Science

Year 6
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 6 SCIENCE

This portfolio provides the following student work samples:

Sample 1	Worksheet : Reversible and irreversible changes
Sample 2	Pamphlet: Generating electrical energy
Sample 3	Worksheet: Energy transformations
Sample 4	News report: Natural disasters
Sample 5	Investigation poster: Mouldy bread
Sample 6	Investigation report: Insulation

In this portfolio, the student classifies changes to materials as reversible and irreversible (WS1). The student describes the energy transformations that occur in the generation of electrical energy from a range of energy sources (WS2, WS3). The student explains how a natural event caused rapid change to Earth's surface (WS4) and demonstrates understanding that living things are affected by environmental conditions (WS5). The student identifies how scientific knowledge is used in decision-making in a range of areas (WS3, WS4, WS5).

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The student demonstrates the ability to follow procedures to develop investigable questions and design investigations into simple cause and effect relationships, including identifying variables to be changed and measured (WS5, WS6) and articulates potential safety risks when planning their investigation methods (WS5). The student collects, organises and interprets investigation data (WS2, WS5, WS6) and identifies where improvements to their methods could improve the data (WS5, WS6). The student interprets, describes and analyses trends in data using graphic representations (WS5, WS6) and constructs multimodal texts to communicate ideas, methods and findings (WS2, WS3, WS4, WS5, WS6).

Worksheet: Reversible and irreversible changes

Year 6 Science achievement standard

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

> *By the end of Year 6, students compare and classify different types of observable changes to materials. They analyse requirements for the transfer of electricity and describe how energy can be transformed from one form to another to generate electricity. They explain how natural events cause rapid change to the Earth's surface. They describe and predict the effect of environmental changes on individual living things. Students explain how scientific knowledge is used in decision making and identify contributions to the development of science by people from a range of cultures.*
>
> *Students follow procedures to develop investigable questions and design investigations into simple cause-and-effect relationships. They identify variables to be changed and measured and describe potential safety risks when planning methods. They collect, organise and interpret their data, identifying where improvements to their methods or research could improve the data. They describe and analyse relationships in data using graphic representations and construct multimodal texts to communicate ideas, methods and findings.*

Summary of task

Students studied a unit of work on changes to materials. They explored a range of changes, including melting, freezing, dissolving, burning and rusting, and classified these as reversible or irreversible.

Students were asked to complete the worksheet independently as a summary of what they had learned over the unit.

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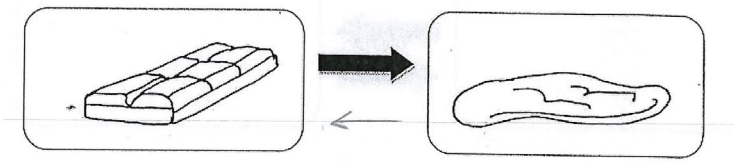
Worksheet: Reversible and irreversible changes

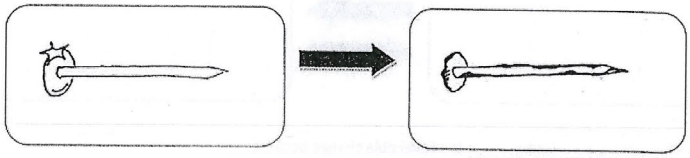
Reversible and irreversible changes – Part A

1. Look at each of the changes and fill in the blanks to say whether the changes are reversible or irreversible.
2. For the reversible changes, draw another arrow below the first one, pointing the other way.
3. For each change, explain why you thought it was reversible or irreversible.



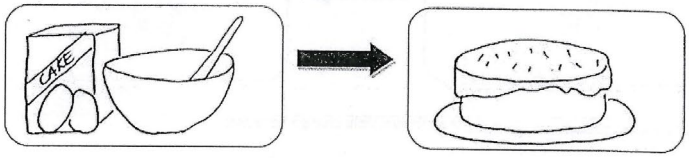
Melting chocolate is __reversible__ change because:

Chocolate hardens when it's cooled down, therefore, if you were to put the melted chocolate in the fridge, it would go hard, but it would go back to it's original shape unless there was a mold.



An iron nail rusting is a __irreversible__ change because:

The rust is the metal becoming old and getting rid of the rust would be like getting of the metal, and that's what the nail is made of.



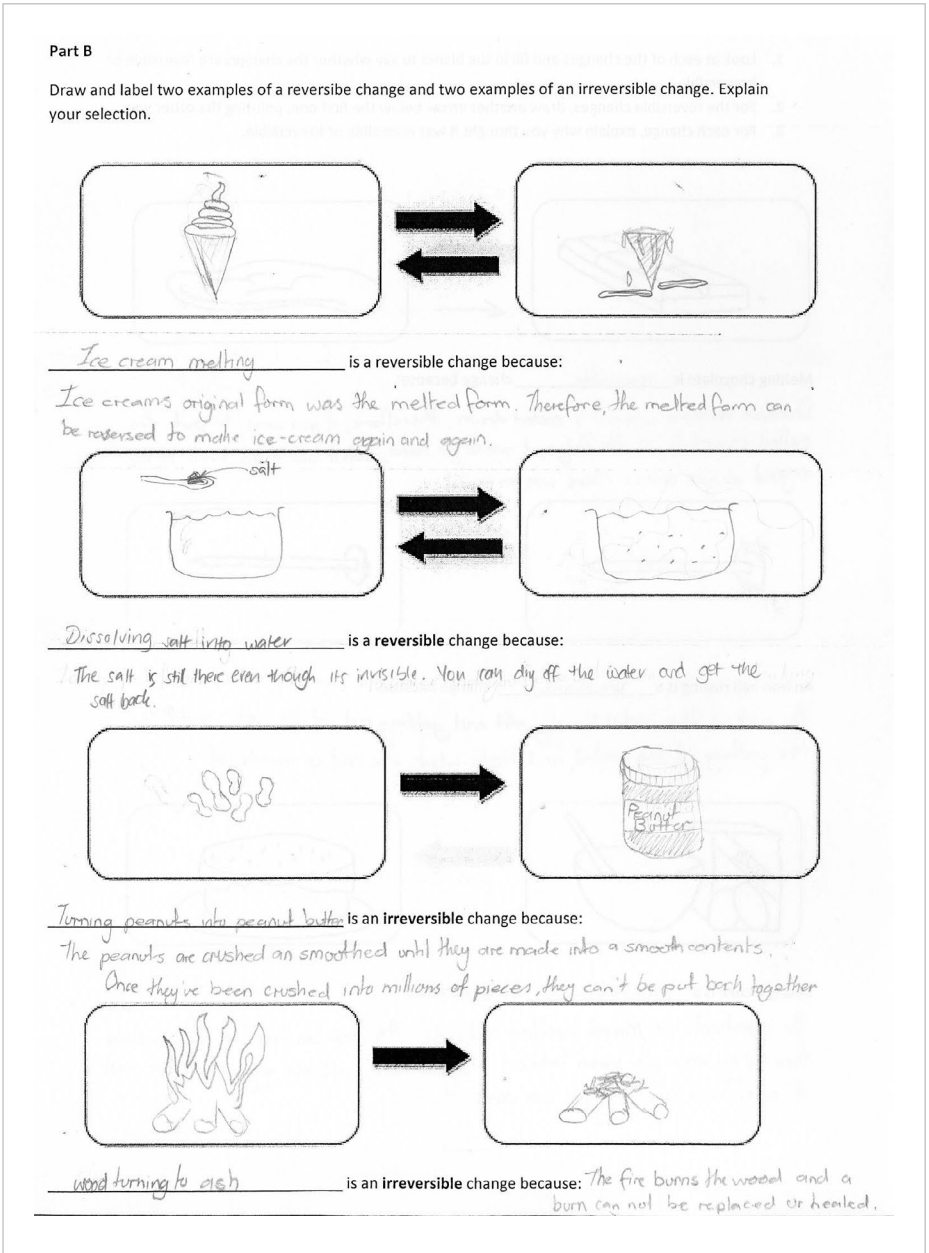
Baking a cake is a __irreversible__ change because:

The ingredients are mixed together and bake. The flour can not be seperated from the egg once it's been mixed and you can't pull the egg and flour out of a baked cake once its been cooked.

Annotations

Correctly classifies changes associated with heating and rusting as reversible or irreversible and provides an explanation based on observable properties.

Worksheet: Reversible and irreversible changes



Part B

Draw and label two examples of a reversibe change and two examples of an irreversible change. Explain your selection.

Ice cream melting is a reversible change because:

Ice creams original form was the melted form. Therefore, the melted form can be reversed to make ice-cream again and again.

salt

Dissolving salt into water is a **reversible** change because:

The salt is stil there even though its invisible. You can dry off the water and get the salt back.

Peanut Butter

Turning peanuts into peanut butter is an **irreversible** change because:

The peanuts are crushed an smoothed until they are made into a smooth contents. Once they've been crushed into millions of pieces, they can't be put back together

wood turning to ash is an **irreversible** change because: The fire burns the wood and a burn can not be replaced or healed.

Annotations

Suggests examples of reversible and irreversible changes, including heating and dissolving, based on observed phenomena.

Pamphlet: Generating electrical energy

Year 6 Science achievement standard

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

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> *Students follow procedures to develop investigable questions and design investigations into simple cause-and-effect relationships. They identify variables to be changed and measured and describe potential safety risks when planning methods. They collect, organise and interpret their data, identifying where improvements to their methods or research could improve the data. They describe and analyse relationships in data using graphic representations and construct multimodal texts to communicate ideas, methods and findings.*

Summary of task

Students had been investigating electrical energy and energy transformations. They had constructed electrical circuits and explored the ways in which electrical energy could be transformed into heat, movement and light energy. Students had been introduced to the concept of renewable and non-renewable resources and had viewed a documentary on the ways in which electrical energy can be generated.

Students were asked to develop an information pamphlet to describe the energy transformations that occur when electricity is being generated and to show the difference between renewable and non-renewable energy sources. Students were provided with stimuli in the form of key words and energy-related graphics. They completed the task over three 60-minute lessons.

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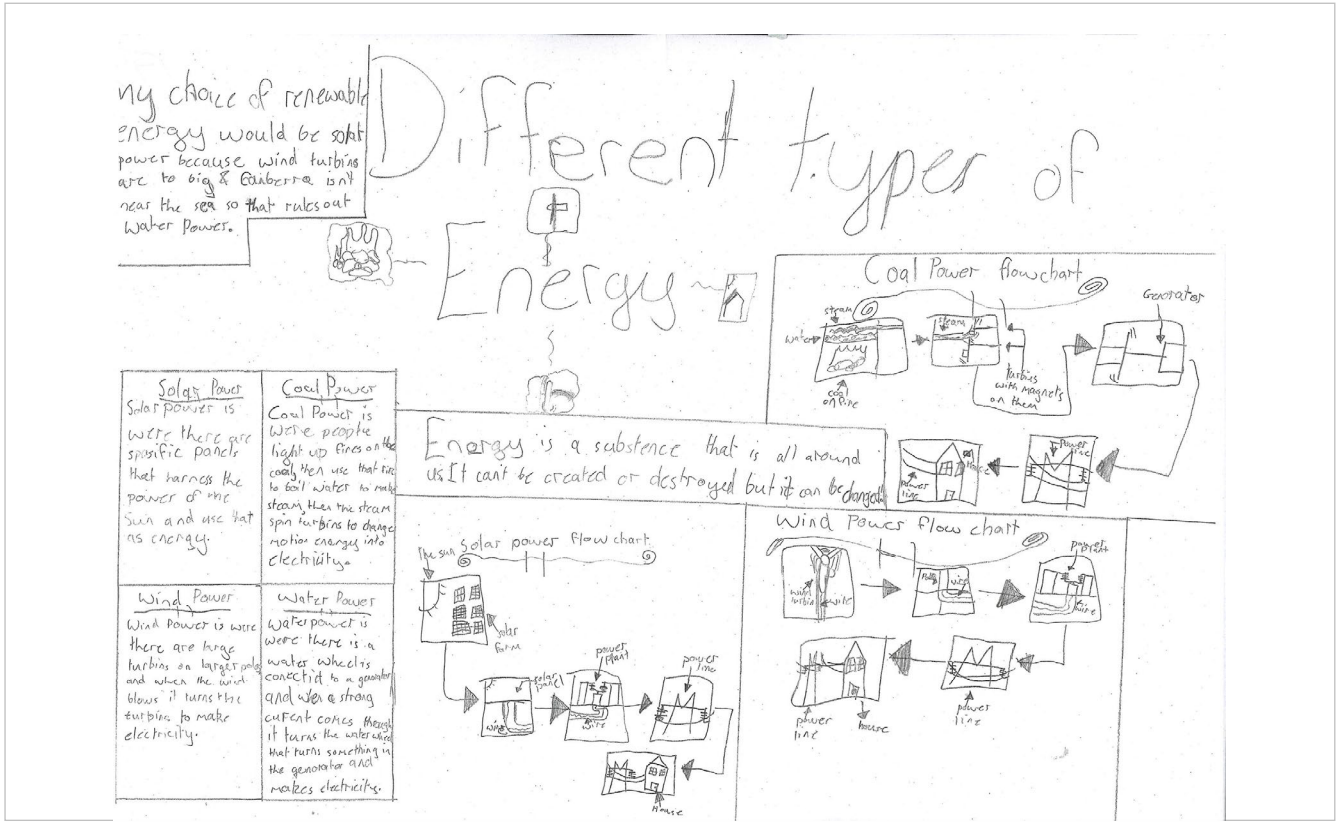
Pamphlet: Generating electrical energy



Annotations

Identifies solar, wind and water energy sources as renewable.

Constructs flow charts to organise collected data on electrical energy generation.

Describes energy transfers and transformations that occur during generation of electrical energy from a range of sources.

Annotations (Overview)

The student constructs a multimodal text to communicate ideas and findings.

Worksheet: Energy transformations

Year 6 Science achievement standard

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Summary of task

Students had completed a unit of work in which they learned how energy from a variety of sources can be used to generate electricity.

Students were asked to select a form of renewable energy and create a flow chart to illustrate how it can be transformed into energy for use in the home. They were also asked to complete a worksheet answering questions about how energy is transformed in order to generate electricity.

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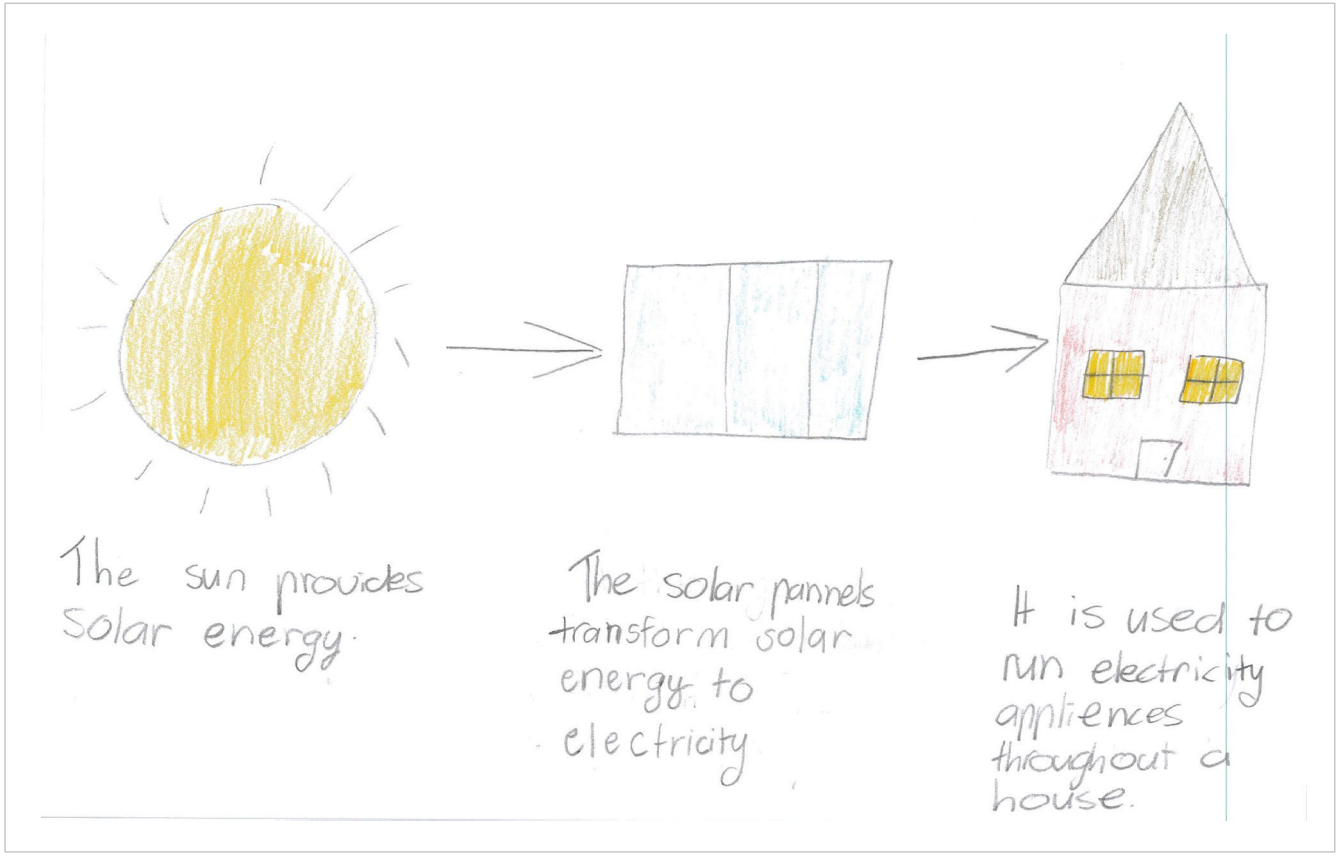
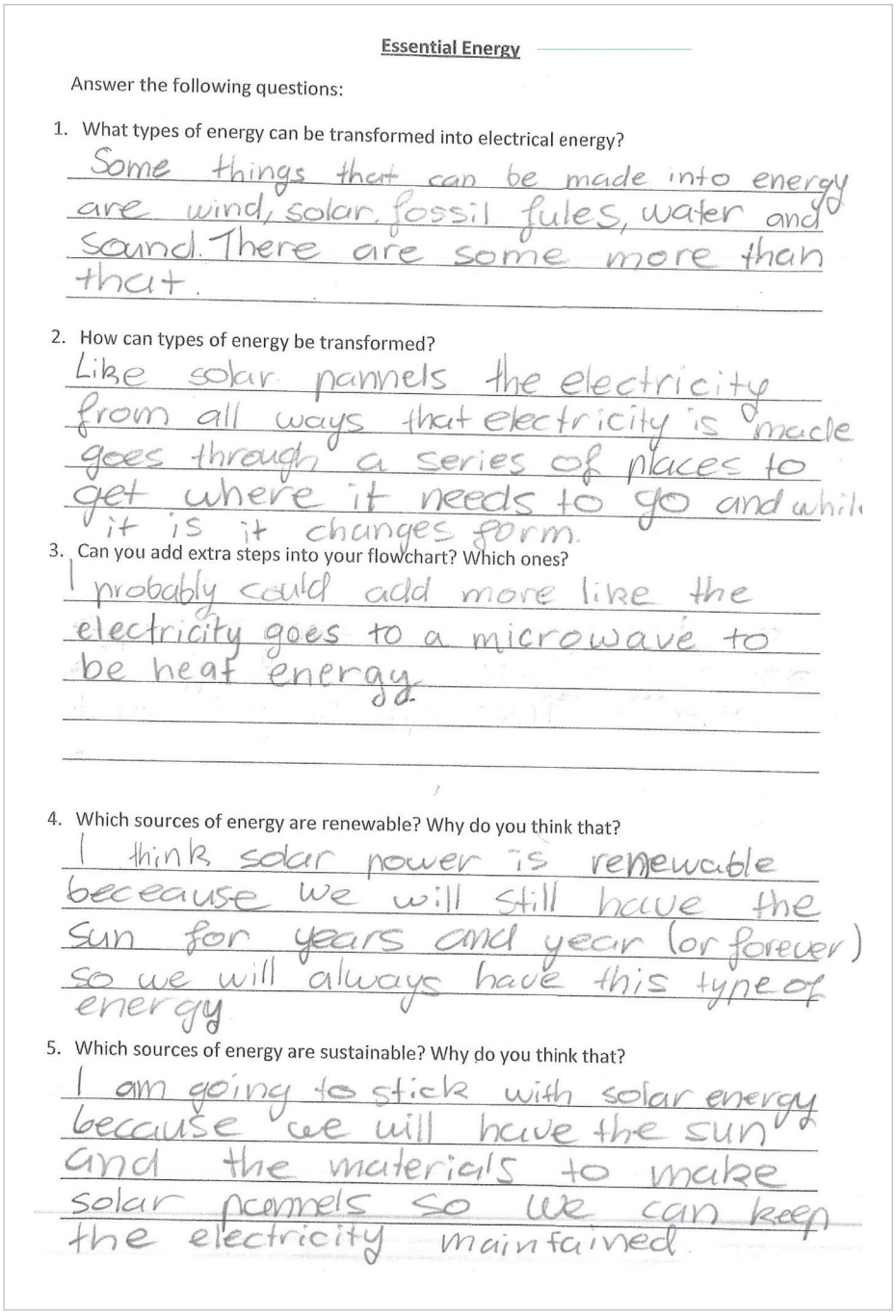
Worksheet: Energy transformations



Annotations

Constructs a flow chart to describe the energy transformations related to harnessing solar energy.

Worksheet: Energy transformations



Essential Energy

Answer the following questions:

1. What types of energy can be transformed into electrical energy?

Some things that can be made into energy are wind, solar, fossil fules, water and sound. There are some more than that.

2. How can types of energy be transformed?

Like solar pannels the electricity from all ways that electricity is made goes through a series of places to get where it needs to go and while it is it changes form.

3. Can you add extra steps into your flowchart? Which ones?

I probably could add more like the electricity goes to a microwave to be heat energy.

4. Which sources of energy are renewable? Why do you think that?

I think solar power is renewable because we will still have the sun for years and year (or forever) so we will always have this type of energy

5. Which sources of energy are sustainable? Why do you think that?

I am going to stick with solar energy because we will have the sun and the materials to make solar pannels so we can keep the electricity maintained.

Annotations

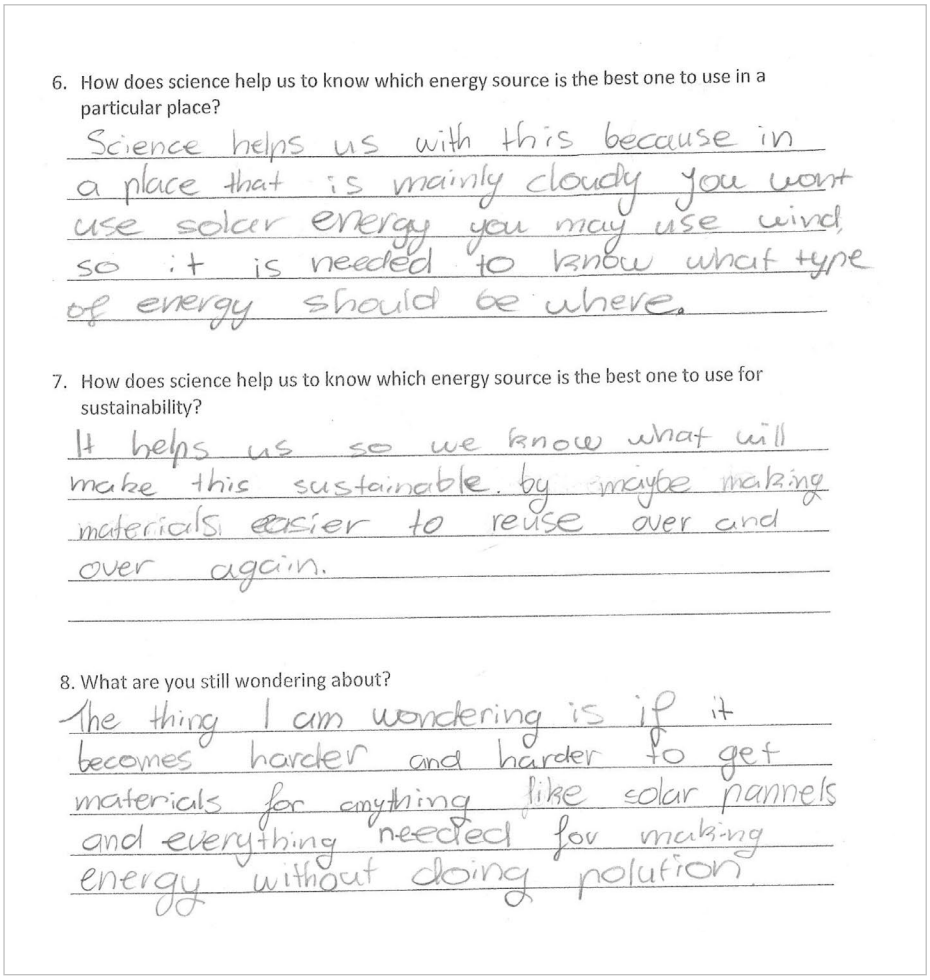
Identifies a range of energy sources that can be transformed into electrical energy.

Identifies that transformations of energy involve energy changing from one form to another.

Explains that an electrical device can transform electrical energy into another form of energy (heat).

Identifies a renewable energy source and considers sustainability with reference to the energy source and the requirement for materials to construct the technology required.

Worksheet: Energy transformations



6. How does science help us to know which energy source is the best one to use in a particular place?

Science helps us with this because in a place that is mainly cloudy you wont use solar energy you may use wind, so it is needed to know what type of energy should be where.

7. How does science help us to know which energy source is the best one to use for sustainability?

It helps us so we know what will make this sustainable. by maybe making materials easier to reuse over and over again.

8. What are you still wondering about?

The thing I am wondering is if it becomes harder and harder to get materials for anything like solar pannels and everything needed for making energy without doing polution.

Annotations

Identifies specific ways in which scientific knowledge informs decision-making.

Annotations (Overview)

The student constructs a multimodal text to communicate ideas and findings.

News report: Natural disasters

Year 6 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 researching the cause, effects and characteristics of a variety of geological events and extreme weather conditions, including earthquakes, tsunamis, volcanic eruptions, floods, cyclones and droughts.

In this task, students were required to research a specific natural disaster and to plan and present a television news report on the event. Students were required to include information on how the event occurred and the effect it had on people and the environment. Students researched and produced their videos over 10 class lessons and in their own time.

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News report: Natural disasters

Annotations

Investigation poster: Mouldy bread

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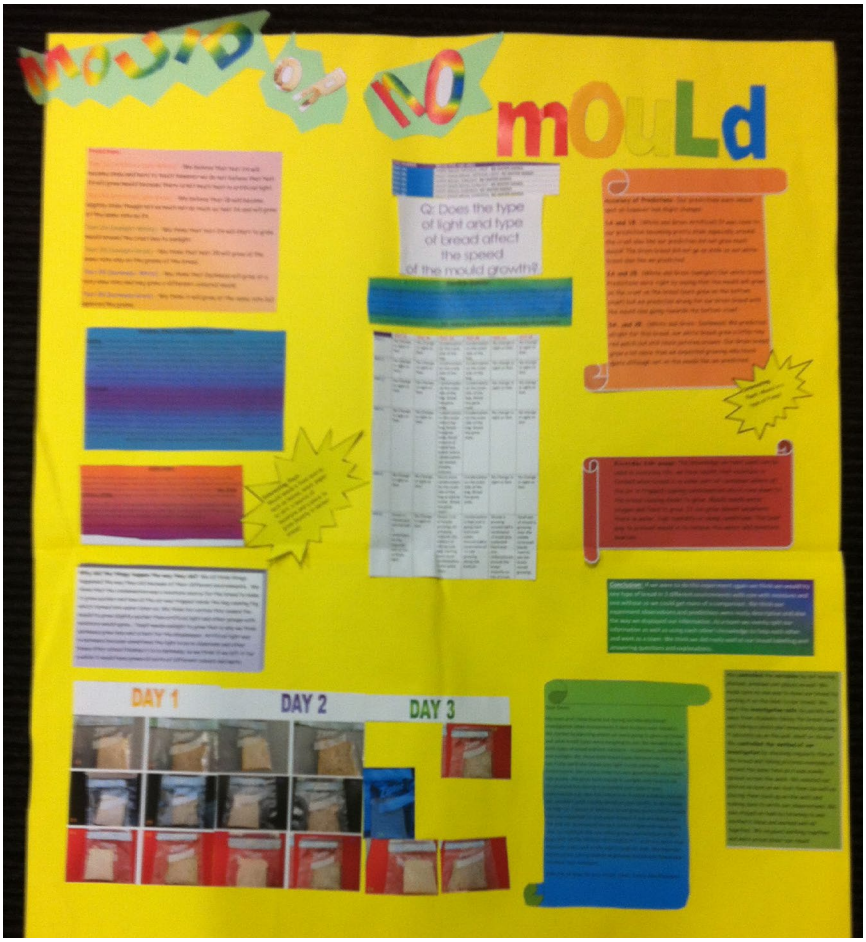
Summary of task

Students had discussed the needs of living things and the effect of environmental changes on individual living things, exploring issues related to changes in their local bushland. The teacher also introduced the idea that an ecosystem can exist on pieces of food, with organisms such as mould inhabiting the food, and that these organisms are living things which also have needs and can be affected by changes to their environmental conditions.

For this task, students were required to work in small groups to design an investigation into the conditions in which mould grows best on bread. They were presented with a scenario in which a shopkeeper was finding that their bread was growing mouldy faster than a competitor's, and wanted advice about what conditions might be causing this. Students were provided with steps to follow in designing their experiment and were required to present their findings on a poster, including a letter to the shopkeeper with their advice.

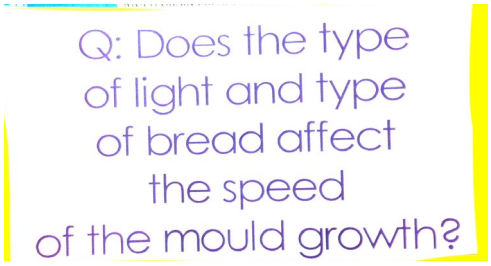
Before undertaking the experiment, the teacher ensured that students were aware of the safety requirements for observing mouldy food. Students were told not to handle the food under any circumstances, and to ensure that the bags were kept sealed. The teacher checked all bags and supervised students when observing the bread.

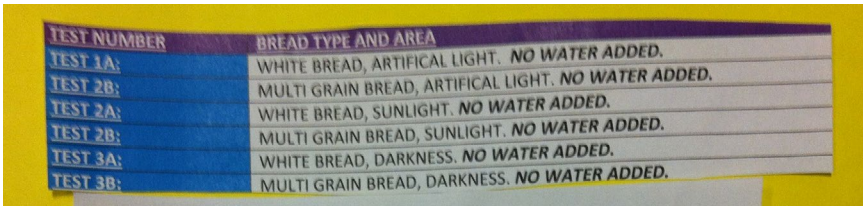
Investigation poster: Mouldy bread



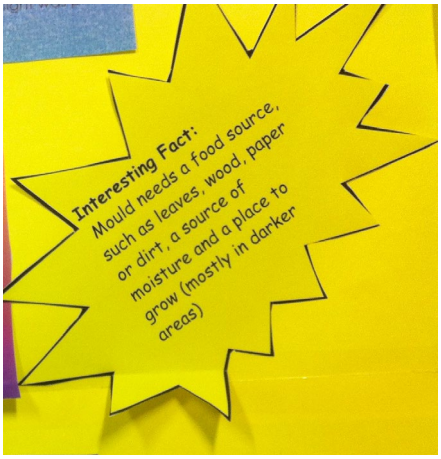
Annotations

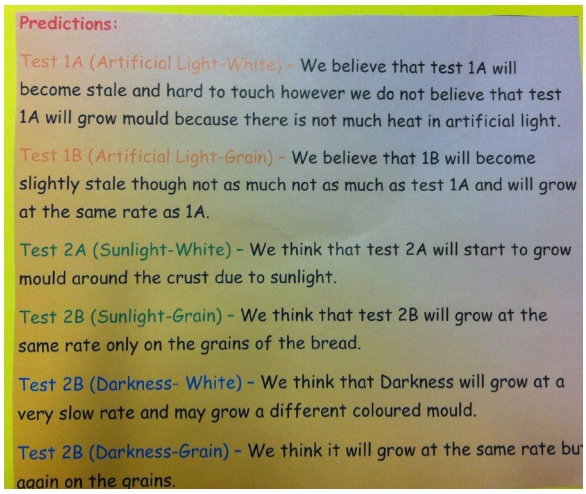
Investigation poster: Mouldy bread





TEST NUMBER	BREAD TYPE AND AREA
TEST 1A:	WHITE BREAD, ARTIFICAL LIGHT. NO WATER ADDED.
TEST 2B:	MULTI GRAIN BREAD, ARTIFICAL LIGHT. NO WATER ADDED.
TEST 2A:	WHITE BREAD, SUNLIGHT. NO WATER ADDED.
TEST 2B:	MULTI GRAIN BREAD, SUNLIGHT. NO WATER ADDED.
TEST 3A:	WHITE BREAD, DARKNESS. NO WATER ADDED.
TEST 3B:	MULTI GRAIN BREAD, DARKNESS. NO WATER ADDED.





Annotations

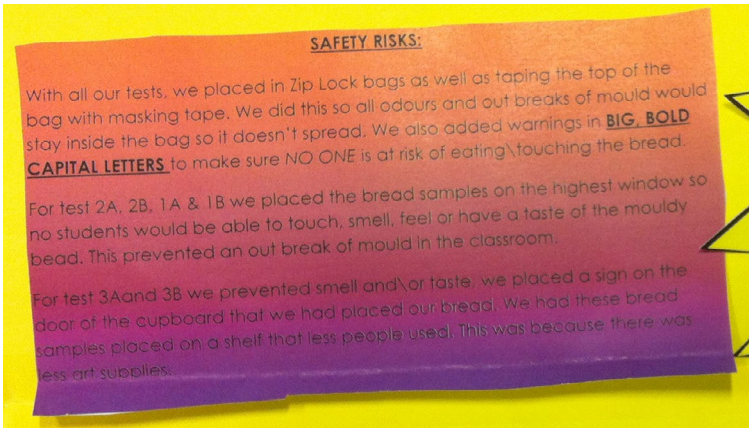
Constructs an investigable question to test two variables.

Designs an investigation to test the effect of changing growth medium (bread type) and light on the growth of the organism.

Identifies the needs of the mould.

Predicts that sunlight (and heat) will be the most influential variable on the growth of the mould.

Investigation poster: Mouldy bread

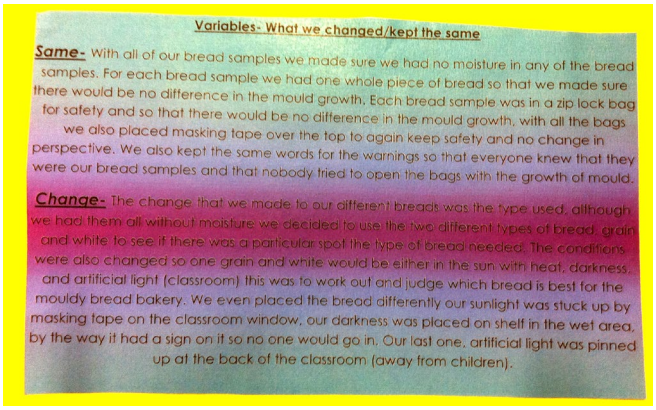


SAFETY RISKS:

With all our tests, we placed in Zip Lock bags as well as taping the top of the bag with masking tape. We did this so all odours and out breaks of mould would stay inside the bag so it doesn't spread. We also added warnings in BIG, BOLD CAPITAL LETTERS to make sure NO ONE is at risk of eating\touching the bread.

For test 2A, 2B, 1A & 1B we placed the bread samples on the highest window so no students would be able to touch, smell, feel or have a taste of the mouldy bead. This prevented an out break of mould in the classroom.

For test 3Aand 3B we prevented smell and\or taste, we placed a sign on the door of the cupboard that we had placed our bread. We had these bread samples placed on a shelf that less people used. This was because there was less art supplies.



Variables- What we changed/kept the same

Same- With all of our bread samples we made sure we had no moisture in any of the bread samples. For each bread sample we had one whole piece of bread so that we made sure there would be no difference in the mould growth. Each bread sample was in a zip lock bag for safety and so that there would be no difference in the mould growth, with all the bags we also placed masking tape over the top to again keep safety and no change in perspective. We also kept the same words for the warnings so that everyone knew that they were our bread samples and that nobody tried to open the bags with the growth of mould.

Change- The change that we made to our different breads was the type used, although we had them all without moisture we decided to use the two different types of bread, grain and white, to see if there was a particular spot the type of bread needed. The conditions were also changed so one grain and white would be either in the sun with heat, darkness, and artificial light (classroom) this was to work out and judge which bread is best for the mouldy bread bakery. We even placed the bread differently our sunlight was stuck up by masking tape on the classroom window, our darkness was placed on shelf in the wet area, by the way it had a sign on it so no one would go in, Our last one, artificial light was pinned up at the back of the classroom (away from children).

We **controlled** the **variables** by not moving shelves, windows and places on wall. We made sure no one was to move our bread by writing it on the label to our bread. We kept the **investigation safe** by quickly and away from students taking the bread down and taking a photo and immediately placing it securely up on the wall, shelf or divider. We **controlled the method of our investigation** by checking regularly the on the bread and taking pictures everyday at around the same time so it was evenly spread across the week. We emailed our photos as soon as we took them (as well as placing them back up on the wall) and making sure to write our observations. We also stayed on task by listening to one another's ideas and worked well all together. We enjoyed working together and were proud about our result.

Annotations

Identifies safety risks and plans appropriate methods to reduce the risks.

Identifies variables to be controlled (amount of moisture, amount of growth medium (bread), bag type, exposure, treatment location) and variables to be changed (bread type, amount of light and heat).

Investigation poster: Mouldy bread

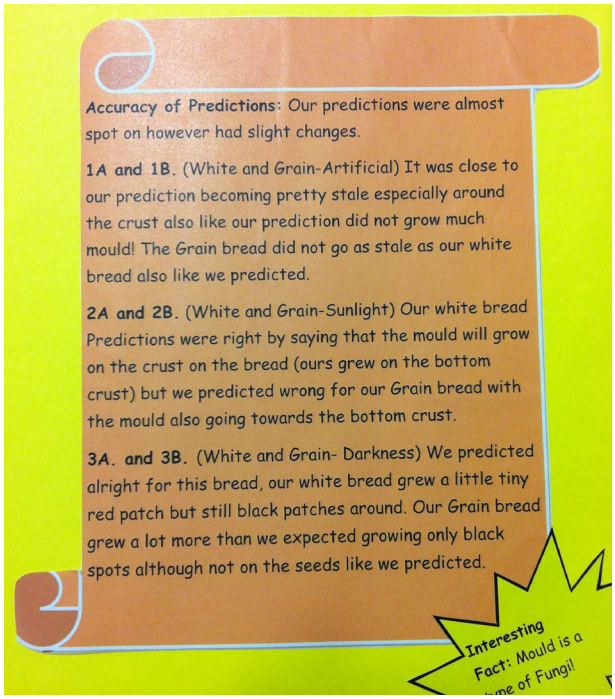
	TEST 1A	TEST 1B	TEST 2A	TEST 2B	TEST 3A	TEST 3B
DAY 1	No Change in sight or feel.	No Change in sight or feel.	Condensation on the outer side of the bag.	Condensation on the outer side of the bag.	No Change in sight or feel.	No Change in sight or feel.
DAY 2	No Change in sight or feel.	No Change in sight or feel.	Condensation on the outer side of the bag.	Condensation on the outer side of the bag.	No change in sight or feel.	No change in sight or feel.
DAY 3	No Change in sight or feel.	No Change in sight or feel.	Condensation on the outer side of the bag. Bread has gone stale.	Condensation on the outer side of the bag. Bread has gone stale.	No change in sight or feel.	No change in sight or feel.
DAY 4	No Change in sight or feel.	No Change in sight or feel.	Condensation on the outer side of the bag. Bread has gone stale. Small amount of mould has grown where condensation has landed. (middle, bottom)	Condensation on the outer side of the bag. Bread has gone stale.	No change in sight or feel.	No change in sight or feel.
DAY 5	No Change in sight or feel.	No Change in sight or feel.	Much more condensation On the outer side of the bag as well as inside. Bread has gone staler.	Condensation on the outer side of the bag. Bread has gone stale.	No Change in sight or feel.	No Change in sight or feel.
DAY 6	Grown a mould spot around half a centimetre on the opposite side to the artificial light.	No Change in sight or feel.	About 1 cm of mould growing, all grouping towards the bottom of the zip lock bag. Getting even more condensation in the same areas.	Condensation is high and is going hard and even staler. Around half a centimetre of mould growing along the bottom.	Mould is growing around half a centimetre of small dots (coloured-black and one red)scattered around the bread majority on top of crust.	Small dot of mould is growing near the middle (coloured-black). Hard to see not much mould growing.

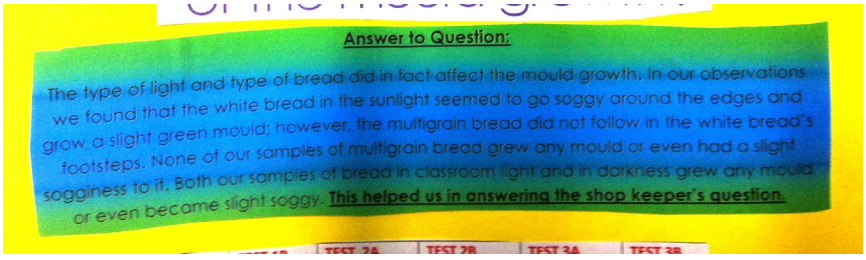
Annotations

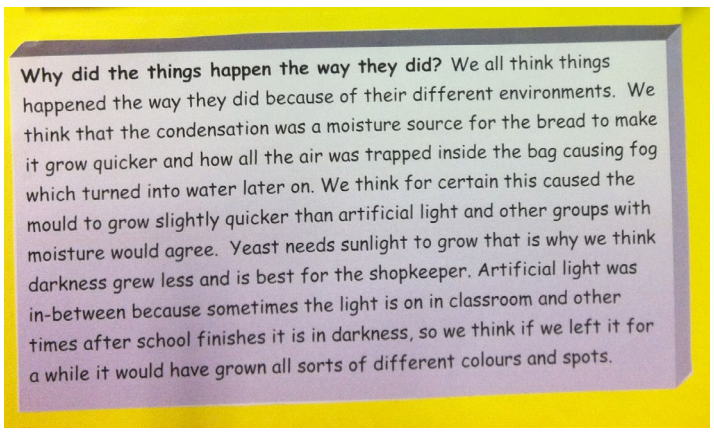
Collects data and provides a visual representation of raw data.

Organises detailed qualitative and quantitative observations in an appropriate table.

Investigation poster: Mouldy bread







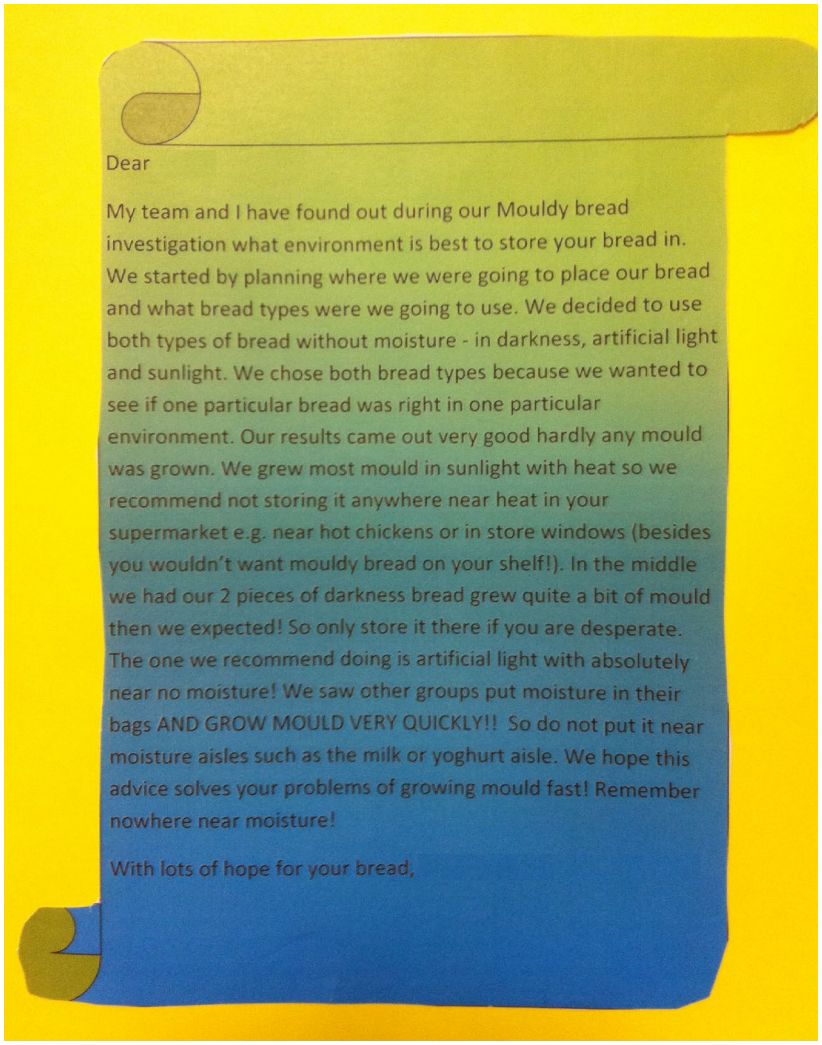
Annotations

Provides a detailed analysis of data to compare finding with predictions.

Analyses data to form a conclusion that is consistent with the data and describes the effect of environmental conditions (light, heat and growth medium) on mould growth.

Suggests improvements to the method to improve the data collected.

Investigation poster: Mouldy bread



Dear

My team and I have found out during our Mouldy bread investigation what environment is best to store your bread in. We started by planning where we were going to place our bread and what bread types were we going to use. We decided to use both types of bread without moisture - in darkness, artificial light and sunlight. We chose both bread types because we wanted to see if one particular bread was right in one particular environment. Our results came out very good hardly any mould was grown. We grew most mould in sunlight with heat so we recommend not storing it anywhere near heat in your supermarket e.g. near hot chickens or in store windows (besides you wouldn't want mouldy bread on your shelf!). In the middle we had our 2 pieces of darkness bread grew quite a bit of mould then we expected! So only store it there if you are desperate. The one we recommend doing is artificial light with absolutely near no moisture! We saw other groups put moisture in their bags AND GROW MOULD VERY QUICKLY!! So do not put it near moisture aisles such as the milk or yoghurt aisle. We hope this advice solves your problems of growing mould fast! Remember nowhere near moisture!

With lots of hope for your bread,

Annotations

Indicates how scientific knowledge can inform decision-making.

Annotations (Overview)

The student constructs a multimodal text to communicate ideas, methods and findings.

Investigation report: Insulation

Year 6 Science achievement standard

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

> *By the end of Year 6, students compare and classify different types of observable changes to materials. They analyse requirements for the transfer of electricity and describe how energy can be transformed from one form to another to generate electricity. They explain how natural events cause rapid change to the Earth's surface. They describe and predict the effect of environmental changes on individual living things. Students explain how scientific knowledge is used in decision making and identify contributions to the development of science by people from a range of cultures.*
>
> *Students follow procedures to develop investigable questions and design investigations into simple cause-and-effect relationships. They identify variables to be changed and measured and describe potential safety risks when planning methods. They collect, organise and interpret their data, identifying where improvements to their methods or research could improve the data. They describe and analyse relationships in data using graphic representations and construct multimodal texts to communicate ideas, methods and findings.*

Summary of task

Students had been studying Australian history, specifically life in the late 1880s. They had investigated the use of science in the context of large blocks of ice in 'ice chests' to keep food cool. They discussed how 'icemen' would transport the ice packed in hessian bags and sawdust to prevent it from melting too quickly. In a class discussion, students also considered the materials they might use to keep food cool in the absence of refrigeration devices.

Using this scenario as a stimulus, students were asked to plan and conduct an investigation to determine which materials were effective insulators of an ice cube. Students were provided with an investigation plan template and a range of materials. They planned and conducted their investigation in two class lessons, and spent a further lesson completing their investigation report.

Investigation report: Insulation

Insulation Investigation

In Australia, the first ice specifically for cooling food was made in 1851. Soon people bought big blocks of ice and put them in "ice chests". Gradually "icemen" began to take ice packed in hessian bags and sawdust around the city streets, delivering ice once or twice a week.

Student name: _____ **Class:** _____

Other member/members of your team:

_____

What is to be investigated:

We are investigating early refrigeration and we are going to see which insulation is the best to keep the ice cold or frozen for the longest. Which insulation will keep the ice block the c... coldest?

Can you write it as a question?

What do you predict will happen? Explain why.

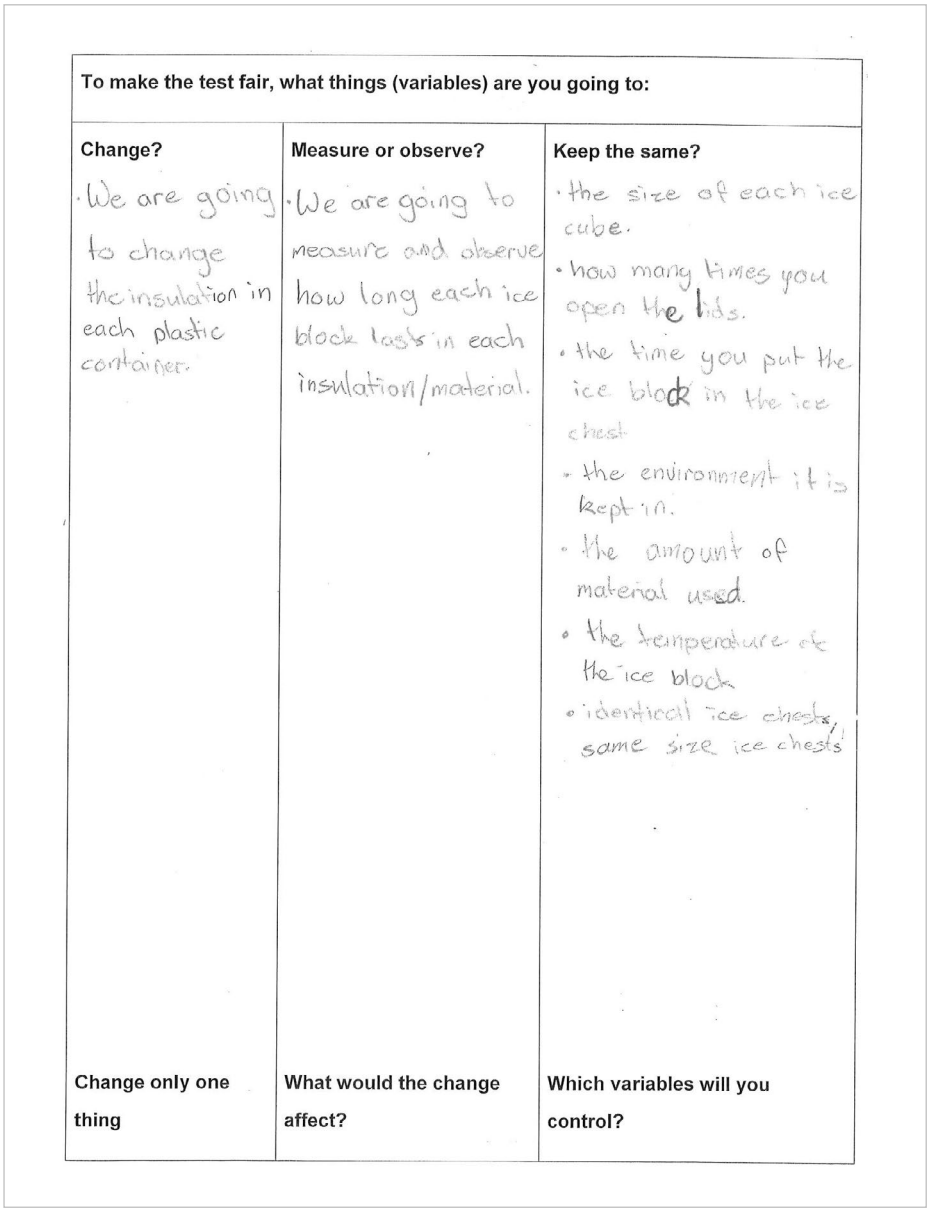
I predict that the ice chest with the bubblewrap for the insulation will keep the ice frozen for the longest because it has pockets of air that should help prevent warm air from melting the ice. I also predict that stuffing would let too much w... air in and that it would be to thin to keep the ice block from melting.

Give scientific explanations for your opinion.

Annotations

Constructs an investigable question.

Investigation report: Insulation



To make the test fair, what things (variables) are you going to:		
Change?	**Measure or observe?**	**Keep the same?**
• We are going to change the insulation in each plastic container.	• We are going to measure and observe how long each ice block lasts in each insulation/material.	• the size of each ice cube. • how many times you open the lids. • the time you put the ice block in the ice chest • the environment it is kept in. • the amount of material used. • the temperature of the ice block • identical ice chests/ same size ice chests
Change only one thing	**What would the change affect?**	**Which variables will you control?**

Annotations

Identifies variables to be changed, measured and controlled.

Investigation report: Insulation

Describe how you will set up and conduct the investigation.

1. Find and collect all of your materials and put them on to you desk.
2. Get a gluegun, 2 plastic cups and 1 type of material.
3. Glue the materials into the plastic cups
4. Put an ice block in the cup.
5. Repeat steps 2 and 4 as many times as you want but each time make sure you use a different material for each.
6. Now you have to wait for them melt and find which material works best.
7. Make sure you measure and observe.

Use drawings, label and explain in steps.

Annotations

Designs an investigation method including collection of data.

Investigation report: Insulation

What equipment will you need?

- plastic tubs x22
- masking tape
- bubble wrap
- foil
- stuffing
- foam / car insulation
- home insulation
- roof insulation
- newspaper
- neoprene
- velvet
- glue gun x1
- pen/marker x1
- Ice x11
- hessian

Use dot points

Write, draw and/or take photos about your observations as you conduct the investigation.

MATERIAL	OPENING TIMES	STARTING TIMES	FINISHING TIMES	LENGTH OF TIME
BUBBLE WRAP	19	11:45	1:31	1hr 46mins
HOME INSULATION	33	11:45	2:46	3hrs 1min
STUFFING	32	11:45	2:39	2hrs 54mins
NEWSPAPER	16	11:45	1:11	1hr 26mins
NEOPRENE	24	11:45	1:59	2hrs 14mins
VELVET	22	11:45	1:46	2hrs 1min
ROOF INSULATION	16	11:45	1:14	1hr 29mins
HESSIAN	19	11:45	1:28	1hr 43mins
FOAM	23	11:45	1:54	2hrs 9mins
FOIL	13	11:45	12:57	1hr 12mins
~~PLAIN~~ CONTROL	13	11:45	12:55	1hr 10mins
SAWDUST	—	—	—	—

Annotations

Constructs a table to present and organise quantitative data.

Science

Year 6

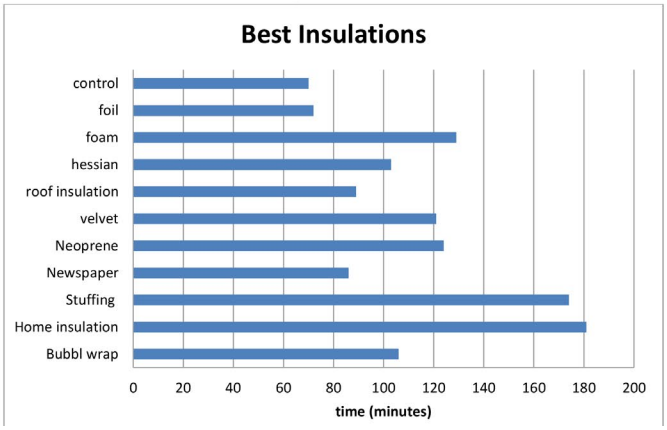
Above satisfactory

Investigation report: Insulation

Tuesday 3rd of July.

Here is all of our ice chests on our desks.

Here is me recording the times that the ice blocks melted in each ice chest.



Annotations

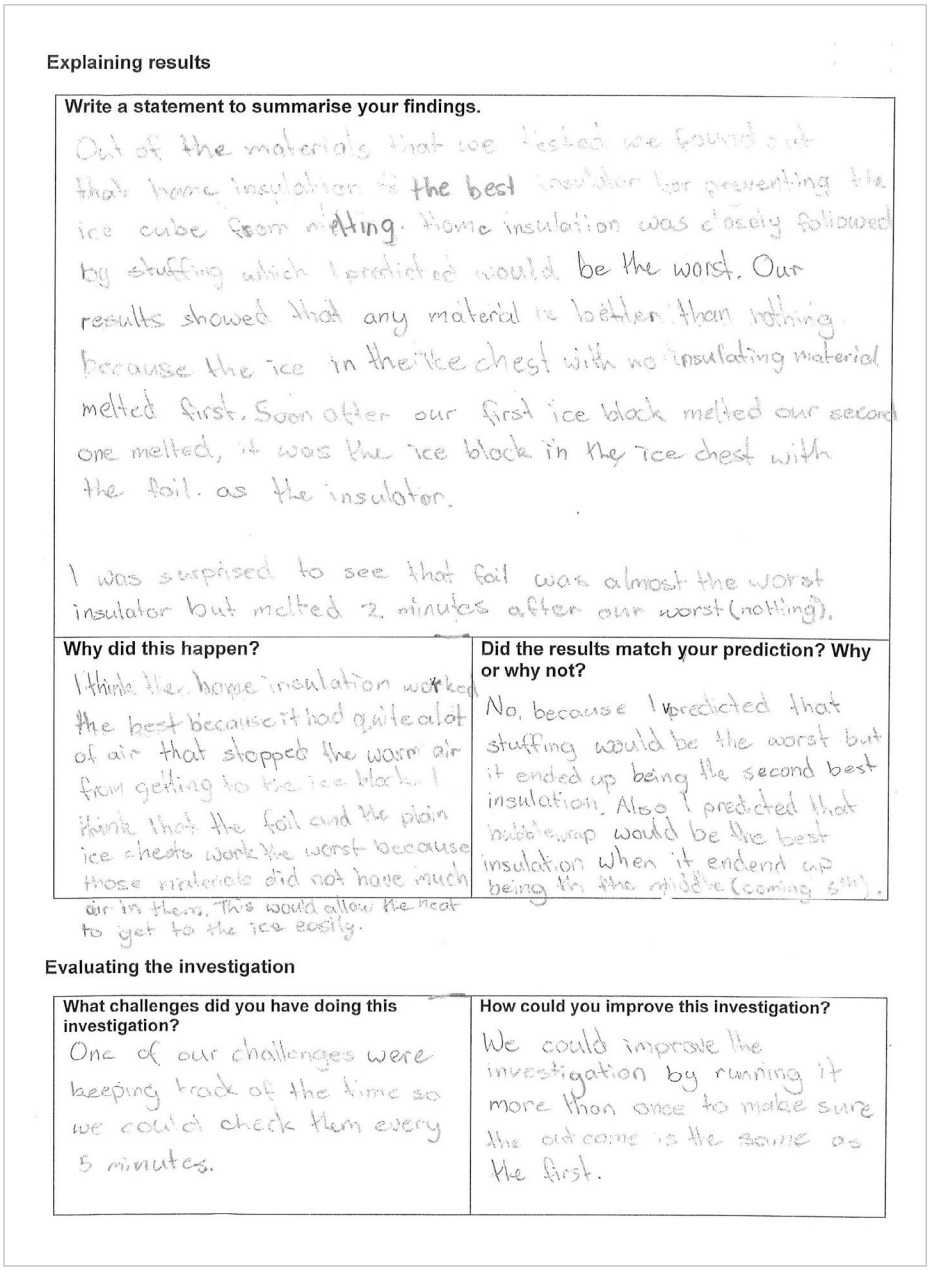
Constructs a graph to show trends in data, including most graphing conventions.

Science

Year 6

Above satisfactory

Investigation report: Insulation



Explaining results

Write a statement to summarise your findings.

Out of the materials that we tested we found out that home insulation is the best insulator for preventing the ice cube from melting. Home insulation was closely followed by stuffing which I predicted would be the worst. Our results showed that any material is better than nothing because the ice in the ice chest with no insulating material melted first. Soon after our first ice block melted our second one melted, it was the ice block in the ice chest with the foil as the insulator.

I was surprised to see that foil was almost the worst insulator but melted 2 minutes after our worst (nothing).

Why did this happen?

I think the home insulation worked the best because it had quite a lot of air that stopped the warm air from getting to the ice block. I think that the foil and the plain ice sheets were the worst because those materials did not have much air in them. This would allow the heat to get to the ice easily.

Did the results match your prediction? Why or why not?

No, because I predicted that stuffing would be the worst but it ended up being the second best insulation. Also I predicted that bubble wrap would be the best insulation when it ended up being in the middle (coming 5th).

Evaluating the investigation

What challenges did you have doing this investigation?

One of our challenges were keeping track of the time so we could check them every 5 minutes.

How could you improve this investigation?

We could improve the investigation by running it more than once to make sure the outcome is the same as the first.

Annotations

Interprets data to order materials with reference to insulation effectiveness.

Attempts to explain results with reference to observable properties of the materials.

Identifies that repeating the investigation could improve the data.

Annotations (Overview)

The student constructs a multimodal text to communicate ideas and findings.