate materials, tools or equipment to make and record observations, using formal measurements and digital technologies as appropriate (ACSIS055, ACSIS066) 🖳 ★ ▦ • using a range of methods to record observations and measurements with care and honesty, including tables and formal units for length, time and mass 🖳▦⚖	**Natural Environment – Living World** Living things have life cycles. (ACSSU072) Students: • observe first-hand one animal or plant as it grows and develops, and sequence the stages in its life cycle 🖳 • identify ways that the environment can affect the life cycle of plants and animals **Made Environment – Information** A range of factors needs to be considered when using information sources and technologies. Students: • acknowledge ownership of information when selecting and using information, eg citing sources 🖳	**Conducting an investigation: Gathering data for the information product** **Teacher background** *Students develop their understanding of the concept of 'life cycle' as they carry out a first-hand investigation. They record detailed observations for the duration of the plant's or animal's life cycle, use a range of secondary sources, and discuss findings with their teacher and peers.* **Project team activity** Students follow the planned method to: • make and record observations in their scaffold for the duration of the life cycle of the plant or animal • record questions and predictions that they identify during the investigation • access data from secondary sources to gather data/information to: – find answers to their questions – raise awareness of a local environmental issue involving a decline in an animal or plant population. The students will need time and structured opportunities in their project teams to discuss their observations, to research information, and to record information in their individual journals. In their individual journals, students record: • predicted answers to their chosen questions • observations that answer the questions they have posed • information extracted from secondary sources • the sources of information used. During the investigation, the teacher conferences with each team to respond to and stimulate students' questions, review the team results and discuss the investigation. During the course of the unit, through their individual journals and discussion, the teacher informally assesses students' skills in posing questions, making observations, and recording data and information.
Working Technologically Students explore and define a task by: • exploring design situations and/or existing solutions relevant to the needs and wants of themselves and others • working individually and collaboratively to develop a design brief that identifies simple design criteria relating to requirements that make the	**Made Environment – Information** There are processes and considerations involved in designing and producing information solutions. Students: • investigate the effectiveness of an information solution for its intended use, eg a game or animated story book	**Evaluating an existing information product** **Teacher background** *Students evaluate an example of an existing information product related to animals or plants, to assist them to begin to generate and develop ideas for their team project.* **Class activity** With teacher guidance, students: • recall the nature and purpose of the design task • suggest the range of forms an information product could take, eg board games, trivia games, books, e-books, animations, video documentaries, narratives, websites, PowerPoint presentations or galleries

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proposed solution useful and attractive while having minimal impact on the environment 🌿🌱⭐👥		• consider possible audiences for their presentation, eg Kindergarten class, their peers, family and/or community members • suggest criteria for their information products, eg the product must contain scientifically accurate information, successfully inform and raise awareness in the intended audience, be engaging and interesting, and have minimal impact on the environment. **Team activity** With teacher guidance, students: • use the criteria they have developed or a teacher-provided scaffold to evaluate at least one information product related to animals or plants, eg printed material, a website or a documentary, using criteria such as the type and purpose of the information product, its intended audience and indicators of success • use the findings to modify, if necessary, the design criteria for their own information product.
Working Technologically Students generate and develop ideas by: • using a range of research techniques to access information relevant to the task 💻 • using techniques including labelled drawings, modelling and storyboarding for documenting and communicating design ideas 🖥 • using digital technologies and multimedia for communicating design ideas 💻 Students produce solutions by: • developing and applying a plan and sequence for production that considers, where relevant, time and resources ⭐ • safely and correctly using a range of tools and equipment, materials and techniques, eg cutting, combining, joining, shaping, assembling and finishing materials 👥		**Designing and producing their own information product** **Teacher background** *Students use the design process to produce an information product based on their first-hand investigation of the life cycle of an animal or plant, and their research into a local environmental issue involving a decline in an animal or plant population. They use information and observations gathered in their journals and work in project teams.* **Project team activity** Using the data and information they have gathered, and with teacher guidance, students define the task to: • make a collaborative decision about the type of information product they plan to produce • identify a suitable audience for their planned product. Students generate and develop ideas by: • accessing and recording additional information relevant to the task, eg factors important for survival, how life cycles can be protected in the local environment • sharing the information they have gathered and selecting appropriate content • discussing their individual design ideas • agreeing on techniques and a sequence for the development of the information product. Students produce solutions by: • developing a plan that considers time and available resources, including technology • allocating particular tasks to team members • ensuring that the product they plan to develop has a minimal impact on the environment. The teacher guides the students as they develop their plan, ensuring that they reflect on and adapt their design as necessary to address the identified criteria.

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	Made Environment – Information There are processes and considerations involved in designing and producing information solutions. Students: • demonstrate how a variety of media can be combined to address the needs of a specific audience, eg combining visual images, sound and text in a digital presentation ▣ 🖋 ★	**Class activity** With teacher guidance, students discuss some methods that could be used by the audience to evaluate their information product, eg short list of simple questions addressing the criteria such as: • Did the product successfully inform and raise awareness in the intended audience? • Was it engaging and interesting? They could consider the scaffold used to evaluate the information product they reviewed and, if appropriate, a similar scaffold could be designed to evaluate their own information product. **Project team activity** Each team uses materials and techniques safely and correctly as they follow their plan to produce a suitable information product for presentation.
Working Scientifically Students communicate by: • representing and communicating ideas and findings in a variety of ways such as diagrams, physical representations and simple reports, tables, simple column graphs, written and oral factual texts, explanation and argument (ACSIS060, ACSIS071) 🖋▦ **Working Technologically** Students evaluate by: • using established design criteria to evaluate the process, product or solution, and suggesting how their design solution could be improved	**Made Environment – Information** People interact with information sources and technologies in a variety of ways. Students; • interview the users of an information solution and find out how the design has influenced their decisions and opinions, eg the design of advertisements ✿ 👥	**Presenting and evaluating the information product** **Teacher background** *Students complete the design process and present their information product to an audience. They communicate their findings about the life cycle of a living thing and raise awareness of the need to protect local places and spaces to ensure the progression of life cycles. They use established design criteria to evaluate the process used and the product that they have produced.* **Project team activity** With teacher guidance, each team: • presents their information product to the class and/or the intended audience • asks the audience to complete their evaluation using the agreed scaffold/tool • collates the responses and analyses the results of the evaluation.
Working Scientifically Students communicate by: • sharing what they did and found out, including identifying some strengths and limitations of the method they used and what could be done differently to improve		**Reflecting on the evaluation process and on individual learning** **Teacher background** *Students reflect on how their design solution could be improved and on their personal learning during the unit.* With teacher guidance, each team: • reflects on the results of the evaluation process in terms of:

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their investigation, including fairness as appropriate ⚙ 👥 **Working Technologically** Students evaluate by: • reflecting on the process followed and what could be done differently to ensure that the solution meets the needs of the user/audience 👥 • reflecting on findings to identify what they could find out next through the processes of Working Technologically and Working Scientifically ⚙		– how well the team addressed the criteria for success – what could have been done differently to ensure that the information product meets the needs of the user/audience. A modified Pluses, Minuses and Improvements (PMI) chart could be used by the teams to reflect on the design process and information product. Students reflect on their own learning by: • identifying new learning acquired from each team presentation • identifying further questions that could be answered through the processes of Working Technologically and Working Scientifically • comparing and contrasting the team presentations • identifying what they learned from working with others in a group. Through their journals and team discussion, the teacher assesses the ability of individual students to reflect on the design process, the effectiveness of their information product and their own learning.

Resources	Assessment overview

Materials and equipment
- Specimens, pictures, digital images to show stages in life cycles
- Materials required for observation of plant and animal life cycles, eg:
   – silkworms – mulberry leaves, cardboard boxes
   – broad beans – containers, stakes, garden bed or containers/potting mix
- Existing information products related to animals or plants
- Scaffold for evaluating an information product
 	
Websites
Life Cycles – Fast Facts
www.kidskonnect.com/subject-index/15-science/87-life-cycles.html
Mealworm Life Cycle
www.superteacherworksheets.com/mealworms.html
Life Cycle of a Silkworm
www.youtube.com/watch?v=NS2tGT6zVyg
Bean Seed Life Cycle for Kids
www.ehow.com/about_6553715_bean-seed-life-cycle-kids.html
Life Cycle of Butterflies and Moths
www.kidsbutterfly.org/life-cycle
Amazing Cicada Life Cycle – Sir David Attenborough's *Life in the Undergrowth* **– BBC wildlife**
www.youtube.com/watch?v=tjLiWy2nT7U
SWOT – State of the World's Sea Turtles – interactive life cycle diagram
http://seaturtlestatus.org/learn/lifecycle?gclid=CPiC-cqKqrMCFQoxpgod5UEAIA
 	
Online file sharing: Google Docs, SkyDrive, School Portal
Presentation applications: PowerPoint, SMART Notebook, Storybird
Word-processing/Publishing: Word, Publisher, Pages
 	
Resources on safety and animal welfare
Print resource: NSW Department of Education and Training, *Chemical Safety in Schools Kit,* Vol 2, NSWDET, 2000
Animals in Schools: The purpose of this website is to assist schools in satisfying the requirements of the *Animal Research Act 1985* (NSW) and the Australian code of practice for the care and use of animals for scientific purposes.
www.schools.nsw.edu.au/animalsinschools/
	Assessment opportunities could include:
	- visual and digital representations of a life cycle
	- peer feedback on life cycle representations
	- student records in journal, including planning the investigation, posing questions, research from secondary sources, making observations and recording data and information
	- student self-assessment of learning using a teacher-provided evaluation sheet
	- use of digital applications
	- completion by the team of a suitable information product using listed criteria
	- student reflection on the design process and their own learning.