**PEST SPECIES**

**Acknowledgement**

This teaching sequence was developed by students in the Issues in Science and Environmental Education (ESS439) unit in trimester 1, 2017.  Peta White lead the unit and had support from colleagues Kieran Lim, John Cripps Clark, Ian Bentley, Russell Tytler, Jorja McKinnon, and Connie Cirkony who supported the students in the initial sequence design.  Research scientists were invited from the Faculty of Science and the Built Environment and contributed their research and ideas as the basis for the students to then develop teaching sequences that result in contemporary science practices being infused into secondary school science.  All sequences were edited by Mary Vamvakas prior to publishing.

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**Year 8 Biological Sciences (VCSSU090) (Victorian Curriculum and Assessment Authority [VCCA] 2016)**

* Interactions between organisms can be described in terms of food chains and food webs and can be affected by human activity
  + Constructing and interpreting food chains and food webs to show relationships between organisms in an environment
  + Recognising the role of microorganisms within food chains and food webs
  + Researching examples of human impacts on specific ecosystems, for example, the use of fire by traditional Aboriginal people, the effects of palm oil harvesting, deforestation, agricultural practices or the introduction of new species

Curriculum link:  <http://victoriancurriculum.vcaa.vic.edu.au/level8?layout=1&d=S>

Core understandings:

* Plants get their energy from sunlight
* Plants store energy in roots, stems and leaves
* Flow of energy
* Concept of carnivore, omnivore, herbivore and detritivore
* Human impact on ecosystems

**Contemporary Science**

This lesson sequence reflects the research of University Researcher Laura Xin Lu Tan.

The study involves monitoring raven predation activity on penguin eggs on the Summerlands beach in Phillip Island.

**Learning sequence: Pest Species**

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| --- | --- | --- | --- | --- |
| **Learning Intention/Concept** | **Teaching Input** | **Student Activity** | **Resources** | **Assessment FOR and OF learning** |
| **Topic:** Introduction to interactions of organisms and human impact. Food chains and food webs.  **2 lessons**  Students should know/understand:  - Interactions between organisms can be described in terms of food chains and food webs  - Food chains and food webs can be affected by human activity and other organisms | - Use bitesize interactive activity for students to explore different ecosystem food webs  -Guided discussion to start students with their brainstorm. Invite students to share ideas with the rest of the class  - Use Laura’s interview of their research to demonstrate that food webs and chains can be impacted by humans. | - Explore bitesize website to see different environmental food chains. **Complete Work Sheet 1 (Appendix 1)** Could be used as a pre-test.  - Group brainstorm of how humans have impacted the environment. Students arrange into groups of 3-4 and brainstorm on butchers’ paper  Phillip Island Nature Notes provide information on the Little Penguin and consider human and predatory threats.  Students to use raven/ penguin video as an example of how organisms like the raven and urbanisation have impacted penguins.  **Complete Work Sheet 2 (Appendix 1)** | <http://www.bbc.co.uk/bitesize/ks2/science/living_things/food_chains/play/>  Butchers paper and Textas  <https://www.penguins.org.au/assets/Conservation/Education/PDF/2017-NN-Little-Penguins.pdf>  - Laura’s video interview  <https://video.deakin.edu.au/media/t/0_iz61gpzp> | -Students to use bitesize website on Food chains to draw food chains of land and sea organisms.  Worksheet 2 |
| **Topic:** Food chains/ food webs and microorganisms  **90-minute double lesson**  Students should know/understand:  - Food chains and food webs can be constructed and interpreted to show the relationships between organisms  - Microorganisms are involved in food chains and food webs by returning energy back into the ecosystem | * - Introducing students to the idea that ecosystems can be found everywhere   - Using the school grounds, get students to complete a food web/chain using a section of the school  - Using an example of a tree and leaf litter, get students to brainstorm how the leaves may return energy back into the ecosystem. Relevant terms decomposers. | **-**  Go outside and look at ecosystems within the school (Eg. A tree/ gardens/ how rubbish can impact) ecosystems (attract pests and scavengers. Brings new species into the ecosystems)  Students to construct a food web of organisms in their school environment  Students to consider the tree and leaf litter and brainstorm in groups how leaves return energy into the ecosystem. Annotate on the food web they have constructed to show how decomposers cycle matter in an ecosystem. Watch the video: **The threat of invasive species - Jennifer Klos** Think-pair share | Using iPads/ paper to document their ecosystem in the school grounds **The threat of invasive species - Jennifer Klos** <https://www.youtube.com/watch?v=spTWwqVP_2s> | - Construct a food web related to the environment around the school.  The threat of invasive species - Jennifer Klos.  -Think-Pair-Share: List 5 things you learnt from the video  **OR** Could do this individually and then in groups of 4 brainstorm the important messages in the video |
| **Topic:** Human impact on specific ecosystems  The effect of human impact on biodiversity  **1-2 lessons**  Students should know/understand:  - The introduction of new species by humans, has an impact on ecosystems | - Introduce the idea of the importance of biodiversity in an ecosystem  -Use Cool Australia Power Point and questions as a flipped classroom tool to lead into discussion of how human activity can impact ecosystems in other ways  - Using Laura’s research as a demonstration of the impact that humans have on the environment such as urbanisation and its effects on Penguin Population.  - Using models of other ecosystems that have been dramatically affected by human impact  -Brainstorm the introduction of species into an ecosystem. Link this back to Laura’s video | Students view Biodiversity Power Point on Cool Australia and answer questions at end of PPT.  - Looking at some examples of ecosystems that have been changed by human impact on the environment (eg. Amazon Rainforest and deforestation)  Students could research in groups of 3 one human impact and its effect on an ecosystem. Create a short film (1-2 minutes) and present to their peers.  **Summative Assessment**  Students are to create a poster looking at how pest species have impacted ecosystems. Students can choose from the following pest species;  Foxes, rabbits, cane toads. Camels, water buffalo, feral cats, feral pig, feral deer, carp  **Refer to details below.** | <https://www.coolaustralia.org/activity/year-9-10-biodiversity-powerpoint/>  - Models of other human impacted ecosystems (Amazon Rainforest) | - Use the Cool Australia link “Biodiversity” as a flipped classroom tool and students to answer questions at the end of the PowerPoint  **ASSESSMENT OF LEARNING:**  Students are to create a poster looking at pest species. Information below. |

Summative Assessment:

Students are to create a poster looking at how pest species have impacted ecosystems. Students can choose from the following pest species;

* Foxes, rabbits, cane toads. Camels, water buffalo, feral cats, feral pig, feral deer, carp

The key questions the students will have to address in the assignment will be

* What are the major impacts these animals have on the environment?
* How long have these pests been introduced?
* What techniques have they used to control or exterminate these pests?
* What effects do the pests have on the local fauna?
* What are the effects on the local flora?
* Compare their own pest species to the ravens on Phillip Island.

**References**

* Victorian Curriculum and Assessment Authority [VCAA] 2016, *Foundation to year 10 curriculum; Year 8 Biological Sciences (VCSSU090)*, retrieved April 5 2017, <<http://victoriancurriculum.vcaa.vic.edu.au/level8?layout=1&d=S>>
* BBC 2014, *Bitesize*, retrieved April 5 2017, <<http://www.bbc.co.uk/bitesize/ks2/science/living_things/food_chains/play/>>
* TED-ed, May 3, 2016, *The threat of invasive species - Jennifer Klos*, Retrieved April 5 2017, <<https://www.youtube.com/watch?v=spTWwqVP_2s>>
* Coolaustralia.org 2017, *Activity: Food Webs and Climate Change*, Retrieved April 5 2017, <<https://www.coolaustralia.org/activity/food-webs-and-climate-change/>>

### Link to Deakin Air Video – Interview - Laura Xin Lu Tan

<https://video.deakin.edu.au/media/t/0_iz61gpzp>

**Appendix 1**

**Work Sheet 1: Exploring Food Chains**

**Use the following link to explore Food Chains**

<http://www.bbc.co.uk/bitesize/ks2/science/living_things/food_chains/play/>

**Work through the Food Chains interactive for land animals and complete the following questions.**

**Q1. a.** Draw a food chain below for the Land habitat.

Grass 🡪 🡪 🡪 🡪

**b.** Using examples from the food chain you have drawn explain the difference between a producer and a consumer.

**c.** For the food chain you have drawn above name the following:

1. Herbivore(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Carnivore(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Work through the Food Chains interactive for sea animals and complete the following questions.**

**Q2. a.** Draw a food chain below for the Sea habitat.

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**b.** For the food chain you have drawn name the following:

1. Autotroph(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Heterotroph(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Second order Consumer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Top order consumer: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**c.** What do the arrows represent in a food chain?

**d.** i. What is the role of the sun in an ecosystem?

ii. Should the sun be included when drawing a food chain? Explain.

**Worksheet 2: Investigating the effect of ravens and humans on Little Penguin populations**

Phillip Island is home to the largest colony of little penguins. Use the information provided in the link below about the little penguins to answer the following questions.

<https://www.penguins.org.au/assets/Conservation/Education/PDF/2017-NN-Little-Penguins.pdf>

**Q1.** With European settlement in Victoria the number of individual little penguin colonies in Phillip Island decreased from ten to one.

1. List 2 sources of food for the little penguin.
2. List 2 predators (one land dwelling and one sea dwelling) of the little penguin.
3. Draw 2 different food chains that include the little penguin. Include at least 4 organisms in each of your food chains. (You may need to do some extra research!)

1. Describe some of the human influences that caused the little penguin population numbers to decline.
2. The Victorian Government initiated a 30-year plan and bought back houses and land as part of the Penguin Protection Plan. How did this initiative help in increasing penguin numbers in Phillip Island?
3. Commercial fishing and plastic pollution have had negative effects on the little penguin population. Can you explain why?

**Q2.** The following table includes organisms found in the Antarctic Ocean and the food they eat.

|  |  |
| --- | --- |
| **Organism** | **Food Source (eats)** |
| Krill | Phytoplankton; Herbivorous zooplankton |
| Zooplankton | Phytoplankton |
| Fish | Zooplankton; Krill; Squid |
| Other Birds | Fish; Krill |
| Penguins | Fish; Krill; Squid |
| Elephant Seal | Squid; Fish |
| Leopard Seal | Penguins; fish; krill; other birds |
| Small Toothed Whales | Penguins; Leopard seals; elephant seals; squid; baleen whale |
| Baleen whale | Krill |

1. Use the information from the table to construct an Antarctic Ocean food web.
2. From your food web draw 2 food chains that include the penguin as a:
3. second order consumer.
4. third order consumer.

Watch Laura’s Video Interview looking at Raven’s interaction on Penguin Burrows

<https://video.deakin.edu.au/media/t/0_iz61gpzp>

1. Describe Laura’s research and explain why her research is important.
2. Looking back at the food web you constructed in part **a.**, describe the short and long-term impact(s) that ravens would have on the food web if they continued to predate on penguin burrows and their eggs.
3. Can you suggest any measures other than killing the ravens that Laura and other scientists might undertake to help control the penguin population?