Science

WORK SAMPLE PORTFOLIOS

These work sample portfolios have been designed to illustrate satisfactory achievement in the relevant aspects of the achievement standard.

The December 2011 work sample portfolios are a resource to support planning and implementation of the Foundation to Year 10 Australian Curriculum in English, Mathematics, Science and History during 2012. They comprise collections of different students' work annotated to highlight evidence of student learning of different aspects of the achievement standard.

The work samples vary in terms of how much time was available to complete the task or the degree of scaffolding provided by the teacher.

There is no pre-determined number of samples required in a portfolio nor are the work samples sequenced in any particular order. These initial work sample portfolios do not constitute a complete set of work samples - they provide evidence of most (but not necessarily all) aspects of the achievement standard.

As the Australian Curriculum in English, Mathematics, Science and History is implemented by schools in 2012, the work sample portfolios will be reviewed and enhanced by drawing on classroom practice and will reflect a more systematic collection of evidence from teaching and learning programs.

THIS PORTFOLIO – YEAR 7 SCIENCE

This portfolio comprises a number of work samples drawn from a range of assessment tasks, namely:

Sample 1	Process design – Purifying water
Sample 2	Poster – Water cycle
Sample 3	Independent task – Classification
Sample 4	Data interpretation – Bird watching
Sample 5	Investigation report – Parachute design
Sample 6	Poster – Feral fox

In this portfolio, the student describes a range of techniques to separate a pure substance (water) from a mixture (WS1) and applies knowledge of the effects of gravity on motion to a parachute design investigation (WS5). The student explores the cycling of water through Earth systems and explains how sustainable use of water is related to the water cycle (WS2). The student demonstrates understanding of the effect of environmental changes on feeding relationships with reference to introduced species (WS6) and uses classification to group and relate organisms (WS3, WS6). The student describes how scientific knowledge has been used to address the problem of an invasive species and indicates how this solution might impact different groups in society differently (WS6).

Science

The student demonstrates the ability to identify a question to investigate scientifically and to identify variables to be changed and measured (WS5). The student uses evidence to support investigation conclusions (WS5, WS6), identifies improvements that could be made to investigation methods (WS5), summarises data from different sources (WS4, WS6) and identifies trends in data (WS4, WS5). The student communicates ideas, methods and findings using scientific language and a range of appropriate representations (WS1, WS2, WS3, WS4, WS5, WS6).

The following aspects of the achievement standard are not evident in this portfolio:

- *explain how the relative positions of the Earth, sun and moon affect phenomena on Earth*
- *plan fair experimental methods*
- *select equipment that improves fairness and accuracy and describe how they considered safety*
- *refer to the quality of their data when suggesting improvements to their methods.*

Science

Work sample 1:
Process design – Purifying water

Relevant parts of the achievement standard

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of the Earth, sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of environmental changes on feeding relationships and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. They explain how the solution was viewed by, and impacted on, different groups in society.

Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Summary of task

Students have studied that matter can be classified as either pure substances or mixtures. They have explored a range of separation techniques. They had discussed typical biological and chemical pollutants of water and the safety issues associated with drinking untreated water.

Students were asked to work in small groups to brainstorm methods of purifying water following a hypothetical local disaster such as a tsunami. They then worked individually to represent their process in a flowchart. The class decided that the water they would purify was originally from a salt water pool and contained different types of debris such as timber, metal, plant material, mud, sand, concrete, plaster, a shallow film of oil and salt.

The teacher advised that the equipment available to them in this hypothetical context included a:

- small portable gas cooker
- half-full gas portable gas cylinder
- pot with no lid
- water bottle (empty) with lid
- nylon singlet top
- clean pair of socks
- travel journal with plastic cover
- small pocket knife
- broken plant pot which could serve as a bucket.

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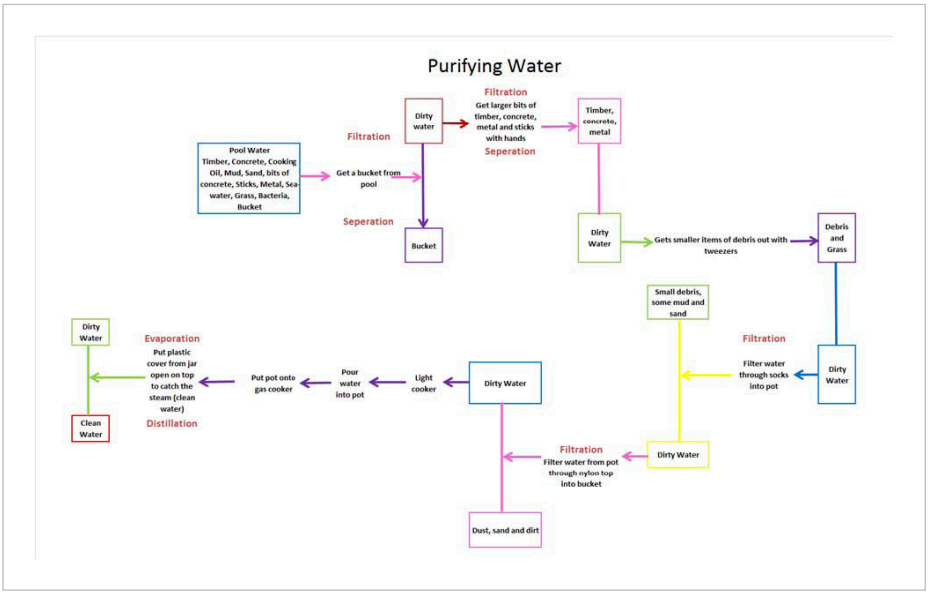
Work sample 1:
Process design – Purifying water



Annotations

Identifies appropriate techniques including filtration and distillation to separate pure substances (e.g. water) from a mixture.

Communicates procedural steps for purification of water using a modified (non standard) flow chart.

Annotation (Overview)

In this work sample the student communicates ideas and findings using scientific language and appropriate representations.

Acknowledgement
ACARA acknowledges the contribution of the trial school teachers and students for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Science

Work sample 2:
Poster – Water cycle

Relevant parts of the achievement standard

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of the Earth, sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of environmental changes on feeding relationships and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. They explain how the solution was viewed by, and impacted on, different groups in society.

Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Summary of task

Prior to this activity, students had completed practical investigations into changes of state involving water and how water cycles through global systems.

Students were asked to provide a conceptual drawing of the water cycle as a summary of their learning. They were asked to:

- focus on describing changes of state that occur during the water cycle and the factors influencing these changes
- provide an explanation of how sustainable use of water relates to the water cycle.

They completed the task individually in class time, using their workbook notes as reference material.

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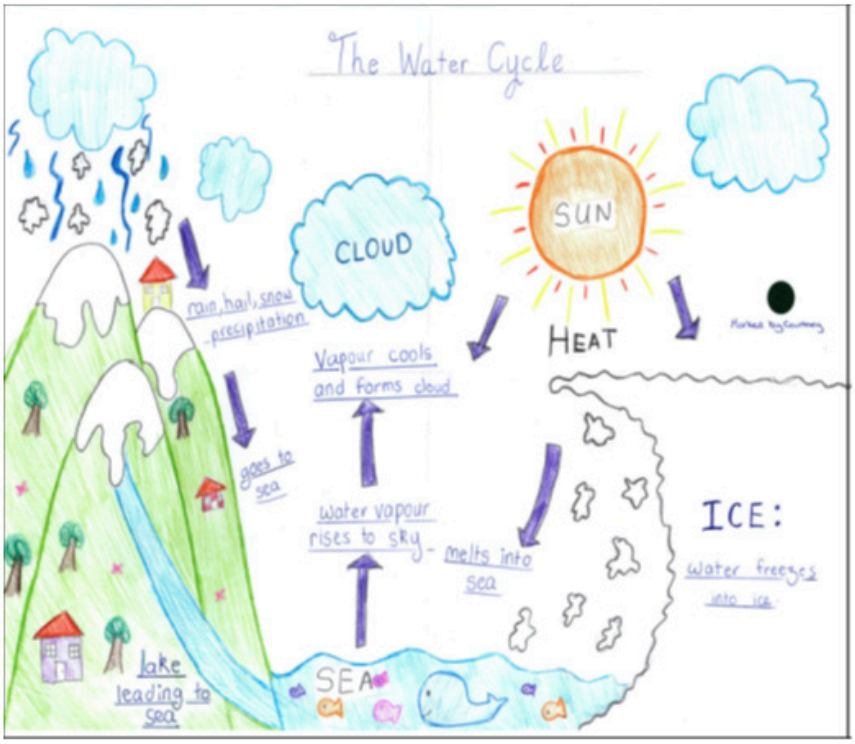
Work sample 2:
Poster – Water cycle



Using water

We use water for drinking, watering and washing clothes and plates. There is a lot of water on Earth but not all of it is good for drinking. We store water from rivers and rain in dams and reservoirs. If we use up drinking water supplies faster than it rains, then we might run out of drinking water. One answer to this might be to get water from the sea but we would still need to purify it.

Annotations

Uses scientific terminology (freezes, melts, vapour, cools, precipitation) to describe the water cycle and changes of state involved.

Shows movement of water using arrows.

Indicates role played by ice reservoirs in the water cycle.

Indicates some water catchments on land.

Describes how sustainable use of water relates to the water cycle.

Annotation (Overview)

In this work sample the student communicates ideas and findings using scientific language and appropriate representations.

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Work sample 3:
Independent task – Classification

Relevant parts of the achievement standard

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of the Earth, sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of environmental changes on feeding relationships and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. They explain how the solution was viewed by, and impacted on, different groups in society.

Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Summary of task

Students have been studying taxonomy as a means of classifying different organisms into groups. Prior to this activity, students were provided with a dichotomous key which identifies invasive species.

The task was intended to test students' understanding of dichotomous keys.

Students were asked to:

- make a dichotomous classification system based on a number of given shapes
- give the scientific names of a number of organisms using a dichotomous key that was provided by the teacher.

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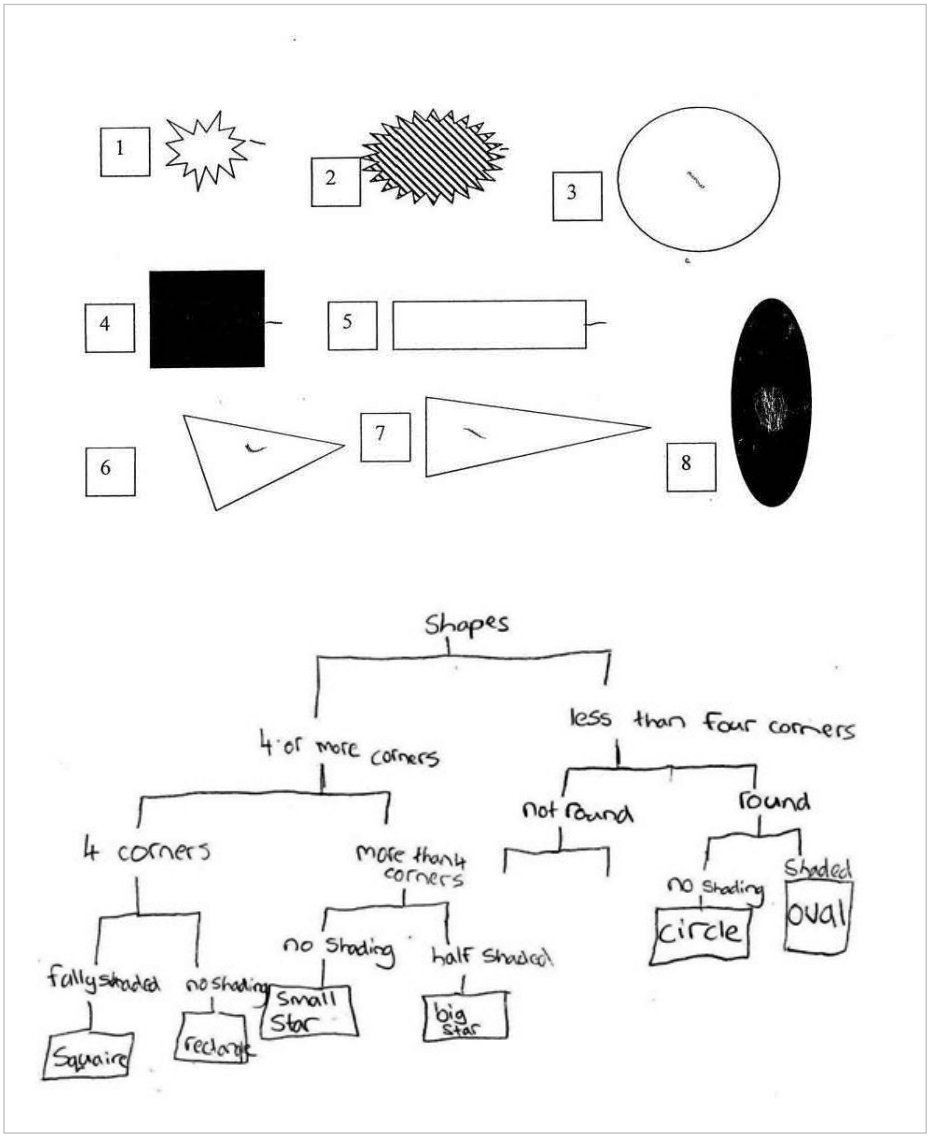
Work sample 3:
Independent task – Classification



Annotations

Creates a key that enables correct classification for 6 of the shapes (excluding the triangles).

Communicates using appropriate conventions for a dichotomous key.

Illustrates the use of two choices at each level of the dichotomous key.

Describes characteristics for classification using easily observable criteria.

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Work sample 3:
Independent task – Classification

Dichotomous Key

1a. This organism has an exoskeleton (outside) - go to question 2

1b. This organism has an endoskeleton (inside) or no skeleton - go to question 3

2a. This organism has thin black body and a red stripe on it's abodomen - go to question 4a.
2b. This organism has a thick black body with large grey/brown abdomen - go to question 4b.

3a. Organism dwells on land - go to question 5
3b. Organism dwells in the ocean - go to question 6

4a. Organism is called *Latrodectus hasselti*
4b. Organism is called *Atrax infensus*

5a. Organism is totally covered in smooth scale-like skin - go to question 7
5b. Organism has a textured coat or covering - go to question 8

6a. Organism 8 thick legs or tentacles - go to question 9a.
6b. Has many string-like legs or tentacles - go to question 9b.

7a. Scale-like skin is patterned in horizontal stripes over the body - go to question 10a.
7b. Scale-like skin has one block colour over most of it's body - go to question 10b.

8a. Has fine fur-like covering - go to question 11
8b. Has feather-like covering over most of it's body - go to question 12

9a. Organism is *Hapalochlaena lunulata*
9b. Organism is *Chironex flecken*

10a. Organism is *Psuedonaja texilis*
10b. Organism is *Pseudechis porphyricus*

11a. Has two opposing thumbs on the front paws - go to question 13a.
11b. Has no opposing thumb on the front paws - go to question 13b.

12a. Has large bone-like structure on a bald, blue-skinned head - got to question 14a.
12b. Has feather-like covering over head with no bone-like structure - go to question 14b.

13a. Organism is *Phascolatarctos cinerus*
13b. Organism is *Vombatus ursinus*

14a. Organism is *Casuarius casuarius*
14b. Organism is *Dromaius novaebollandiae*

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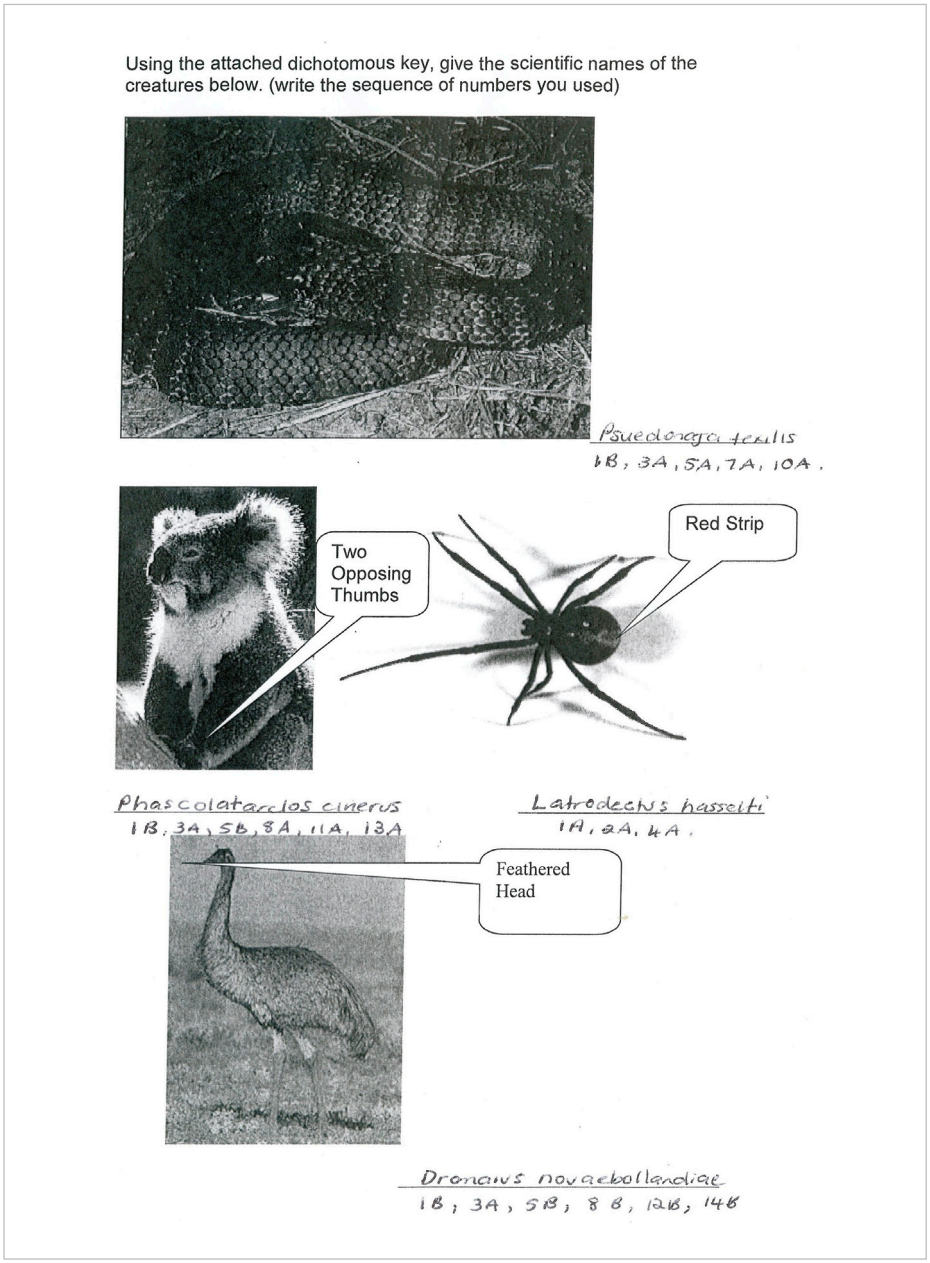
Work sample 3:
Independent task – Classification



Annotations

Identifies organisms correctly using the key.

Communicates choices made for classification of each species.

Annotation (Overview)

In this work sample the student communicates ideas and findings using scientific language and appropriate representations.

Acknowledgement
ACARA acknowledges the contribution of the trial school teachers and students for providing the tasks and work samples. The are referenced to the Australian Curriculum achievement standards.

Science

Work sample 4:
Interpreting Data – Bird Watching

Relevant parts of the achievement standard

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of the Earth, sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of environmental changes on feeding relationships and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. They explain how the solution was viewed by, and impacted on, different groups in society.

Students identify questions that can be investigated scientifically. They plan fair experimental methods, identifying variables to be changed and measured. They select equipment that improves fairness and accuracy and describe how they considered safety. Students draw on evidence to support their conclusions. They summarise data from different sources, describe trends and refer to the quality of their data when suggesting improvements to their methods. They communicate their ideas, methods and findings using scientific language and appropriate representations.

Summary of task

This activity was an extension of a camp activity where groups of students collected data on diversity of bird life at a specific location. They were given direct instruction on the functional aspects of a bar graph to produce from a table of combined data including tide and weather.

Students in groups were asked to record the numbers and different types of bird life at different times of the day. They were required to plot their results on a bar graph and analyse their findings. Students discussed whether the data collected was discrete or continuous.

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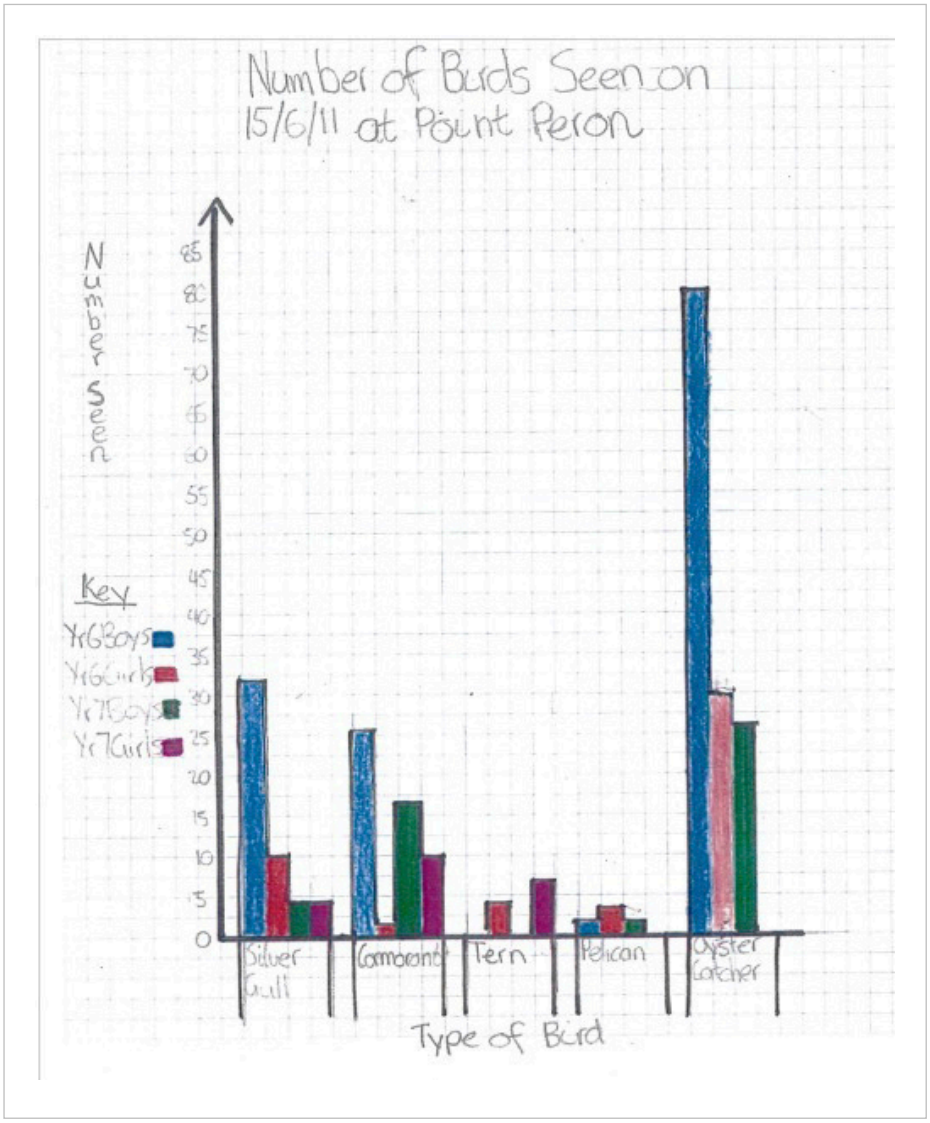
Work sample 4:
Interpreting Data – Bird Watching



Annotations

Displays discrete data correctly using a bar graph.

Provides a key, title and axes labels.

Produces scale with even increments on graph.

Science

Work sample 4:
Interpreting Data – Bird Watching

Is this graph discrete or continuous?

The data is discrete

It is discrete because that was all the birds, seen on the 15/06/11 and there will be no more information added.

Analysis

The year six boys found thirty two Silver Gulls, twenty six Cormorants, zero Terns, two Pelicans and eighty Oyster Catchers. They saw on hundred and forty birds. There was a high tide, wind and rain during 11:00am – 12:00pm while they were looking.

The year six girls found ten Silver Gulls, two Cormorants, four Terns, four Pelicans and thirty Oyster Catchers. They saw a total of fifty birds. There was sun and clouds during 9:30 – 10:30am.

The year seven boys saw four Silver Gulls, seventeen Cormorants, zero Terns, two Pelicans and twenty six Oyster Catchers. They saw a total of forty nine birds. There was wind and cloud at 2:30pm – 3:30pm.

The year seven girls saw four Silver Gulls, ten Cormorants, seven Terns, zero Terns and Zero Pelicans. They saw a total of twenty one birds. It was cloudy and windy during 1:00pm – 2:00pm.

Most birds were found at noon when there was a high tide. The least amount of birds were found when it was cloudy and windy. Most of the Cormorants only came out after 11:00am. The Silver Gulls went away after it got cloudy and rainy. There was more birds in the morning than afternoon. Oyster Catchers were the most commonly seen bird and Pelicans were the least seen.

Birds Seen at Different Times

9:30-10:30	11:00-12:00	1:00-2:00	2:30-3:30
50	140	21	49

Annotations

Identifies data as discrete.

Identifies variables that may affect observations (time, tide, boys/girls).

Presents data from two different sources, the two year groups.

Identifies trends concerning the bird count (time of the day/wind conditions).

Uses appropriate representations (bar graph) for data and a table to summarise information.

Annotation (Overview)

In this work sample the student communicates ideas and findings using scientific language and appropriate representations.

Acknowledgement
ACARA acknowledges the contribution of the Department of Education, Western Australia for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

Science

Work sample 5:
Investigation report – Parachute design

Relevant parts of the achievement standard

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of the Earth, sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of environmental changes on feeding relationships and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. They explain how the solution was viewed by, and impacted on, different groups in society.

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Summary of task

This task was part of a unit on force and motion. Students were given four 50 minute lessons to complete the task. Students were provided with a stop watch, paper, string, glue, tape, scissors, eggs (or similar, for example, chalk).

Students worked in small groups to research/brainstorm responses to a set of questions designed to establish their understanding of parachutes. As a class the students brainstormed what things (variables) could affect how well a parachute works. Each group selected an independent variable to test. The students in each group then designed, built and tested three different parachutes with a basket/cradle to determine which was the most effective to drop an egg from a first floor balcony without breaking the egg.

Students were asked to individually complete a report using a provided template.

Science

Work sample 5:
Investigation report – Parachute design

SCIENCE PRACTICAL REPORT: PARACHUTES

A Design of a Parachute, with an egg held in it.

INTRODUCTION: In your own words explain the relationship between parachutes and air resistance

and gravity, Explain what a parachute is and what may it effect how well it works.
A Parachute is a soft fabric device used to slow the motion of an object. The word a parachute comes from the French words para.
Gravity comes from the centre of the earth, which attracts everything. the Gravity allows the parachute to land safetly.
Air resistance happens because as things fall they have to push their way pass the atmos, and molecules that make up air in order to get where there going.
The effects that how well it works are: weight of an object, size of a canopy, how high its dropped from, material of canopy, length of string lines, and shape of canopy.

AIM: List two aims.

1 To find out which canopy material works better.
2. To design a parachute to land an egg safely

Annotations

Identifies that Earth's gravity pulls objects towards the centre of the Earth.

Identifies that multiple forces are acting on objects that are falling towards Earth.

Identifies variables that may affect the functioning of the parachute.

Identifies questions that can be investigated scientifically.

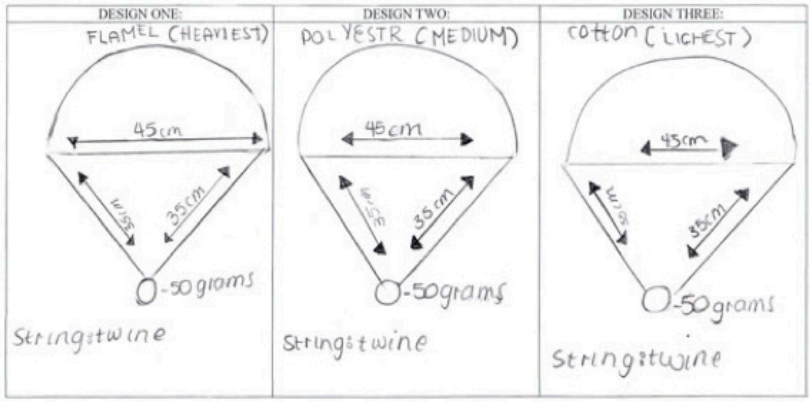
Science

Work sample 5:
Investigation report – Parachute design

HYPOTHESIS: State your scientific idea.

The Heavier the material the slower the parachute will land.

METHOD: Draw labelled diagrams of your three parachute designs



List the control and independent (test) variable.

CONTROL	INDEPENDENT-change
-length of guideliness/strings -Shape of canopy -size of canopy -height dropped from -weight of object -type of string	-Type of canopy material

Annotations

Communicates parachute design using a labelled diagram.

Indicates aspects of the design to be kept the same for each parachute.

Identifies variables to control to enable a fair test, and variables to change.

Science

Work sample 5:
Investigation report – Parachute design

Number each step so someone else could do your experiment.

1 collect three different materials of cotton, polyester and flammel.
2. Measure a 45cm square in the material and cut out, all three.
3. Reinforse all four eages of the cut out material, with sticki tap.
4. Punch holes on the four edges.
5. attach string to each corners
6. Put all four corners together and attach a ball of plasteicence of (50 grams).
7 Test and time how long each parachute to land droped from a high distance.
8 choose the best parachute and make a basket for the egg.
9- attach basket to parachute, and place a egg for ready to test.

Annotations

Identifies dependent variable (time to land) and how it is to be measured.

Science

Work sample 5:
Investigation report – Parachute design

RESULTS: Organise data in an appropriate table including title and headings.

The Average time of the three different types of material canopys

Type of material	Trial 1	Trial 2	Trial 3	Average
cotton	1.37s	1.78s	2.35s	1.83s
Polyester	2.66s	1.69s	2.34s	2.23s
Flammel	2.35s	2.35s	2.58s	2.43s

DISCUSSION:

1. Is your hypothesis supported or rejected? Why or why not?

The hypothesis was supported because the heaiver material was the slower the parachute will land.

2. Explain what your results show.

The results show that the the flammel was the heaivest, and the cotton material showed that it was the leghest.

Annotations

Organises data in a table.

Provides a summary measure (average time).

Interprets data with references to trends.

Science

Work sample 5:
Investigation report – Parachute design

3. Discuss and provide any suggestions for improvement.

material larger
strings longer
-We should have put a covering over the egg
So it wouldn't of cracked.
- We should have used a plastic bag
because it took the longest to land.

CONCLUSION: Explain whether you achieved you two aims.

The first aim that we achieved was that the flannel material worked the best.
The second aim was not achieved because the egg we launched cracked while it was in the cup.

Annotations

Suggests specific improvements to procedure.

Annotation (Overview)

In this work sample, the student communicates ideas, methods and findings using scientific language and appropriate representations.

Acknowledgement:
ACARA acknowledges the contribution of the Victorian Curriculum and Assessment Authority for providing the tasks and work samples. The annotations are referenced to the Australian Curriculum achievement standards.

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Work sample 6:
Poster - Feral Fox

Relevant part of the achievement standard

By the end of Year 7, students describe techniques to separate pure substances from mixtures. They represent and predict the effects of unbalanced forces, including Earth's gravity, on motion. They explain how the relative positions of the Earth, sun and moon affect phenomena on Earth. They analyse how the sustainable use of resources depends on the way they are formed and cycle through Earth systems. They predict the effect of environmental changes on feeding relationships and classify and organise diverse organisms based on observable differences. Students describe situations where scientific knowledge from different science disciplines has been used to solve a real-world problem. They explain how the solution was viewed by, and impacted on, different groups in society.

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Summary of task

Students had been investigating relationships in ecosystems, and the effect of introduced species on those relationships.

Students were asked to independently investigate an introduced species in Australia by researching using secondary sources. They were asked to present their research in a poster.

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Work sample 6:
Poster - Feral Fox

Annotations:

Communicates ideas through text and appropriate representations.

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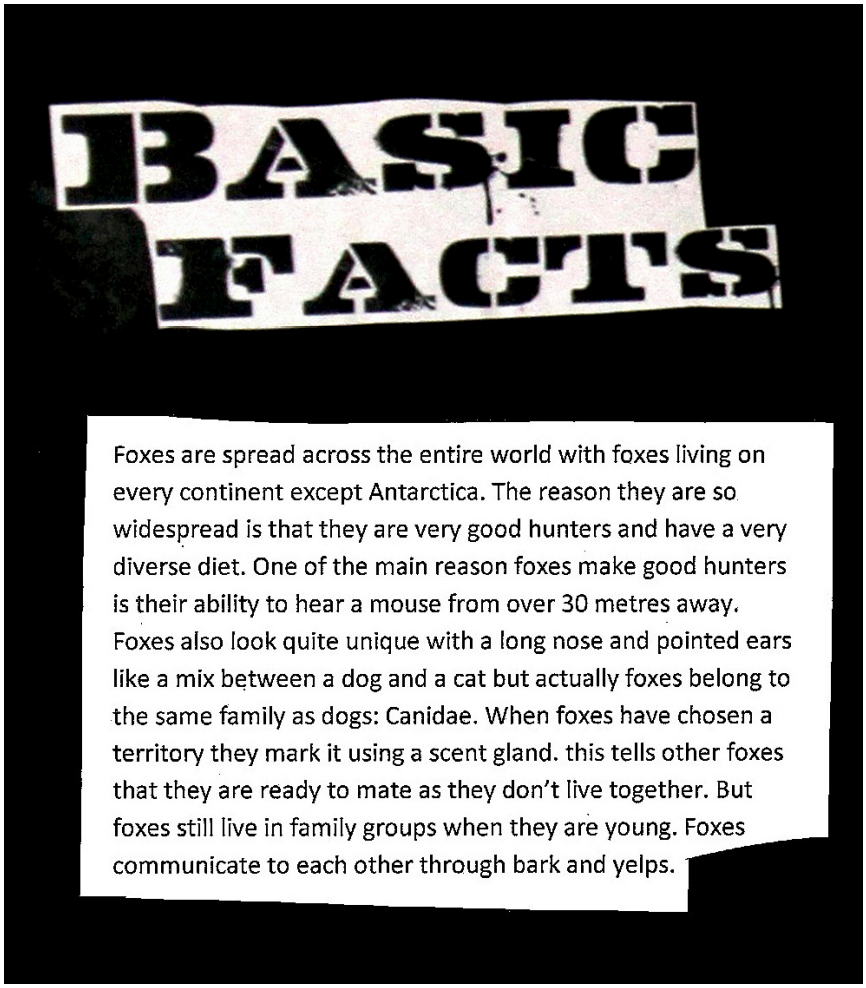
Work sample 6:
Poster - Feral Fox



Annotations:

Indicates that classification enables similar organisms to be grouped together.

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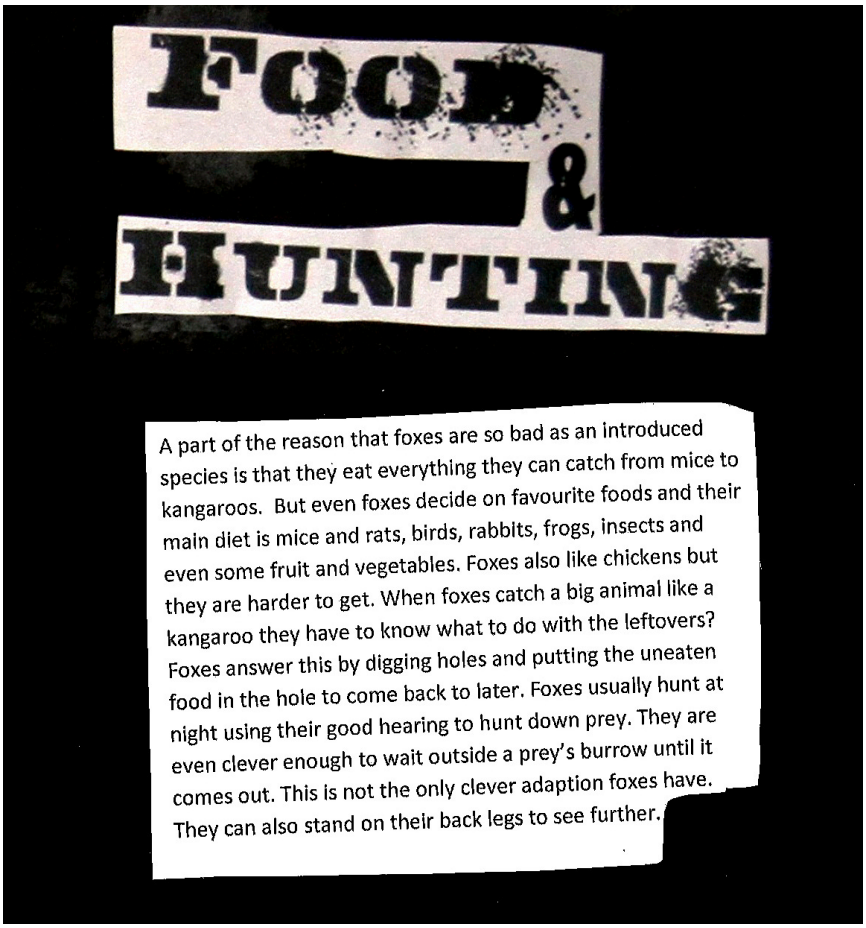
Work sample 6:
Poster - Feral Fox



Annotations:

Identifies feeding relationships.

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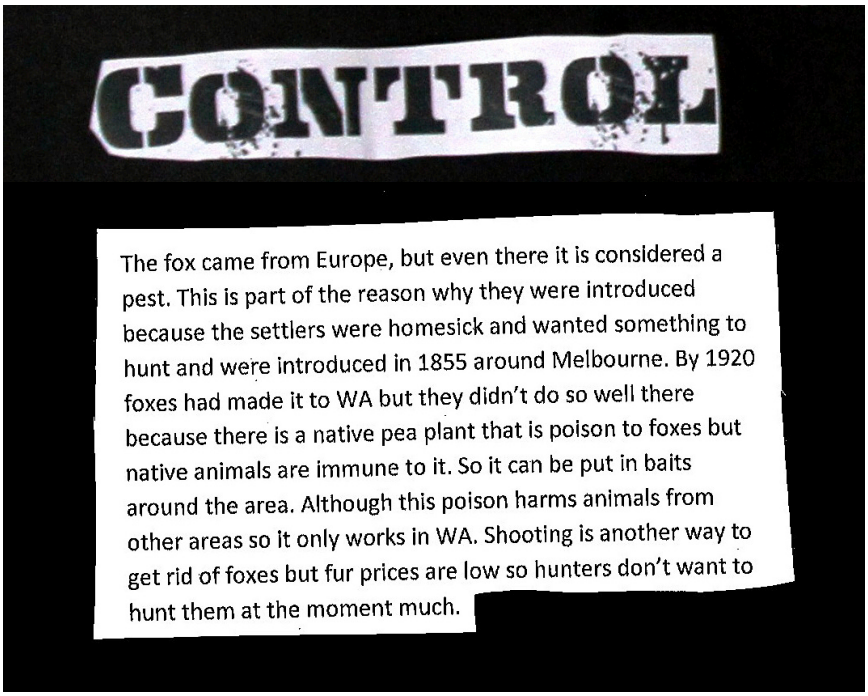
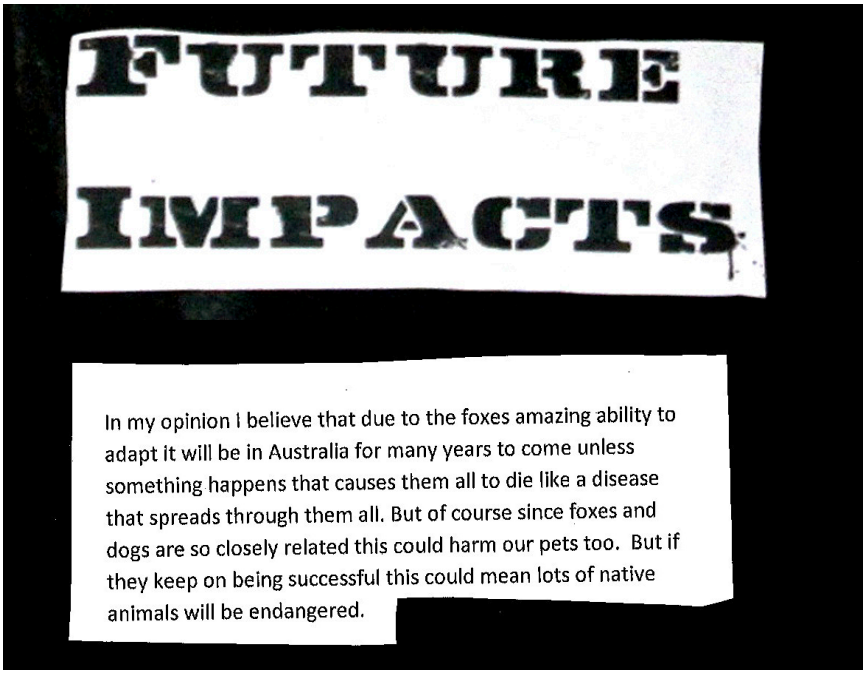
Work sample 6:
Poster - Feral Fox





Annotations:

Identifies a situation where science knowledge has been used to solve a problem.

Identifies that the solutions can have different impacts, i.e. use of the native pea outside WA.

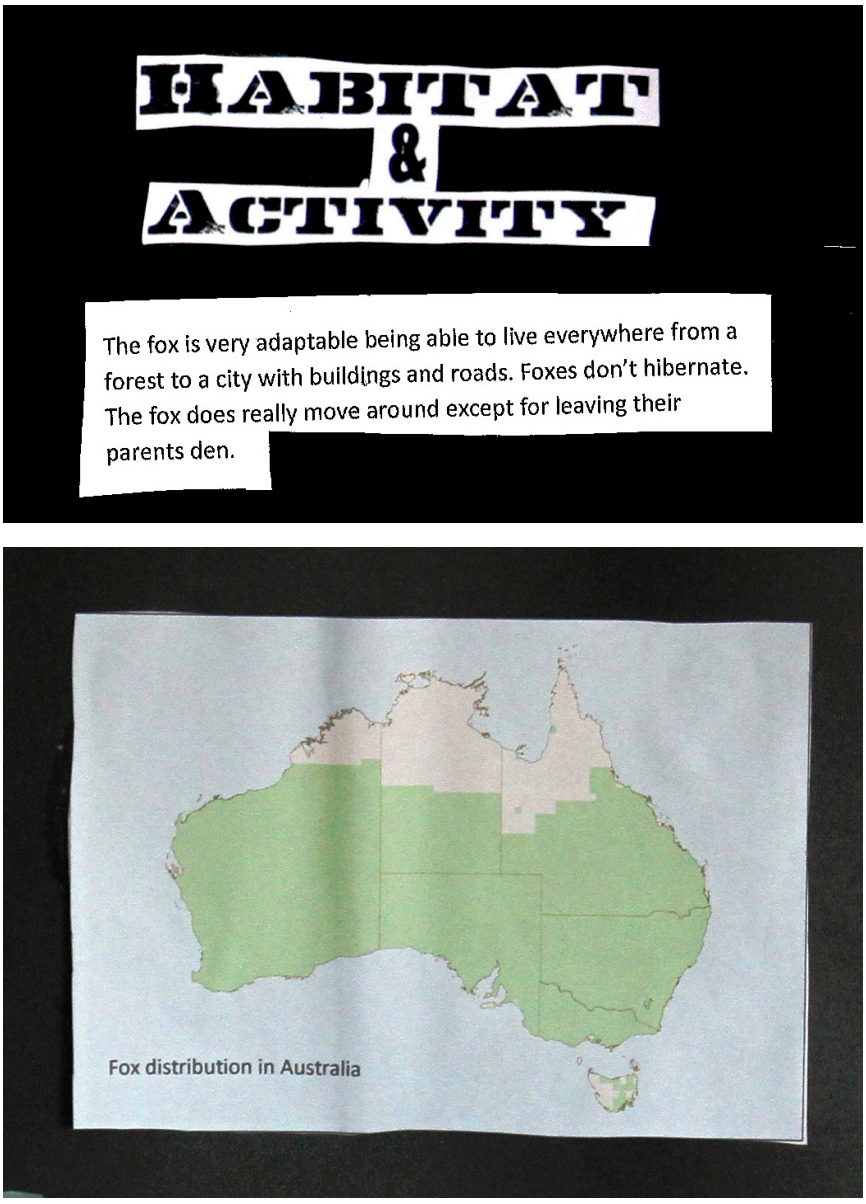
Identifies that solutions are not always viable depending on other factors, i.e. low fur prices.

Identifies the potential for a scientific solution to have additional impacts, i.e. harming pets.

Identifies the impact of increased fox population on the populations of prey animals.

Science

Work sample 6:
Poster - Feral Fox



Annotations:

Includes an appropriate representation to indicate fox distribution.

Annotation (Overview):

The sample shows that the student has synthesised information from a range of sources and communicated their ideas through scientific language and appropriate representations. The student has drawn conclusions based on the evidence collated to develop conclusions about fox impact and control.

Acknowledgement:
ACARA acknowledges the contribution of Education and Training Directorate, ACT for providing the tasks and work samples. The annotations written by ACARA are referenced to the Australian curriculum achievement standards.