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 5 SCIENCE

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

Sample 1	Research presentation – Planets
Sample 2	Research report – Can light go around corners?
Sample 3	Independent review – Desert survivors
Sample 4	Independent investigation – Beak shapes
Sample 5	Independent review – Observable properties of solids, liquids and gases
Sample 6	Newspaper article – Australian scientists

In this portfolio, the student classifies a range of common substances as solids, liquids and gases, and demonstrates an understanding of the observable properties and behaviours that enable that classification (WS5). The student applies the understanding that light travels in straight lines and is reflected to direct light around a corner (WS2). The student describes a number of planets in our solar system and compares them to Earth in terms of size and distance from the sun (WS1). The student identifies a range of adaptations of a camel (WS3) and explains how structural features relate to function (WS3, WS4). The student investigates the work of two Australian scientists who worked collaboratively and explains how their findings improved people's lives (WS6).

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The student demonstrates the ability to follow teacher instructions to pose questions for investigation and to manipulate equipment to achieve a desired outcome (WS2). The student collates data in a provided table and constructs a column graph to organise data and identify patterns (WS4), using the data to explain their reasoning (WS4, WS2).The student describes ways to improve the fairness of investigation methods (WS4) and communicates ideas, methods and findings using a range of text types (WS1, WS2, WS3, WS6).

The following aspect of the achievement standard is not evident in this portfolio:

- *use equipment in ways that are safe and improve the accuracy of their observations.*

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Work sample 1:
Research presentation – Planets

Relevant parts of the achievement standard

By the end of Year 5, students classify substances according to their observable properties and behaviours. They explain everyday phenomena associated with the transfer of light. They describe the key features of our solar system. They analyse how the form of living things enables them to function in their environments. Students discuss how scientific developments have affected people's lives and how science knowledge develops from many people's contributions.

Students follow instructions to pose questions for investigation, predict what might happen when variables are changed, and plan investigation methods. They use equipment in ways that are safe and improve the accuracy of their observations. Students construct tables and graphs to organise data and identify patterns. They use patterns in their data to suggest explanations and refer to data when they report findings. They describe ways to improve the fairness of their methods and communicate their ideas, methods and findings using a range of text types.

Summary of task

Prior to completing this task, students investigated aspects of the solar system, including how we obtain information about other planets, and viewed a DVD about key features of the solar system.

Students were asked to research features of planets in the solar system, and were directed to focus on the planets closest to the Earth, and how these planets compare to Earth. They were given a choice of how to present their information and this student chose a slide presentation.

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Work sample 1:
Research presentation – Planets

Annotations

Identifies four planets of the solar system closest to the sun.

Lists some key features of each planet, including size, temperature and surface characteristics.

Identifies relationships between planets in the solar system, including relative position with regard to distance from the sun and similarity to Earth.

Synthesises and communicates research data through a slide presentation.

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.

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Work sample 2:
Investigation report – Can light go around corners?

Relevant parts of the achievement standard

By the end of Year 5, students classify substances according to their observable properties and behaviours. They explain everyday phenomena associated with the transfer of light. They describe the key features of our solar system. They analyse how the form of living things enables them to function in their environments. Students discuss how scientific developments have affected people's lives and how science knowledge develops from many people's contributions.

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Summary of task

Students had been studying phenomena associated with light. They had been introduced to the idea that light travels in straight lines and that this could be represented using ray diagrams. They discussed the types of questions they could investigate using classroom resources and how they could refine their questions to ensure they were investigable.

Students were asked to develop an investigable question about light. They independently conducted the investigation and communicated their findings.

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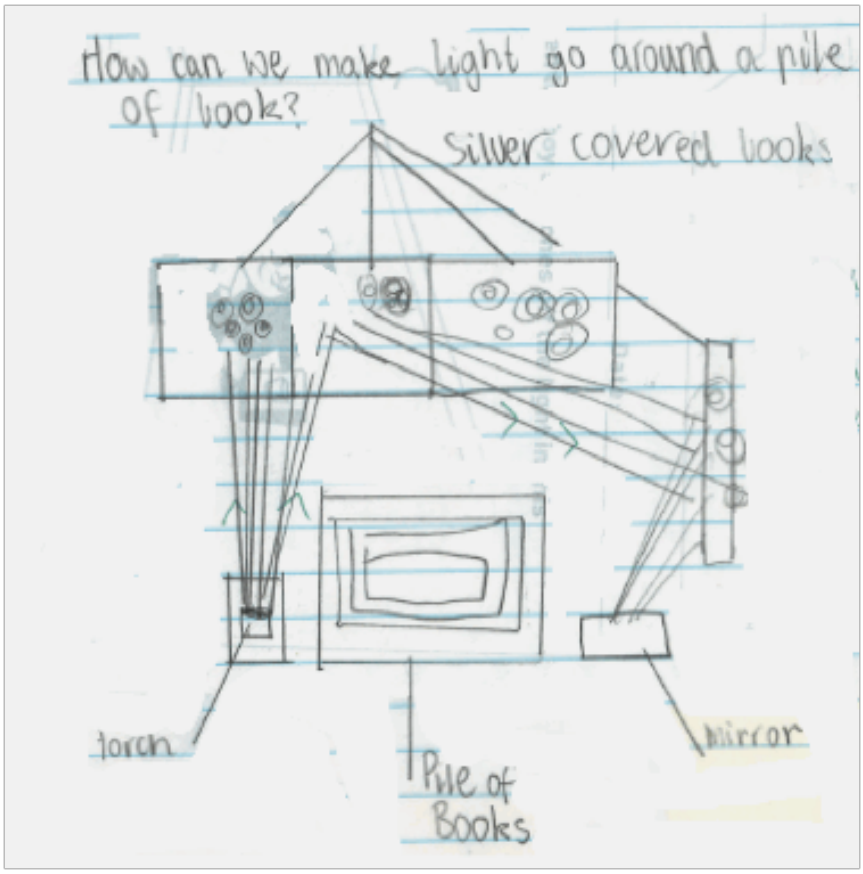
Work sample 2:
Investigation report – Can light go around corners?



Annotations

Poses question for investigation.

Proposes solution based on knowledge of light and investigation findings.

Uses rays to show that light travels in straight lines and reflects off different surfaces.

Represents solution as an annotated diagram.

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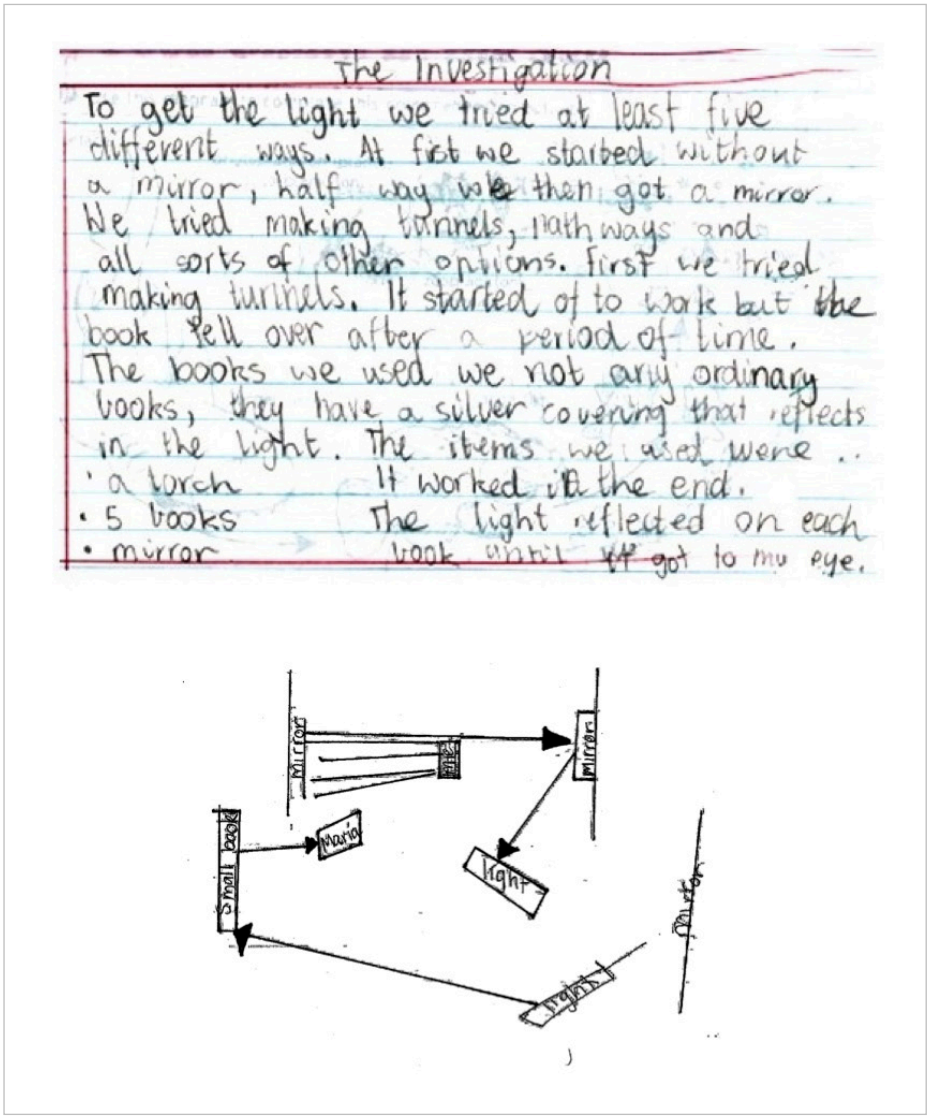
Work sample 2:
Investigation report – Can light go around corners?



The Investigation

To get the light we tried at least five different ways. At first we started without a mirror, half way we then got a mirror. We tried making tunnels, path ways and all sorts of other options. First we tried making tunnels. It started of to work but the book fell over after a period of time. The books we used we not any ordinary books, they have a silver covering that reflects in the light. The items we used were ..

- a torch
- 5 books
- mirror

It worked in the end. The light reflected on each book until it got to my eye.

Annotations

Uses trial and error and evaluates each trial to improve quality of solution.

Identifies torch as a light source.

Identifies the need for a reflective surface to redirect the light.

Describes how light can be reflected from a surface to the eye.

Communicates ideas and method using text and annotated diagrams, including ray arrow representations.

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

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Work sample 3:
Independent review – Desert survivors

Relevant parts of the achievement standard

By the end of Year 5, students classify substances according to their observable properties and behaviours. They explain everyday phenomena associated with the transfer of light. They describe the key features of our solar system. They analyse how the form of living things enables them to function in their environments. Students discuss how scientific developments have affected people's lives and how science knowledge develops from many people's contributions.

Students follow instructions to pose questions for investigation, predict what might happen when variables are changed, and plan investigation methods. They use equipment in ways that are safe and improve the accuracy of their observations. Students construct tables and graphs to organise data and identify patterns. They use patterns in their data to suggest explanations and refer to data when they report findings. They describe ways to improve the fairness of their methods and communicate their ideas, methods and findings using a range of text types.

Summary of task

Students had completed a unit exploring desert environments. They had investigated the conditions of desert environments and how plants and animals living in these environments are adapted to those conditions.

Students were asked to independently complete this review at the end of the unit to demonstrate their learning about how particular structural features help animals and/or plants to survive in the desert.

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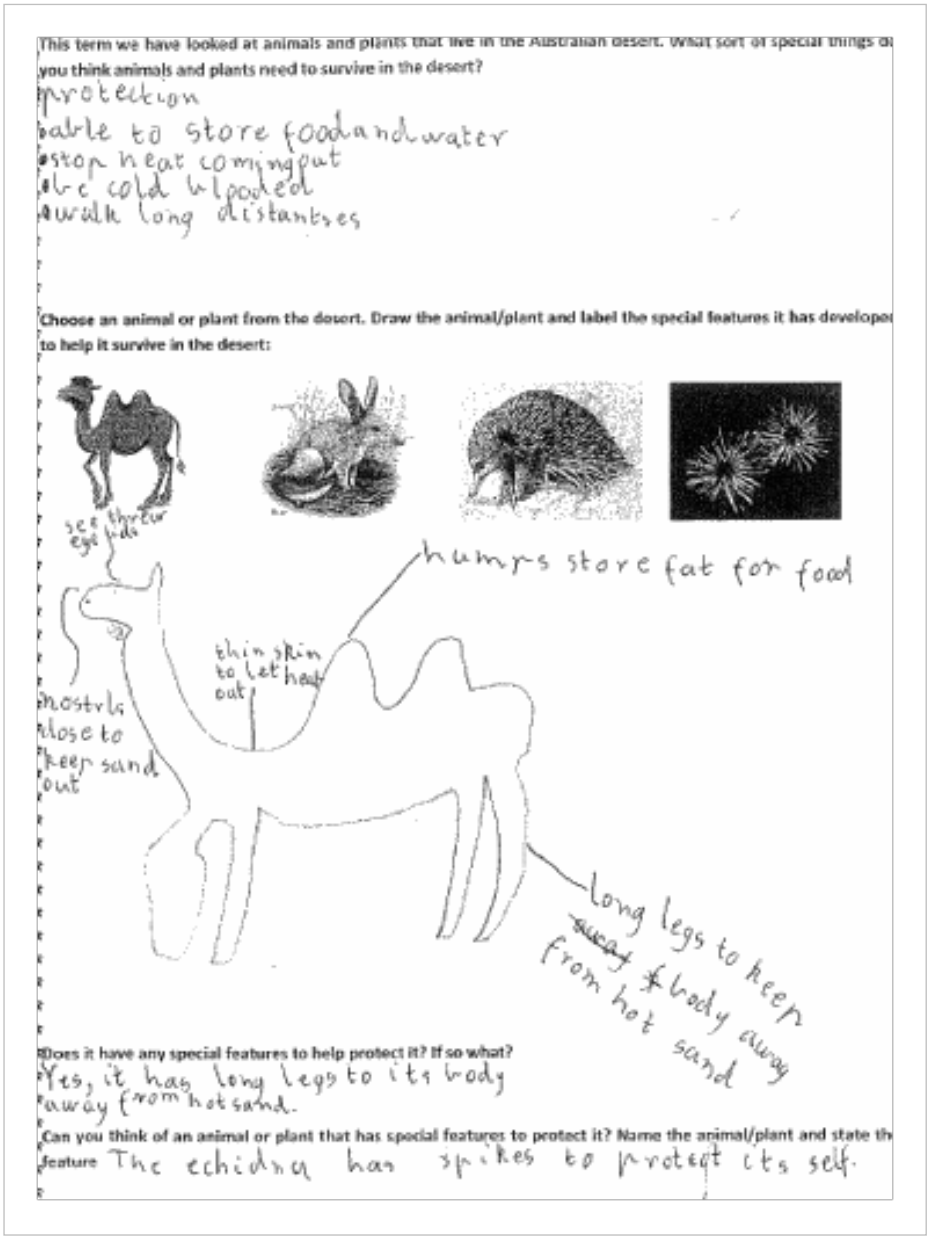
Work sample 3:
Independent review – Desert survivors


This term we have looked at animals and plants that live in the Australian desert. What sort of special things do you think animals and plants need to survive in the desert?

protection
able to store food and water
stop heat coming out
to be cold when cooled
walk long distances

Choose an animal or plant from the desert. Draw the animal/plant and label the special features it has developed to help it survive in the desert:

Does it have any special features to help protect it? If so what?
Yes, it has long legs to its body away from hot sand.

Can you think of an animal or plant that has special features to protect it? Name the animal/plant and state the feature The echidna has spikes to protect its self.

Annotations

Describes adaptations of plants and animals that enable them to survive in the desert.

Identifies structural features of a camel and explains how these features assist survival in the desert.

Communicates ideas using text and labelled diagrams.

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

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Work sample 4:
Independent investigation – Beak shapes

Relevant parts of the achievement standard

By the end of Year 5, students classify substances according to their observable properties and behaviours. They explain everyday phenomena associated with the transfer of light. They describe the key features of our solar system. They analyse how the form of living things enables them to function in their environments. Students discuss how scientific developments have affected people's lives and how science knowledge develops from many people's contributions.

Students follow instructions to pose questions for investigation, predict what might happen when variables are changed, and plan investigation methods. They use equipment in ways that are safe and improve the accuracy of their observations. Students construct tables and graphs to organise data and identify patterns. They use patterns in their data to suggest explanations and refer to data when they report findings. They describe ways to improve the fairness of their methods and communicate their ideas, methods and findings using a range of text types.

Summary of task

The National Assessment Program for Scientific Literacy (NAP-SL) samples Year 6 students but includes tasks at a range of levels. Students had been studying adaptation and the teacher used this task from the School Release Materials to test their science inquiry skills in a familiar context.

Students were asked to independently complete the attached task. They had worked in groups to gather their data, but only one answer was data dependent. The investigation required them to model different shaped beaks using craft sticks (sieve type beak), toothpick (spear type beak) and spoon (net /type beak) to see how many pieces of paper (food) they could pick up in 10 seconds. Timing was done by counting (e.g. one thousand and one, one thousand and two).

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Work sample 4:
Independent investigation – Beak shapes

Table 2: 'Food' (number of pieces of paper) gathered

Beak type	'Food' (number of pieces of paper) gathered by			
	Person 1	Person 2	Person 3	Total
Sieve (two craft sticks)	34	32		66
Spear (toothpick)	22	20		42
Net (plastic spoon)	54	57		111

Part B

Individual work (Answer these questions by yourself.)

Q1 Look at your group's results in **Table 1:** *'Food' (number of beads) gathered.*

When Person 1 used the **craft sticks**, how many beads did they gather?

They collected one bead.

Q2 In the experiment you used a plastic spoon as a net-type beak.

Describe how a plastic spoon works in a similar way to a net-type beak.

It has a pit in it which can carry things.

Q3 Describe how a plastic spoon is different from a net-type beak.

The spoon doesn't have a lid like the top of a beak.

Q4 Ducks move over the surface of the water with their mouths open to sieve (filter) floating weed. In this experiment small pieces of paper were used to represent floating weed.

Do your group's results show that the best type of a beak to collect floating weed is a sieve?

Circle: Yes / (No)

Use the data you collected in the experiment to explain your answer.

The plastic spoon was the best type because it held a lot of paper which was piled on the spoon like a tower so it fitted and still collected heaps.

Annotations

Records data in a provided table.

Suggests how a simple model of a beak (spoon) relates to how a real net type beak functions.

Can identify a pattern in tabulated data.

Uses data as evidence in explaining conclusions.

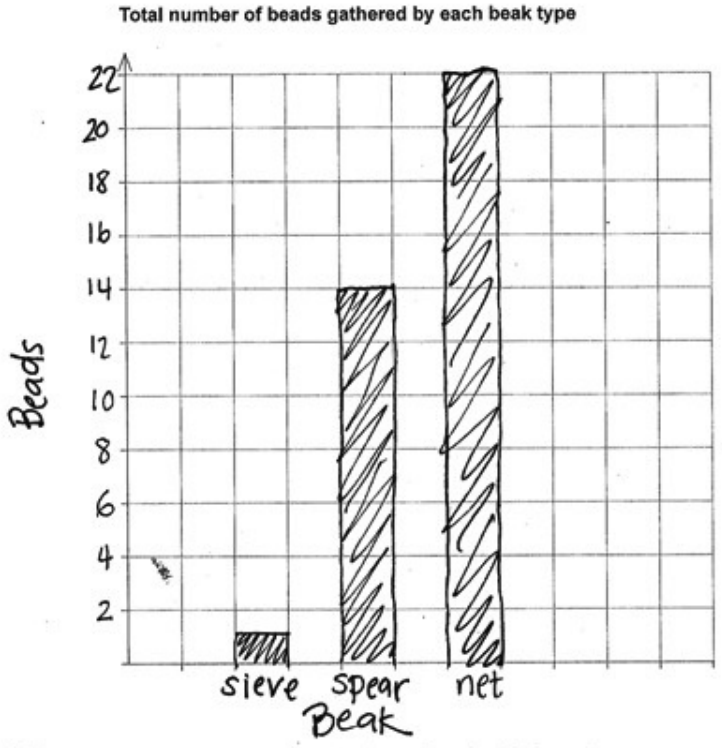
Science

Work sample 4:
Independent investigation – Beak shapes

Q5–Q7

Use the **TOTAL number of beads gathered** to draw a column (bar) graph that displays your group's data from **Table 1**.

Draw your graph in the space below. Remember to label the axes of your graph.



Q8 How is a bird's beak matched to what the bird eats?

Give an example to support your answer.

If it's thin it would eat small things. If it's large it could eat small and big things.

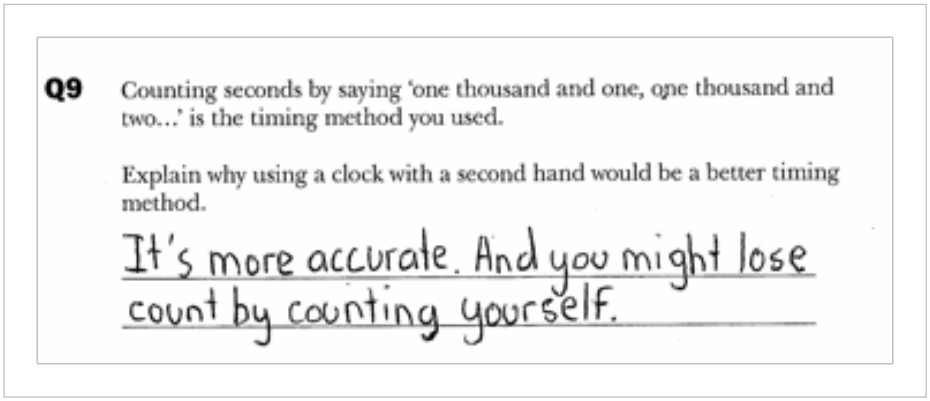
Annotations

Represents data in a column graph.

Explains how structural features are related to function.

Science

Work sample 4:
Independent investigation – Beak shapes



Q9 Counting seconds by saying 'one thousand and one, one thousand and two...' is the timing method you used.

Explain why using a clock with a second hand would be a better timing method.

It's more accurate. And you might lose count by counting yourself.

Annotations

Identifies that using a clock with a second hand would improve accuracy (and thus, fairness) of measurement.

Annotations (Overview)

In this work sample, the student communicates ideas using text and graphic representations.

Acknowledgment
ACARA acknowledges the contribution of 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 5:
Independent review – Observable properties of solids, liquids and gases

Relevant parts of the achievement standard

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Summary of task

Students had completed a unit exploring the properties of solids, liquids and gases and how they change state.

Students were asked to independently complete the attached questions as a final review of the unit.

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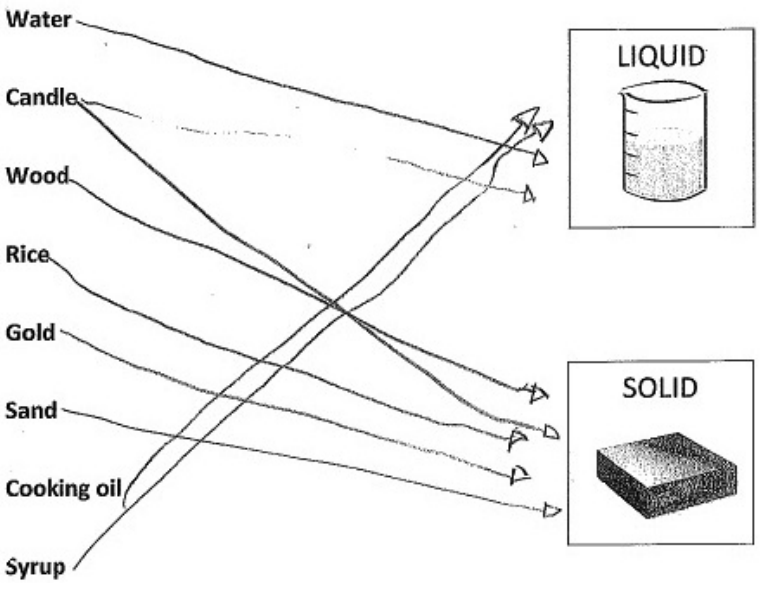
Work sample 5:
Independent review – Observable properties of solids, liquids and gases

1. Fill in the table below by putting a **cross (x) in the correct box** or boxes.

	Solid	Liquid	Gas
a. It fills the shape of its container		X	
b. It stays the same shape	X		
c. The air around us is made of this			X
d. If you freeze a liquid it will become a.....	X		
e. Helium and oxygen are examples of this			X
f. If you boil water it will become a....			X

2. These solids and liquids are all mixed up. **Draw an arrow to show** which of these materials are liquid and which are solid.



Annotations

Identifies that liquids take the shape of their container (doesn't identify gases as having the same property).

Identifies that solids stay the same shape.

Identifies that substances change state.

Correctly identifies the state of a number of common substances.

Science

Work sample 5:
Independent review – Observable properties of solids, liquids and gases

3. Use the words from the list below to complete the eight sentences

Word list: heat, solids, freezes, shape, volume, cool, melts

a. Liquids change.....Shape.....when you move them in a container.

b. .....Solids.....don't change shape when you move them.

c. Moving a liquid from a bottle to a glass does not changes its.....Mass.....

d. When a solid.....melts.....it turns into a liquid.

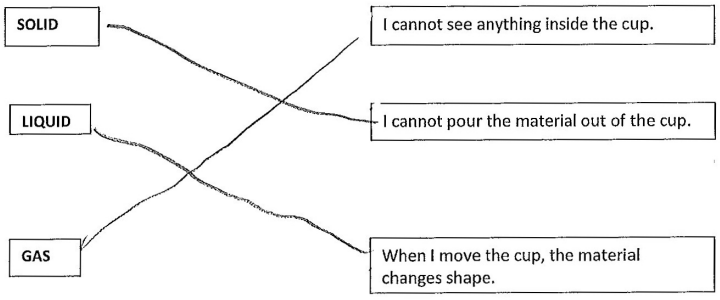
e. When a liquid.....freezes.....it turns into a solid.

f. To turn into a liquid, you must.....cool.....it.

g. To turn a liquid into a solid, you must .....volume.....it.

4. Megan has three cups. There is a solid in one cup, liquid in another, and gas in another. Megan writes a description of what is in each cup.

a. Draw **THREE** lines to match solid, liquid and gas to the best description of what is in each cup.



Annotations

Identifies that liquids fit the shape of their container and that solids don't change shape.

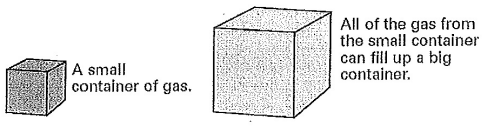
Describes some changes of state but confuses volume and heat.

Identifies that gases are often not visible.

Science

Work sample 5:
Independent review – Observable properties of solids, liquids and gases

b. Megan's teacher says gases spread out to **completely fill up any container.**



Write **yes** or **no** in each row to complete the table.

	Do they spread out to **completely fill up** any container?
SOLID	NO
LIQUID	Ye NO
GAS	YES

Annotations

Identifies that liquids and solids do not spread out to completely fill any container.

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

Science

Work sample 6:
Newspaper article – Australian scientists

Relevant parts of the achievement standard

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Summary of task

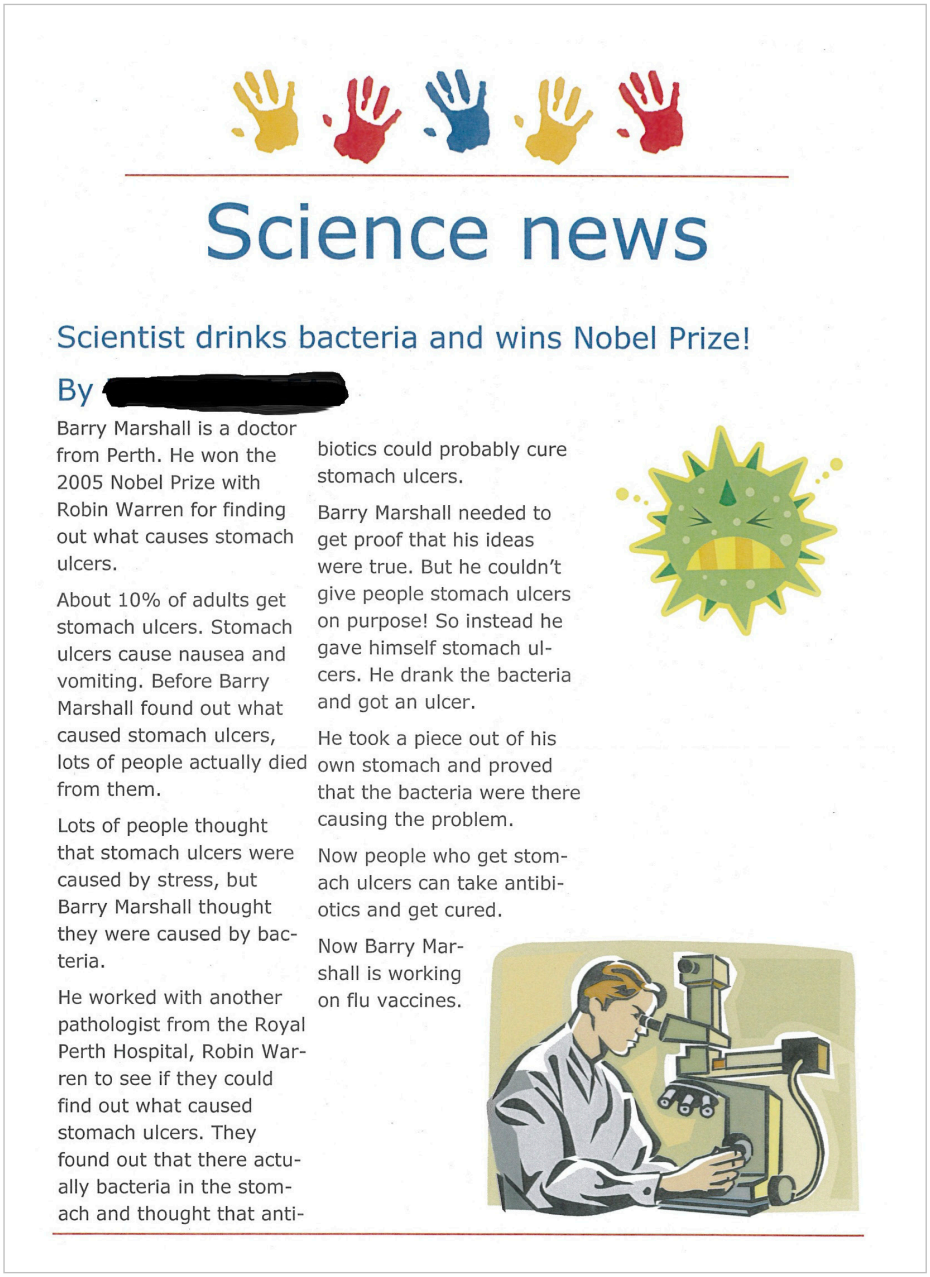
As part of a unit on microorganisms as living things, students explored the role of research in building our knowledge and understanding of bacteria and the ways these microorganisms impact our lives. Students viewed a video about the work of Barry Marshall and Robin Warren. As a class, they created a timeline that showed the major events in their work on stomach ulcers.

Students were asked to write a newspaper article about Barry Marshall and Robin Warren's work. They were provided with a pro forma for the article and were required to include the following:

- a catchy headline for the article
- a description of what the scientists did
- a description of why their work was important.

Science

Work sample 6:
Newspaper article – Australian scientists



Science news

Scientist drinks bacteria and wins Nobel Prize!

By [redacted]

Barry Marshall is a doctor from Perth. He won the 2005 Nobel Prize with Robin Warren for finding out what causes stomach ulcers.

About 10% of adults get stomach ulcers. Stomach ulcers cause nausea and vomiting. Before Barry Marshall found out what caused stomach ulcers, lots of people actually died from them.

Lots of people thought that stomach ulcers were caused by stress, but Barry Marshall thought they were caused by bacteria.

He worked with another pathologist from the Royal Perth Hospital, Robin Warren to see if they could find out what caused stomach ulcers. They found out that there actually bacteria in the stomach and thought that antibiotics could probably cure stomach ulcers.

Barry Marshall needed to get proof that his ideas were true. But he couldn't give people stomach ulcers on purpose! So instead he gave himself stomach ulcers. He drank the bacteria and got an ulcer.

He took a piece out of his own stomach and proved that the bacteria were there causing the problem.

Now people who get stomach ulcers can take antibiotics and get cured.

Now Barry Marshall is working on flu vaccines.

Annotations

Demonstrates basic knowledge about the scientist and their work with a reasonable degree of accuracy.

Illustrates the collaborative nature of the work.

Links the science to the treatment of disease in society and indicates how science has made a difference to people's lives.

Annotations (Overview)

In this work sample, the student communicates science ideas through a newspaper article text.

Acknowledgment
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