Science

Year 5

Above satisfactory

WORK SAMPLE PORTFOLIO

Annotated work sample portfolios are provided to support implementation of the Foundation – Year 10 Australian Curriculum.

Each portfolio is an example of evidence of student learning in relation to the achievement standard. Three portfolios are available for each achievement standard, illustrating satisfactory, above satisfactory and below satisfactory student achievement. The set of portfolios assists teachers to make on-balance judgements about the quality of their students' achievement.

Each portfolio comprises a collection of students' work drawn from a range of assessment tasks. There is no pre-determined number of student work samples in a portfolio, nor are they sequenced in any particular order. Each work sample in the portfolio may vary in terms of how much student time was involved in undertaking the task or the degree of support provided by the teacher. The portfolios comprise authentic samples of student work and may contain errors such as spelling mistakes and other inaccuracies. Opinions expressed in student work are those of the student.

The portfolios have been selected, annotated and reviewed by classroom teachers and other curriculum experts. The portfolios will be reviewed over time.

ACARA acknowledges the contribution of Australian teachers in the development of these work sample portfolios.

THIS PORTFOLIO: YEAR 5 SCIENCE

This portfolio provides the following student work samples:

Sample 1	Worksheet: Solids, liquids, gases
Sample 2	Data analysis: Patterns in the solar system
Sample 3	Investigation report: Bird beaks
Sample 4	Investigation report: Hide and seek
Sample 5	Investigation report: Viscosity
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 (WS1). 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 (WS2). The student investigates different adaptations 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, predict the outcome of changing variables (WS4, WS5) and to use equipment accurately and safely to achieve a desired outcome (WS5). The student collates data in a provided table (WS2, WS3, WS4) and constructs a column graph to organise data and identify patterns (WS3, WS4, WS5), using the data to explain their reasoning (WS2, WS3, WS4). The student describes ways to improve the fairness of investigation methods (WS4, WS5) and communicates ideas, methods and findings using a range of text types (WS2, WS3, WS4, WS5, WS6).

Worksheet: Solids, liquids, gases

Year 5 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

> *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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> *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

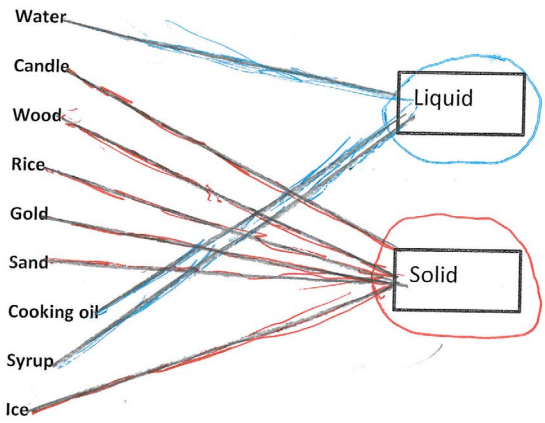
Students had completed a unit on classifying states of matter (solid, liquid and gas) based on observable properties.

They were required to complete this worksheet as a review of their learning across the unit. They completed the task over one hour in class.

Worksheet: Solids, liquids, gases

Solids, liquids and gases

1. These solids and liquids are all mixed up. Draw an arrow to show which of the materials are liquid and which are solid.



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

	Solid	Liquid	Gas
a. It fills the shape of its container		X	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. If you boil water it will become a...			X
f. It has weight	X	X	X

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

Annotations

Classifies common solids and liquids.

Identifies properties of solids, liquids and gases.

Identifies that solids, liquids and gases all have mass.

Worksheet: Solids, liquids, gases

c. Moving a liquid from a bottle to a glass does not change its volume

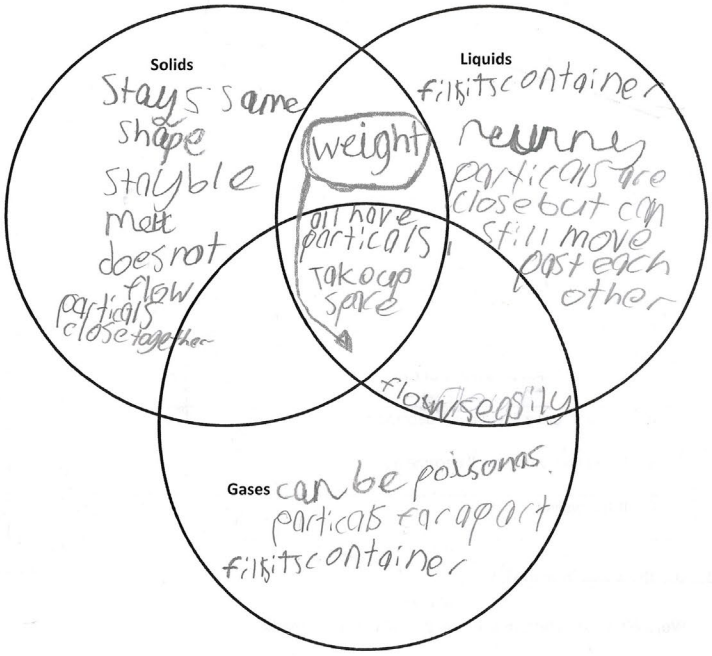
d. When a solid melts it turns into a liquid.

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

f. To turn a solid into a liquid, you must melt it.

g. To turn a liquid into a solid, you must add cool? or remove heat

4. Complete the Venn diagram below to show as much as you know about solids, liquids and gases. Remember to use the overlapping parts of the diagram to show what they have in common.



Annotations

Identifies that adding or removing heat can cause a change of state.

Identifies that all states of matter have particles, mass and take up space and begins to use a particle model to explain difference in states.

Data analysis: Patterns in the solar system

Year 5 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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Summary of task

Students had investigated models of the solar system, including exploring a digital learning object. They had discussed the types of data that could be gathered about the solar system, and the ways in which patterns in data can assist us in making predictions.

Students were asked to extract and organise a set of data related to the planets in the solar system. As a whole class they constructed a scale model of the solar system on the school oval. They were then provided with a set of questions that prompted them to identify patterns in the data. Students spent one lesson constructing their table from the provided data, another lesson constructing and discussing their scale model, and a final lesson completing the discussion questions.

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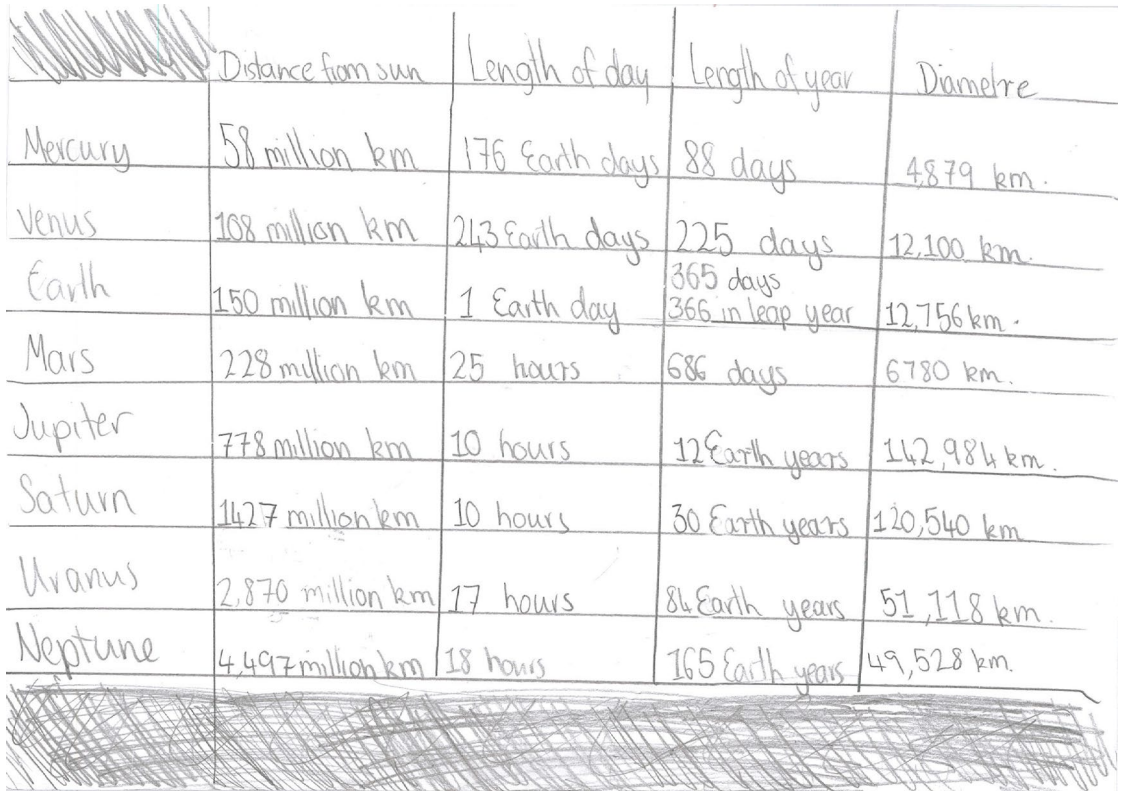
Above satisfactory

Data analysis: Patterns in the solar system



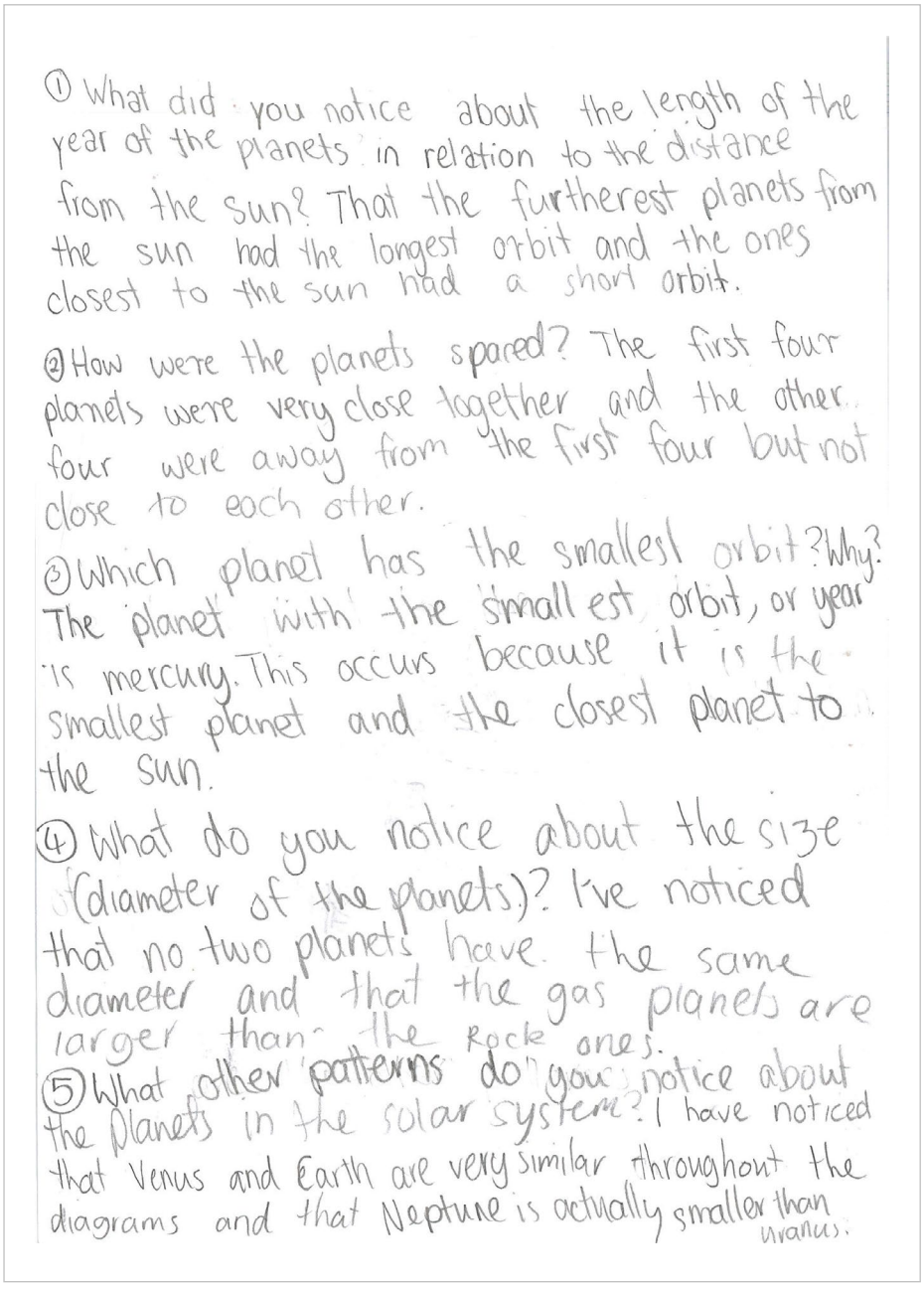
	Distance from sun	Length of day	Length of year	Diametre
Mercury	58 million km	176 Earth days	88 days	4879 km.
Venus	108 million km	243 Earth days	225 days	12,100 km.
Earth	150 million km	1 Earth day	365 days 366 in leap year	12,756 km.
Mars	228 million km	25 hours	686 days	6780 km.
Jupiter	778 million km	10 hours	12 Earth years	142,984 km.
Saturn	1427 million km	10 hours	30 Earth years	120,540 km
Uranus	2,870 million km	17 hours	84 Earth years	51,118 km.
Neptune	4,497 million km	18 hours	165 Earth years	49,528 km.

Annotations

Constructs a table to record and organise data collected.

Identifies the planets in the solar system, and that they have varying properties (distance from the sun, day length, year length, diameter).

Data analysis: Patterns in the solar system



① What did you notice about the length of the year of the planets in relation to the distance from the sun? That the furtherest planets from the sun had the longest orbit and the ones closest to the sun had a short orbit.

② How were the planets spaced? The first four planets were very close together and the other four were away from the first four but not close to each other.

③ Which planet has the smallest orbit? Why? The planet with the smallest orbit, or year is mercury. This occurs because it is the smallest planet and the closest planet to the sun.

④ What do you notice about the size (diameter of the planets)? I've noticed that no two planets have the same diameter and that the gas planets are larger than the rock ones.

⑤ What other patterns do you notice about the planets in the solar system? I have noticed that Venus and Earth are very similar throughout the diagrams and that Neptune is actually smaller than Uranus.

Annotations

Identifies patterns in data by relating two variables, and recognises that year length is related to time taken to orbit the sun.

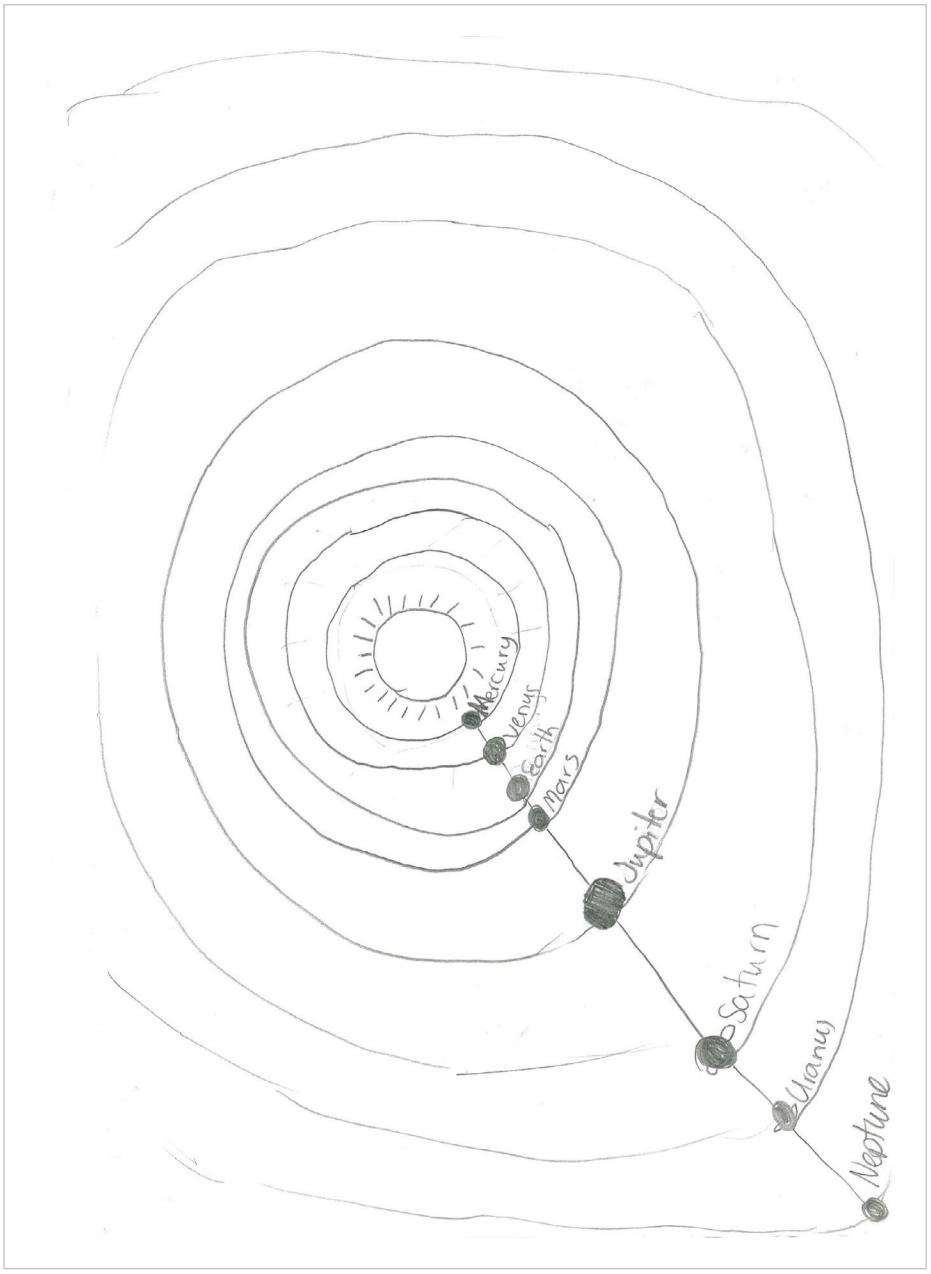
Observes and describes patterns in the data.

Uses data to answer a research question and provides an explanation with reference to features of the solar system.

Draws on qualitative data to identify additional patterns.

Identifies similarities between planets based on a range of properties.

Data analysis: Patterns in the solar system



Annotations

Constructs a labelled diagram of the solar system.

Annotations (Overview)

The student communicates ideas and findings using tables, written text and labelled diagrams.

Investigation report: Bird beaks

Year 5 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

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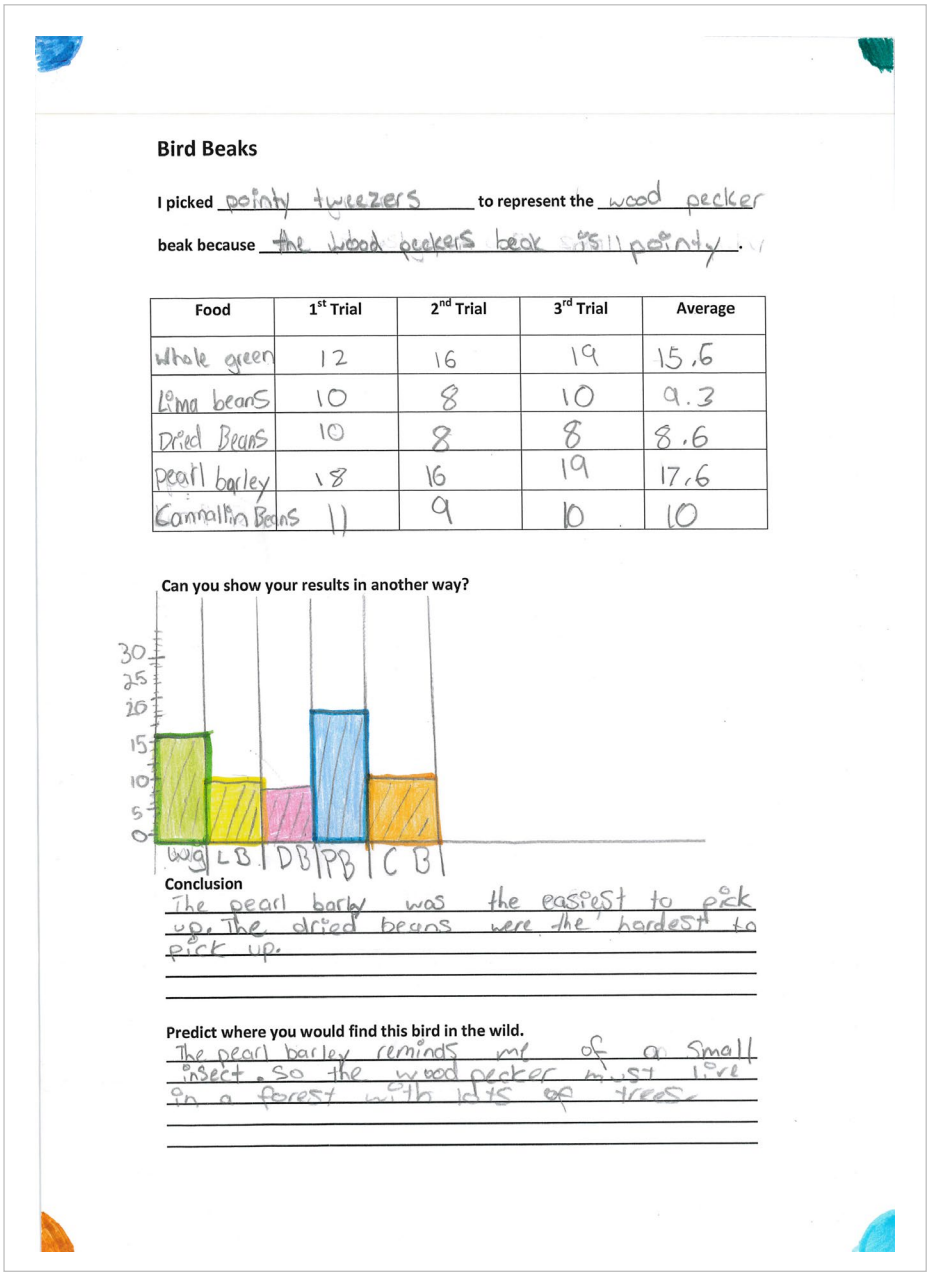
Summary of task

Students had been studying adaptations and the way they could model animal adaptations to make predictions about how those adaptations enabled the animal to survive in their environment.

Students were asked to independently complete an investigation into the relationship between bird beak shape and food size. The investigation required them to model the beak shape of a chosen bird, and see how much of each food type they could collect in 10 seconds. Timing was completed by counting, for example, 'one thousand and one, one thousand and two'.

Investigation report: Bird beaks



Bird Beaks

I picked pointy tweezers to represent the wood pecker beak because the wood peckers beak is pointy.

Food	1st Trial	2nd Trial	3rd Trial	Average
Whole green	12	16	19	15.6
Lima beans	10	8	10	9.3
Dried Beans	10	8	8	8.6
Pearl barley	18	16	19	17.6
Cannellini Beans	11	9	10	10

Can you show your results in another way?

Conclusion

The pearl barley was the easiest to pick up. The dried beans were the hardest to pick up.

Predict where you would find this bird in the wild.

The pearl barley reminds me of a small insect. so the wood pecker must live in a forest with lots of trees.

Annotations

Selects a tool to model the beak based on structural properties of the beak.

Records data in a table and calculates summary data.

Constructs a column graph to represent summary data.

Uses data to identify patterns and states a conclusion.

Predicts where the bird might be found, and the type of food it might eat, with reference to data.

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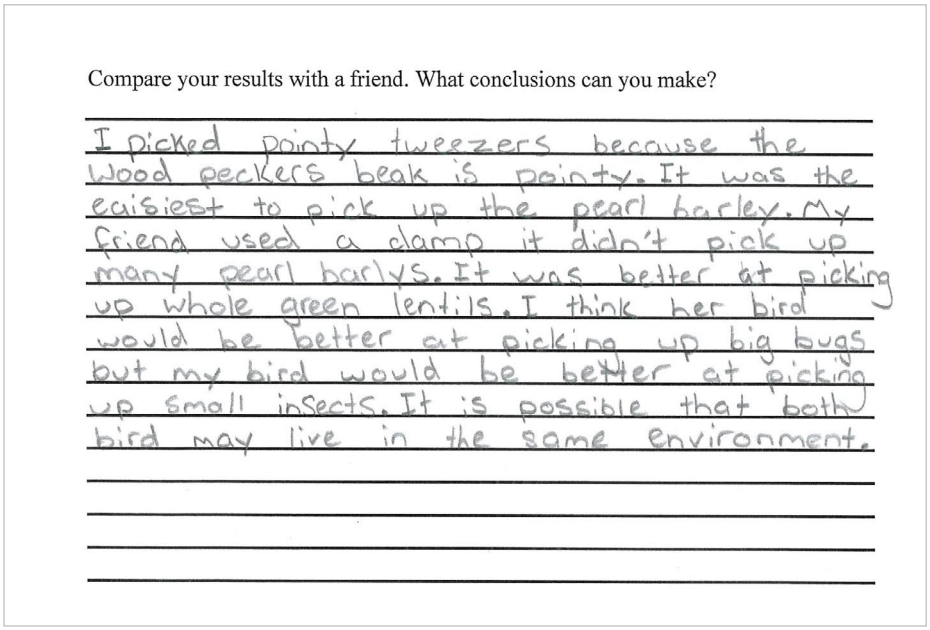
Above satisfactory

Investigation report: Bird beaks



Compare your results with a friend. What conclusions can you make?

I picked pointy tweezers because the Wood peckers beak is pointy. It was the easiest to pick up the pearl barley. My friend used a clamp it didn't pick up many pearl barlys. It was better at picking up whole green lentils. I think her bird would be better at picking up big bugs but my bird would be better at picking up small insects. It is possible that both bird may live in the same environment.

Annotations

Explains that different tools were required to model different beak sizes on different birds.

Refers to data to support the prediction that birds with different beak sizes eat different-sized food.

Annotations (Overview)

The student communicates ideas and findings using tables, graphs and written text.

Investigation report: Hide and seek

Year 5 Science achievement standard

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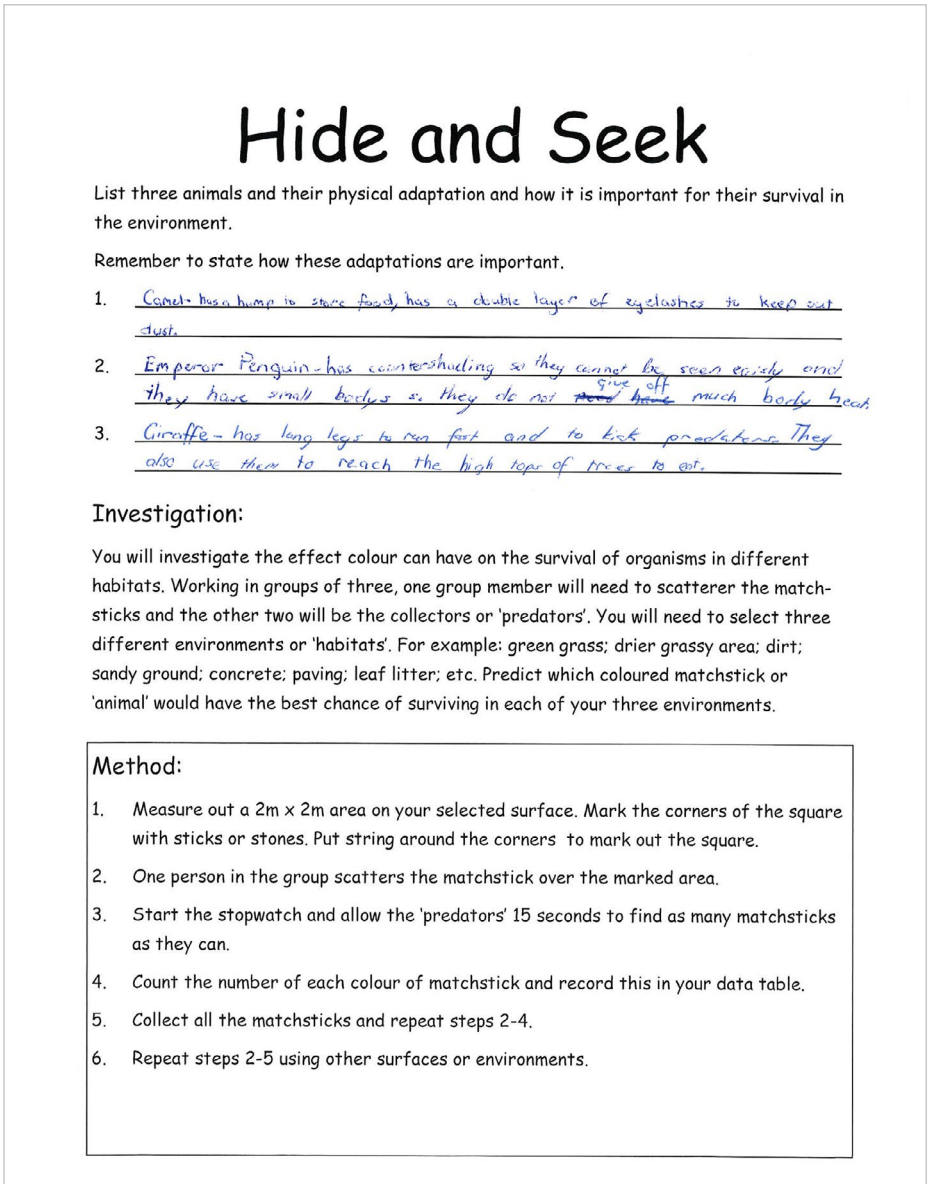
Summary of task

The class participated in a brainstorming activity in which they identified the physical adaptations of a range of animals and the advantages of those adaptations. Students then separated into small groups to complete an activity which used coloured small coloured sticks to represent organisms in a range of 'environments', such as green grass, leaf matter, soil and sand.

The students reviewed the data collection process as a whole group. They were then asked to graph their data and compare the survival rates of the organisms in each environment. They were also required to apply their findings to various real-world scenarios. The final stage of the activity involved an analysis of the fairness of the investigation and consideration of possible improvements to the investigation.

Investigation report: Hide and seek



Hide and Seek

List three animals and their physical adaptation and how it is important for their survival in the environment.

Remember to state how these adaptations are important.

1. Camel- has a hump to store food, has a double layer of eyelashes to keep out dust.
2. Emperor Penguin- has countershading so they cannot be seen easily and they have small bodys so they do not ~~lose~~ give off ~~heat~~ much body heat.
3. Giraffe- has long legs to run fast and to kick predators. They also use them to reach the high tops of trees to eat.

Investigation:

You will investigate the effect colour can have on the survival of organisms in different habitats. Working in groups of three, one group member will need to scatterer the match-sticks and the other two will be the collectors or 'predators'. You will need to select three different environments or 'habitats'. For example: green grass; drier grassy area; dirt; sandy ground; concrete; paving; leaf litter; etc. Predict which coloured matchstick or 'animal' would have the best chance of surviving in each of your three environments.

Method:

1. Measure out a 2m x 2m area on your selected surface. Mark the corners of the square with sticks or stones. Put string around the corners to mark out the square.
2. One person in the group scatters the matchstick over the marked area.
3. Start the stopwatch and allow the 'predators' 15 seconds to find as many matchsticks as they can.
4. Count the number of each colour of matchstick and record this in your data table.
5. Collect all the matchsticks and repeat steps 2-4.
6. Repeat steps 2-5 using other surfaces or environments.

Annotations

Identifies multiple structural features of living things that help them to survive in their environments.

Investigation report: Hide and seek

Hide and Seek

Aim

to find out, if the ~~cool~~ colour ~~affect~~ of the ~~colour~~ animal affects its survival in a particular ~~hab.tat~~ habitat.

Hypothesis

What do you think will happen? Explain why?

I think that it will definetaly matter what ~~cool~~ colour the animal is because if the animal is green or brown you would not be able to see them if they were in a bed of leaves or forest because they'd be ~~camoflaged~~ camouflaged.

Variables

What will be the dependent variable? ***What are you going to measure?***

The rate of survival → how many coulourred matchsticks (animals) you collect.

What will be the independent variable? ***What are you going to change?***

The enviroment/habitat of the animals

What variables will you need to control? ***What will you need to keep the same?***

The ~~cool~~ colour, number, ~~type and and~~, type of matchstick ~~and~~, the time you have to collect them, size of the area, use only one hand, and you need to keep the sticks in the area, evenly scatter the sticks

How will you ensure the test is kept fair?

Control the variables that need to be controlled, repeat trials and average the result

Annotations

Makes a plausible prediction about what will happen when variables are changed.

Uses knowledge of animals' camouflage strategies to support the prediction.

Identifies variables to be measured and changed and multiple variables to be controlled.

Identifies that controlling variables is important in a fair test.

Investigation report: Hide and seek

Hide and Seek

Surface 1 Grass

Colour of Match-stick	Test 1	Test 2	Average	% picked up	% Survived
Yellow	6	8	7	70%	30%
Red	7	10	8.5	85%	15%
Green	6	7	6.5	65%	35%
Brown	4	10	7	70%	30%
Blue	8	8	8	80%	20%

Surface 2 Dirt

Colour of Match-stick	Test 1	Test 2	Average	% picked up	% Survived
Yellow	6	7	6.5	65%	35%
Red	6	8	7	70%	30%
Green	4	8	6	60%	40%
Brown	8	3	5.5	55%	45%
Blue	6	6	6	60%	40%

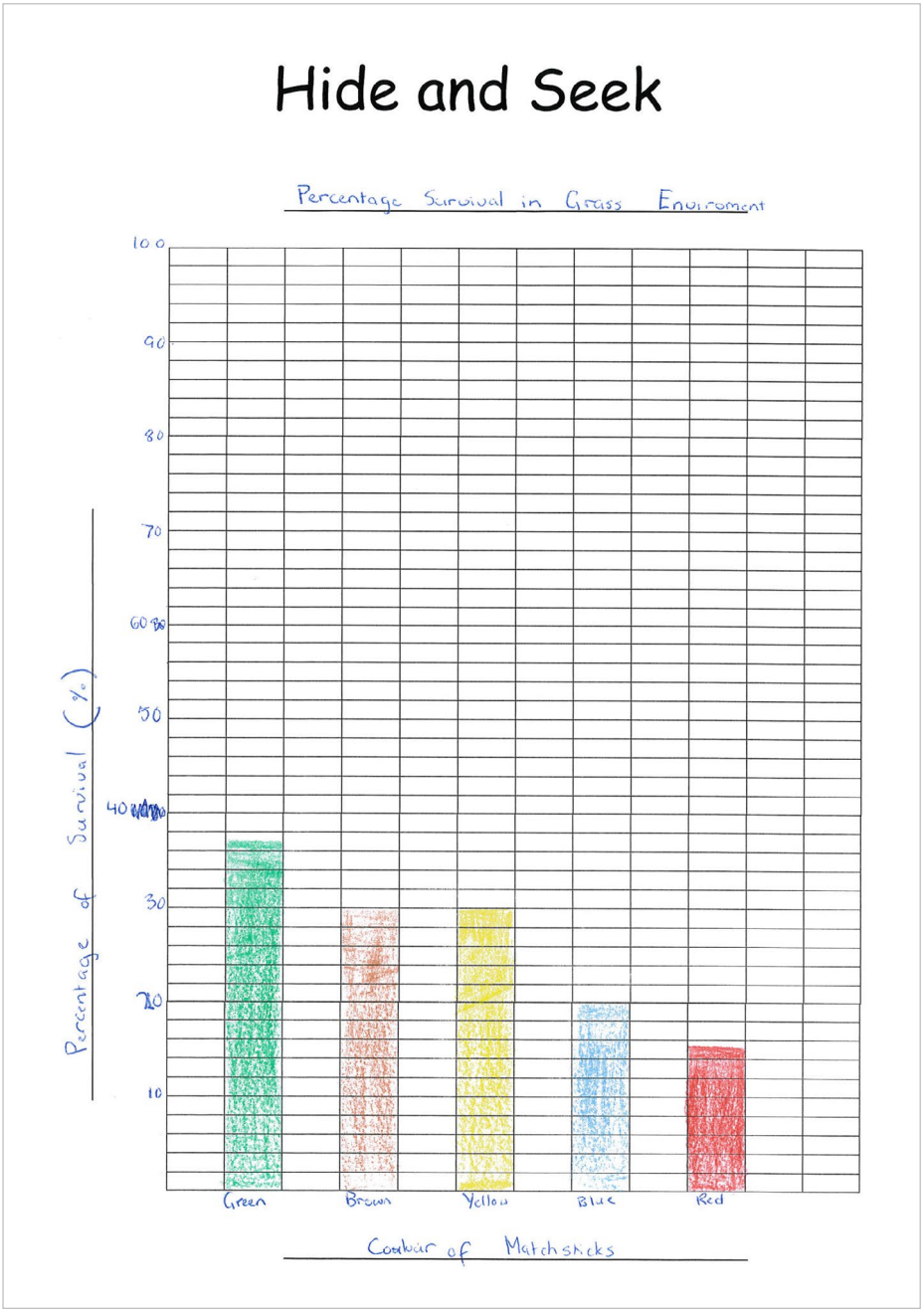
Surface 3 Sand

Colour of Match-stick	Test 1	Test 2	Average	% picked up	% Survived
Yellow	5	8	6.5	65%	35%
Red	4	10	7	70%	30%
Green	8	5	6.5	65%	35%
Brown	7	7	7	70%	30%
Blue	9	7	8	80%	20%

Annotations

Records and processes data in a provided table.

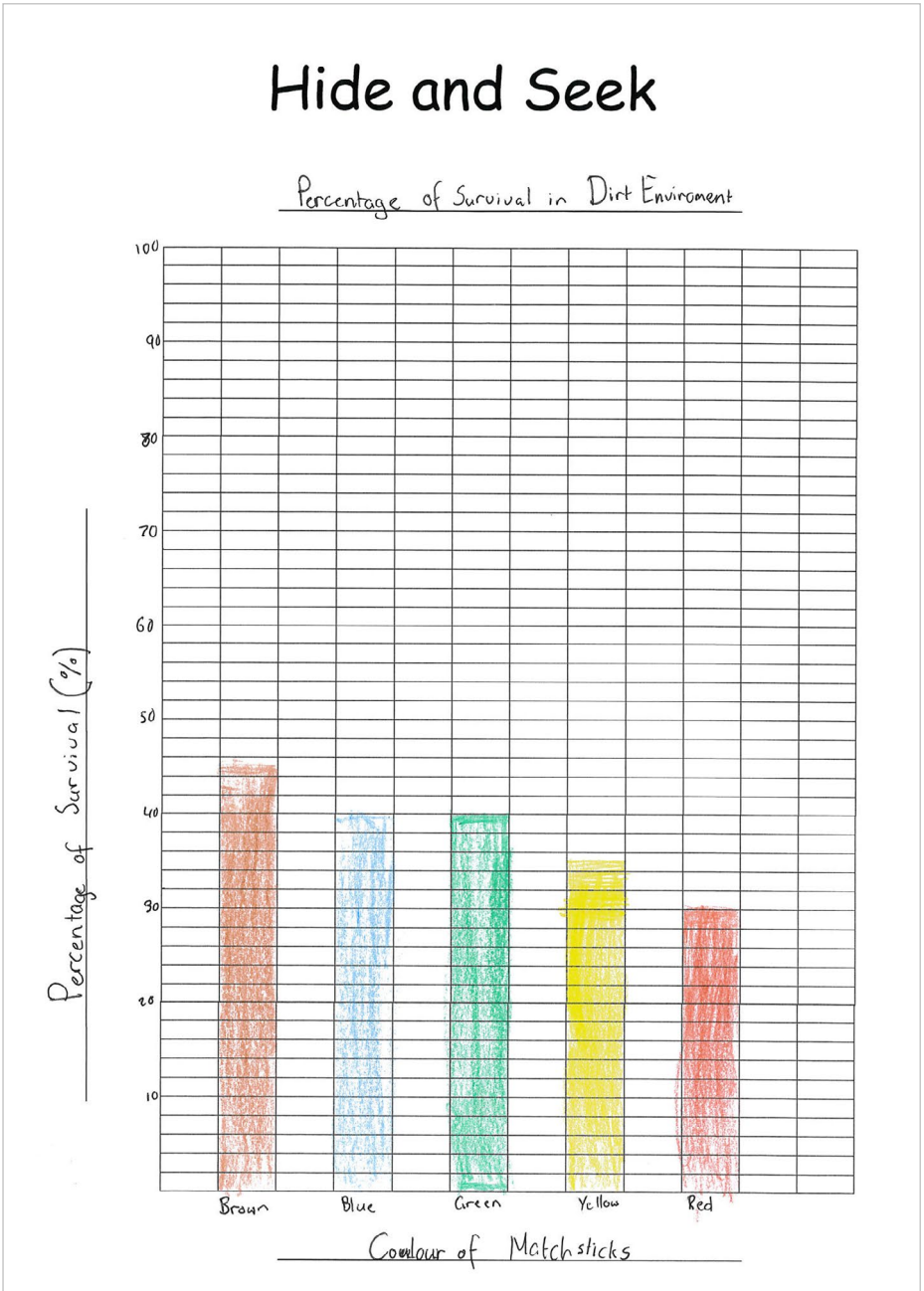
Investigation report: Hide and seek



Annotations

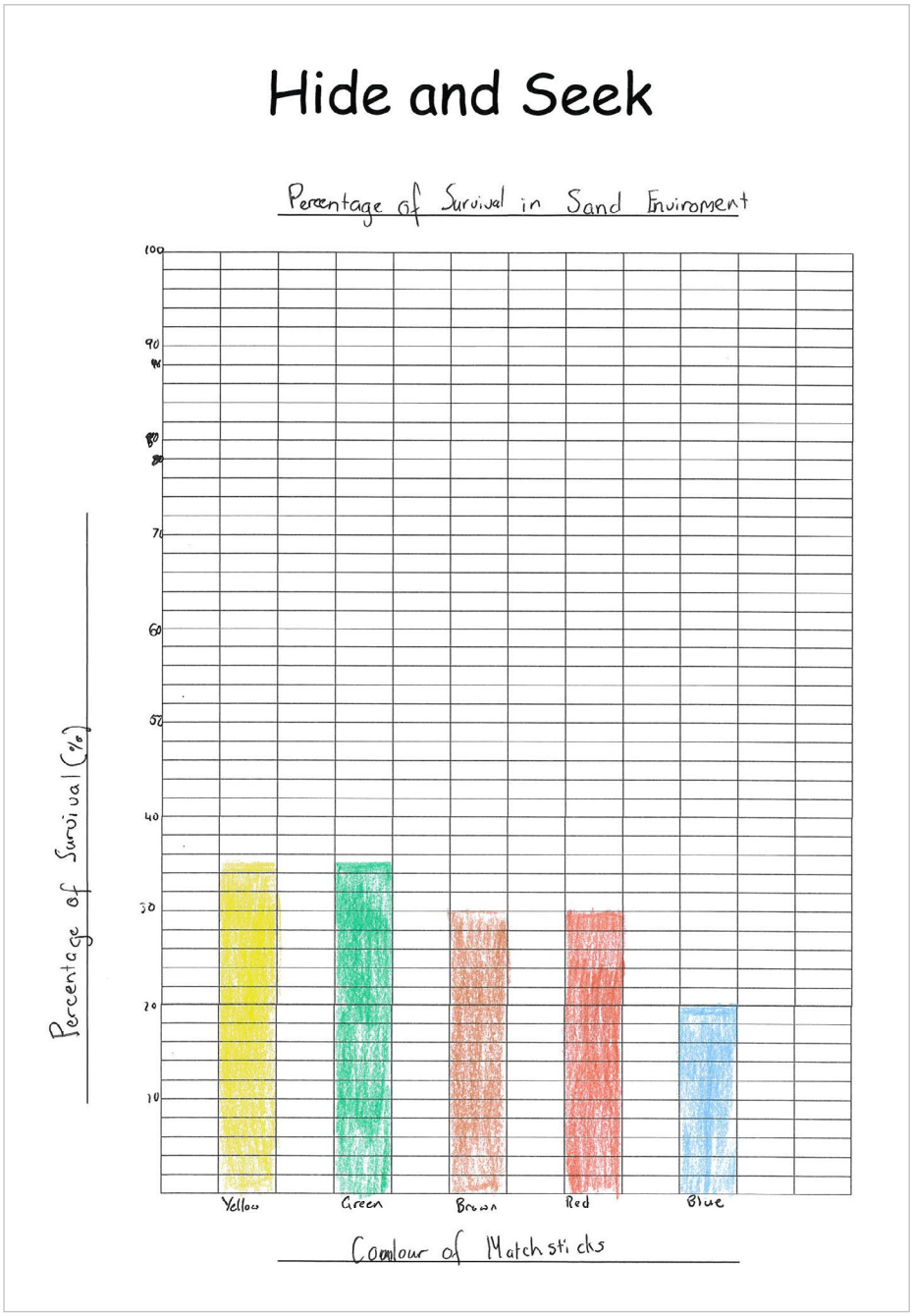
Follows graphing conventions to construct graphs of summary data.

Investigation report: Hide and seek



Annotations

Investigation report: Hide and seek



Annotations

Investigation report: Hide and seek

Hide and Seek

Compare the survival rate for the different environments. Why do you think there is a difference in survival rates?

Because animals like the browns could camouflage well ~~in brown that~~ and the ~~an~~other animals like the reds and blues were bright and easy to see because the enviroments didn't hide the well.

Imagine that an animal population, featuring the five colours you investigated, were in the same environments with the same 'predators'. What do you think would happen to this population over time. Give reasons for your prediction.

The animals that could camouflage like the brouns would not get eaten by the predators and would have baby's and grow in popelation, but the ~~coul~~ colours that could not camouflage would eventually die out because the predators would eat them before they could reproduce

Now imagine that a bushfire had passed through each environment. Assume that many of the 'matchstick' creatures survived the fire. Explain what you now think would happen to the population.

The bushfire would destroy the animals habitat so they would not be ~~ab~~ able to camouflage very well and there would also be no food or water so they would die out and if they were like a camel they would still be eaten by predators because they could be seen.

Using your results, what can you say about the effect of colour on the survival of organisms in a particular habitat?

The animals have more chance of surviving if they can camouflage and cannot be seen easily by predators

Annotations

Identifies that survival rate reflects a relationship between prey colour and environment colour.

Uses an understanding of the process of natural selection to predict what would happen to a population over time.

Uses understanding of animal camouflage to predict the effect of environmental change on a population over time.

States a conclusion related to the data collected.

Investigation report: Hide and seek

Hide and Seek

Scientists look to nature for solutions to problems. Where and how do you think scientists could use the information you have gathered? What 'problems' could be solved? Give examples.

They could use it to see what animals have a chance of becoming endangered or extint faster than other animals without being noticed

Draw an example.

Was this a fair test? No Why / why not?

It was not a fair test because the matchsticks were three colours except for the brown and because the animals couldn't move around and the scatterer needs to scatter the sticks more evenly

Were there any problems that you encountered during this investigation?

Yes, there were, because in the dirt and sand you would lose the sticks, especially the sand because when you walked on it you would bury the sticks.

Explain how do you think this investigation could be improved?

I think that if the colours ~~are~~ of the matchsticks was more flat and that they could somehow move around.

Annotations

Identifies how scientists could apply knowledge of camouflage to the study of endangered species.

Identifies limitations of the analogy (colour of sticks, lack of movement) and issues with the method as impacting on the fairness of the test.

Suggests improvements to address problems in the method.

Annotations (Overview)

The student communicates ideas, methods and findings through tables, graphs, written text and annotated diagrams.

Science

Year 5

Above satisfactory

Investigation report: Viscosity

Year 5 Science achievement standard

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Summary of task

Students had been investigating the properties of liquids and the characteristics of a fair test. They participated in a brainstorming activity in which they identified a number of different liquids and discussed how the liquids could be categorised based on their properties.

Students were asked to work in small groups to investigate the viscosity of the liquids. Students were given a variety of liquids and asked to predict which ones would flow easily and which would not. They were then asked to plan an investigation to test their prediction about the viscosity of each liquid. Students were required to identify the dependent, independent and controlled variables, and consider how they could ensure that their tests were fair and the number of tests they would perform. They were also asked to determine how they would tabulate their data.

Following analysis of their individual results, students participated in a class discussion and compared their results with those of other groups. Students were asked to account for any differences and to suggest ways to improve the investigation.

Investigation report: Viscosity

Viscosity

What do you know about liquids? In the space below write as many words as you can that describe liquids.

liquids

transparent
sticky
wet
runny
squishy
dripping
fluid
flowing
gooey
splashy

Different liquids have different properties. Today you are going to be investigating the viscosity of liquids. ***Viscosity*** is a liquid's resistance to flowing. Not all liquids are the same. Some are thin and flow easily these have a **low viscosity**. Others are thick and gooey and have a **high viscosity**.

Aim

Compare the rate of flow for a variety of liquids and classify them according to their viscosity.

Hypothesis

What do you think will happen? Explain why?

I think the low viscosity liquids will slide/run down the paper faster than the high viscosity liquids

Variables

What will be the dependent variable? ***What are you going to measure?***

We are going to measure the distance the drops travel

What will be the independent variable? ***What are you going to change?***

the type of liquid

What variables will you need to control? ***What will you need to keep the same?***

time, how many drops of liquid.

Annotations

Identifies properties and behaviours of liquids.

Makes a prediction related to knowledge of the property of viscosity.

Identifies the variable to be measured and changed, and some variables to be controlled.

Investigation report: Viscosity

Viscosity

Investigation Sequence:

1. One group member collects equipment, set up in a cleared area.
2. Put an equal amount (two or three drops) of each liquid at the top of your race sheets.
3. Start the timer as the card is carefully lifted to rest on overturned bookend (use some Blutack® to keep the card in place.)
4. Record how far the droplet travels in 15 seconds
5. Repeat steps 2 to 4 two more times.

How will you be sure that you have completed a fair test?

You have have to keep the variables the same.

Safety

What are the potential risks with this investigation and how will you ensure you and your team members are using the equipment safely.

change the pipette everytime, don't drink it because you don't know what it is and you could get sick.

Distance Travelled in 15 Seconds

Liquid	Test 1	Test 2	Test 3	Average
Dish washing liquid	10mm	1mm	1mm	4 mm
Olive Oil	40 mm	30 mm	40 mm	36.6mm
milk	290+mm	290+mm	290+mm	290 mm
water	290+mm	290+mm	290+mm	290 mm
glucose	0 mm	0 mm	0mm	0 mm

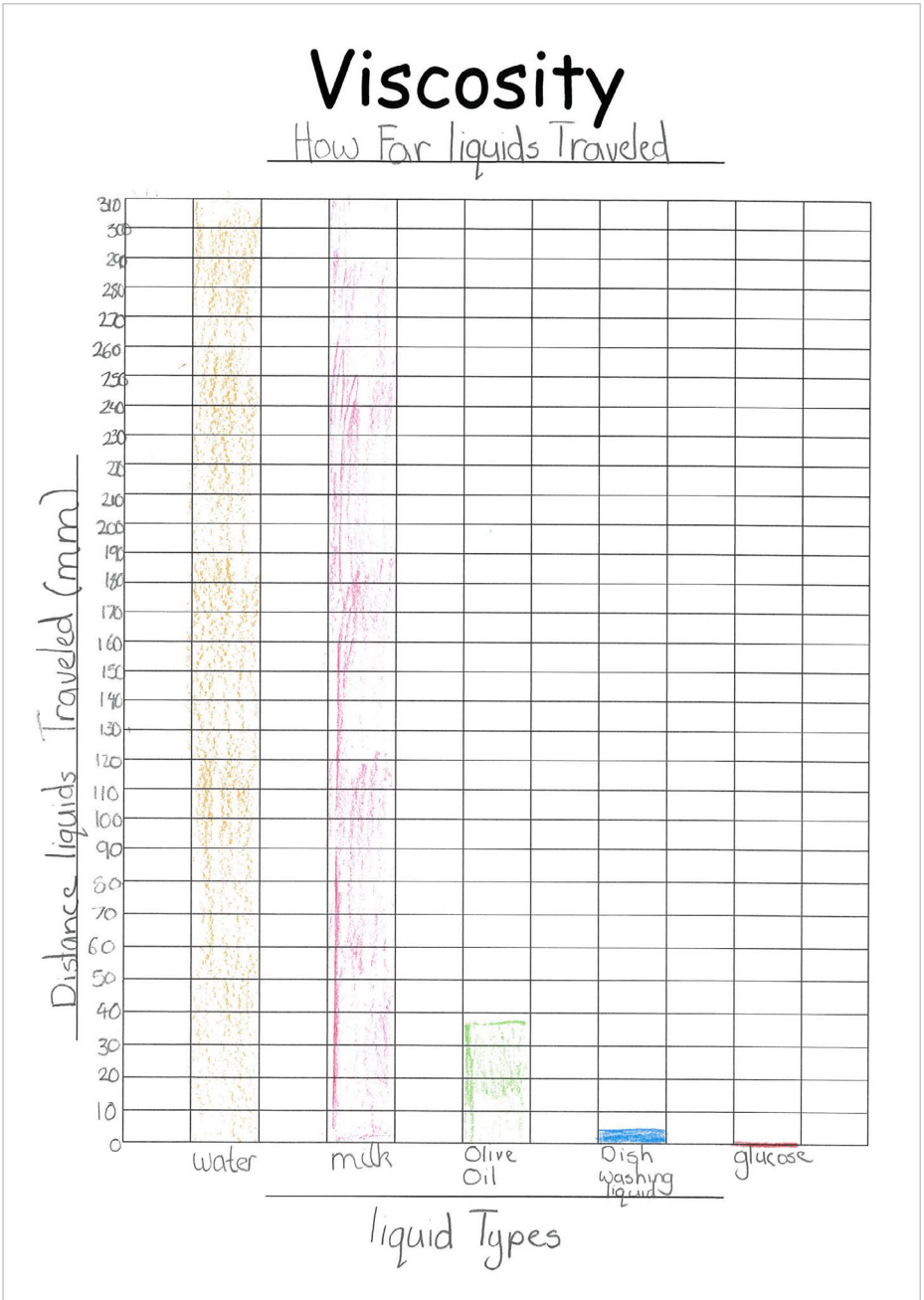
Annotations

Identifies that a fair test must keep some variables the same.

Identifies ways to use equipment safely.

Constructs a table to record quantitative data and provides summary data (average distance travelled).

Investigation report: Viscosity



Annotations

Follows graphing conventions to construct a graph of summary data, including correct units.

Investigation report: Viscosity

Viscosity

Using your results, compare the rate of flow for the different liquids. Which liquids have a high viscosity, which have a low viscosity? Why?

I think the water and milk have low viscosity because they just zoomed down the page, and the olive oil, dishwashing liquid and the glucose were high viscosity because they didn't go down the page as far because they were too thick.

Compare your results with those of another team. How were they similar, how were they different? ?

Many people got 290* for water because it is a low viscosity and many people got zero for glucose because it is a high viscosity.

Explain why might there be a difference in the two set of results?

Maybe because the other team started the timer early or they put more drops on the page.

Was this a fair test? no Why / why not?

because most people put more than 3 drops on the page

Were there any problems that you encountered during this investigation?

No there were no problems

Explain how do you think this investigation could be improved?

I think it could be improved by adding more time for the drops to come down so they would atleast come down a bit further.

Annotations

Uses data collected to classify liquids according to level of viscosity.

Identifies similarities in class results.

Identifies sources of human error that could cause variation in the data.

Identifies variations in method that meant that the aggregated class results did not reflect a fair test.

Identifies an improvement to the method based on an identified problem.

Annotations (Overview)

The student communicates ideas, methods and findings through tables, graphs and written text.

Newspaper article: Australian scientists

Year 5 Science achievement standard

The parts of the achievement standard targeted in the assessment task are highlighted.

> *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

As part of a unit on micro-organisms as living things, students explored the role of research in building our knowledge and understanding of bacteria and the ways these micro-organisms impact our lives. Students viewed a video about the work of Barry Marshall and Robin Warren and, 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 is important.

Science

Year 5

Above satisfactory

Newspaper article: Australian scientists

Science news

Scientist drinks bacteria and wins Nobel Prize!

By

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.

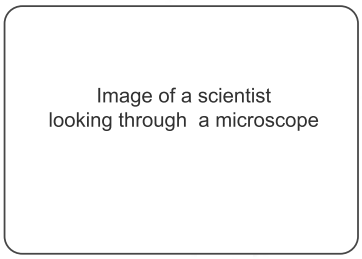
He worked with another pathologist from the Royal Perth Hospital, Robin Warren to see if they could find out what caused stomach ulcers. They found out that there actually bacteria in the stomach and thought that antibiotics could probably cure stomach ulcers.

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

Recounts information about the scientist and his work.

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

Illustrates the collaborative nature of the work.

Annotations (Overview)

The student communicates ideas through written text in the genre of a newspaper article.