Science

Year 8
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 8 SCIENCE

This portfolio provides the following student work samples:

Science

Year 8
Satisfactory

In this portfolio, the student compares physical and chemical changes (WS9, WS10) and uses the particle model to explain the behaviour of substances (WS1). The student identifies different forms of energy and describes how energy transformations cause change in a system (WS2, WS8, WS11). The student describes the processes that led to formation of particular rock samples (WS3), analyses different cell types to determine the relationship between structure and function (WS5) and constructs a board game that explores structure and function at organ and body system levels (WS4). The student identifies the different science knowledge required by a selected career (WS7, WS12), and researches the way in which an inspirational scientist collaborated with others to solve a contemporary problem (WS7). The student investigates the scientific evidence that underpins a science idea that is publicly contested (WS13).

The student demonstrates an ability to identify and construct a question or problem for scientific investigation (WS6, WS8, WS11) and to plan an experimental investigation (WS2, WS6, WS8), including identification of appropriate safety considerations (WS10, WS11). The student identifies variables to be changed, measured and controlled (WS2, WS6, WS11). The student constructs representations of data to reveal and analyse patterns and trends (WS2, WS3, WS6, WS8, WS11) and uses data when justifying their conclusions (WS2, WS6, WS8, WS9, WS11). The student uses scientific knowledge to evaluate claims made by others (WS13) and explains how modifications to investigation methods could improve the quality of data (WS2, WS6, WS11). The student communicates science ideas, methods and findings in a range of text types, using appropriate language and representations (WS2, WS3, WS4, WS6, WS7, WS8, WS9, WS10, WS11, WS12, WS13).

Written test: Particle model

Year 8 Science achievement standard

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

> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.*
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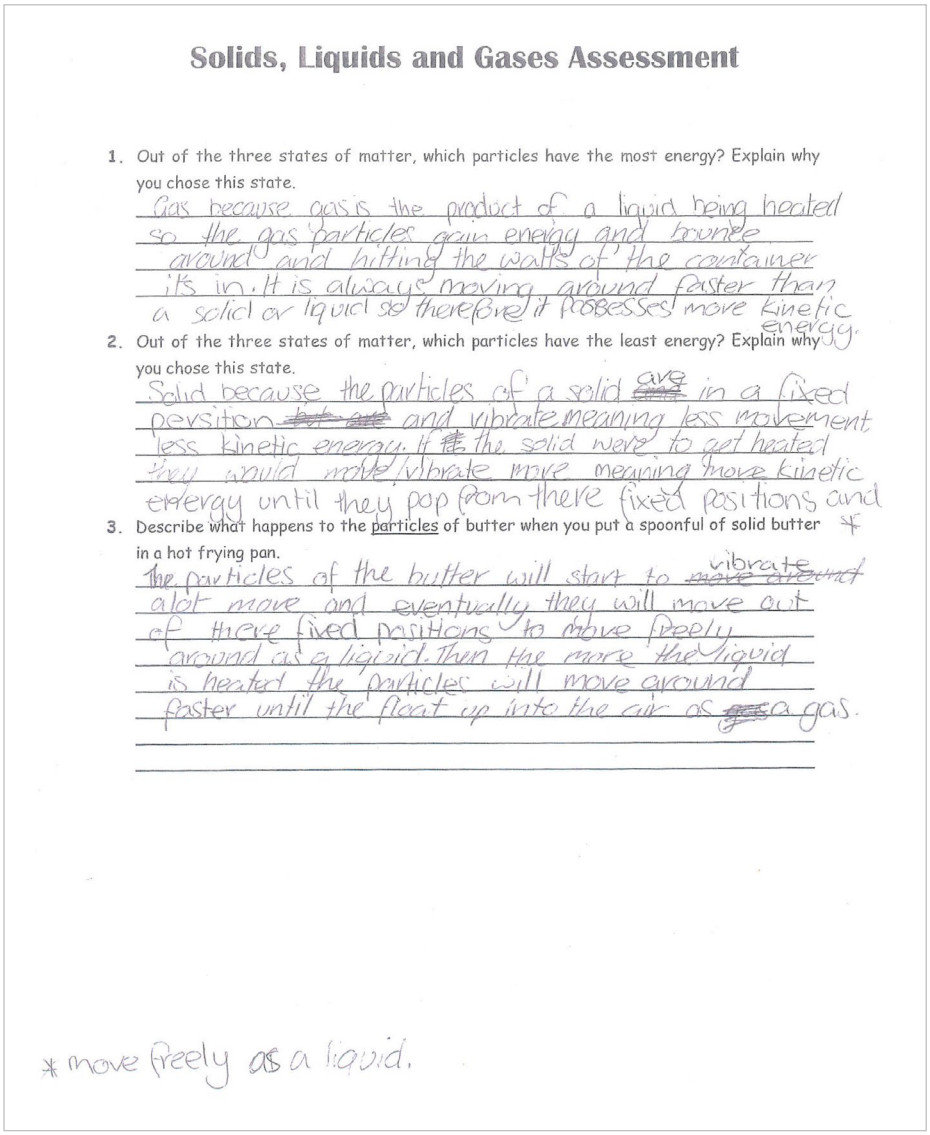
Summary of task

Students had explored the particle model and engaged in class discussion about particle explanations of change of state. They then worked in small groups to develop a particle model representation (physical model or computer animation) of a solid, liquid and gas, and shared their representations with the class.

Following their presentation, students were asked to complete a short test to demonstrate their understanding of particle model explanations of change of state. Students completed the test in 20 minutes.

Written test: Particle model



Solids, Liquids and Gases Assessment

1. Out of the three states of matter, which particles have the most energy? Explain why you chose this state.

Gas because gas is the product of a liquid being heated so the gas particles gain energy and bounce around and hitting the walls of the container it's in. It is always moving around faster than a solid or liquid so therefore it possesses more kinetic energy.

2. Out of the three states of matter, which particles have the least energy? Explain why you chose this state.

Solid because the particles of a solid ~~are~~ avg in a fixed pesition ~~but are~~ and vibrate meaning less movement less kinetic energy. If the solid were to get heated they would move/vibrate more meaning more kinetic energy until they pop from there fixed positions and

3. Describe what happens to the particles of butter when you put a spoonful of solid butter in a hot frying pan.

The particles of the butter will start to ~~move around~~ vibrate a lot more and eventually they will move out of there fixed positions to move freely around as a liquid. Then the more the liquid is heated the particles will move around faster until the float up into the air as ~~gas~~ a gas.

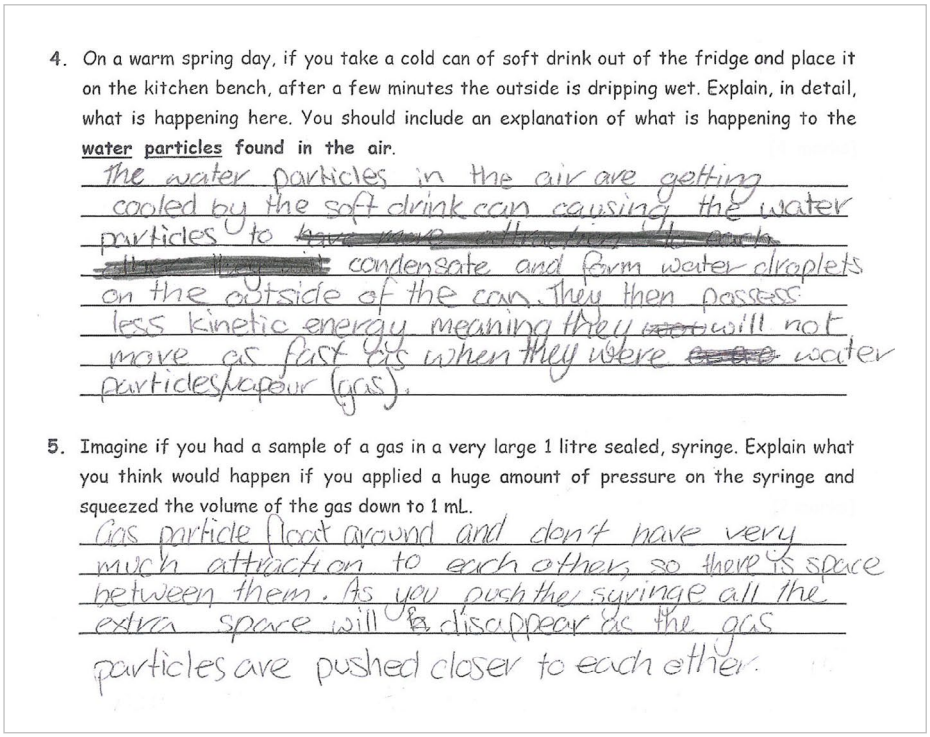
* move freely as a liquid.

Annotations

Uses the particle model to explain properties of gases and solids, with reference to kinetic energy of particles.

Provides a particle model explanation of change of state as the result of adding heat.

Written test: Particle model



4. On a warm spring day, if you take a cold can of soft drink out of the fridge and place it on the kitchen bench, after a few minutes the outside is dripping wet. Explain, in detail, what is happening here. You should include an explanation of what is happening to the **water particles found in the air.**

the water particles in the air are getting cooled by the soft drink can causing the water particles to [redacted] condensate and form water droplets on the outside of the can. They then possess less kinetic energy meaning they ~~were~~ will not move as fast as when they were ~~water~~ water particles/vapour (gas).

5. Imagine if you had a sample of a gas in a very large 1 litre sealed, syringe. Explain what you think would happen if you applied a huge amount of pressure on the syringe and squeezed the volume of the gas down to 1 mL.

Gas particle float around and don't have very much attraction to each other, so there is space between them. As you push the syringe all the extra space will be disappear as the gas particles are pushed closer to each other.

Annotations

Explains how cooling water particles in the air causes condensation on a cool object.

Identifies that increasing pressure causes gas particles to move closer together.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

Investigation report: Bouncing ball

Year 8 Science achievement standard

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Summary of task

Students had investigated forms of energy and energy transfers and transformations.

As part of the unit, students were required to undertake a practical investigation to identify the relationship between drop heights and bounce heights of a variety of balls. A report planning scaffold was provided. They were required to interpret their results with reference to energy transfers and transformations. Students completed the task over two 50-minute lessons.

Investigation report: Bouncing ball

Year 8 Science

Investigation: Bouncing Ball

Student Name: Class:

Other members of my group:

Background information –

If you drop a tennis ball onto a hard surface you notice that it bounces back to a specific height. We can change the height from which we drop the ball (Drop Height) and see the effect it has on the height the ball bounces back to (Bounce Height).

The tennis ball has energy before you drop it and it has energy at the top of its bounce.

You will investigate the effect of changing the **Drop Height** on the **Bounce Height**.

Planning

What is the topic of my investigation? Give it a **Title**.
How the bounce of a ball is affected by the drop height.

What do I predict will happen (Hypothesis)? Write a suitable **Hypothesis**
I predict that the ball will bounce to around half of the original drop height and the higher the drop height the higher the ball will bounce no matter what substance.

Why I think it will happen (give some **prior scientific knowledge** –Hint energy and its transformation might help).
I think this will happen because the higher the drop height of the ball will create more potential energy giving it more bounce power. I think it will only bounce around half of the drop height because some of the kinetic energy will be lost when it hits the ground being transferred into sound energy.

Annotations

Identifies some energy forms and describes an energy transformation that occurs in the system.

Investigation report: Bouncing ball

What am I going to do? (Method)

- Attach the two rulers, one on top of the other, to a flat wall with blue tac
- Have one person holding the ball at 20 cm in height and release the ball
- Watch how high it bounces in cm and record this in a table
- Repeat the last two steps several more times but 20 cm higher each time until you reach 2 metres

Which variables are you going to?

- Change (Independent) Drop height
- Measure (Dependent) Bounce height
- Keep the same (Controlled). Think of as many of these as you can. Test environment, temperature, type of ball, floor type

What will I need (equipment)
2 metre rulers
Tennis ball
Blue Tac

Conducting
How can I make it a fair test?
I can make this a fair test by doing it all on the same day, not changing the ball type, having a controlled test environment and having only one person drop the ball.

Results (table) – you will also need other groups results to compare.

My Group	
Drop Height (cm)	Bounce Height (cm)
20	11
40	23
60	33
80	47
100	57
120	67
140	75
160	86
180	96
200	103

Other Group	
Drop Height (cm)	Bounce Height (cm)
100	55
110	58
120	68
130	75
140	81
150	86
160	88
170	94
180	98
190	107
200	106

Annotations

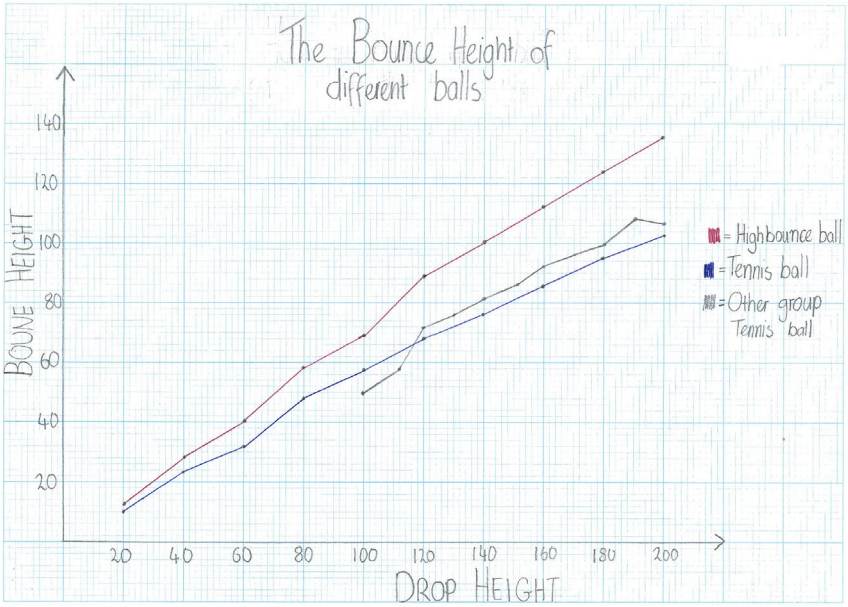
Identifies variables to be changed, measured and controlled.

Identifies some actions that will contribute to conducting a fair test.

Designs appropriate tables to present data for analysis.

Investigation report: Bouncing ball

Draw a graph of your results and the other groups results onto a single graph on graph paper.



What do your results suggest you? Can you see any trends from the graph?
Our results suggest that the higher the drop height was the higher the ball would bounce no matter what type of ball. The trends I can see from the graph is the stable increase of bounce height.

Annotations

Constructs a line graph that follows most graphing conventions and clearly represents trends in data.

Analyses patterns in data to justify observed trends.

Investigation report: Bouncing ball

Data Analysis

Why did you get these results? Try to use some science ideas, and your understanding so far of energy, to help explain what happened. You will need to identify the **forms of energy** and the **energy transfers** and **energy transformations** that take place.
I got these results because as the ball is higher it has more potential gravitational energy, therefore letting it bounce higher. It only bounces around half of its drop height because it loses energy when it hits the ground and transfers into sound energy.

Was the outcome different from your prediction? Explain.
The outcome was very similar to my prediction. This was because we had studied about energy and researched our topic before.

Evaluating

What difficulties did you experience in doing this investigation? The difficulties we experienced during this experiment were deciding accurately how high the ball bounced.

Compare your group results to the other group you chose, are their results the same or different? If there are differences then can you suggest why? The other groups results are very similar to our results.

How can I improve this investigation, for example fairness and accuracy? I could improve this investigation by repeating it a few times to create an accurate average and I could have

Extension

If you finish this you can explore changing the ball to a different type (one used in down ball?) Graph the results of this on your original graph and then compare these results to those with the tennis ball. Can you explain any differences you see in these results when compared to your original ones? The difference between the tennis ball and the high bounce ball is the bounce height. The high bounce ball was always higher than the tennis ball.

Annotations

Explains observations with reference to energy transformations and transfers.

Identifies how modifications to the method could improve the quality of the data.

Annotations (Overview)

The student uses appropriate language and representations to communicate science ideas, methods and findings.

Analysis task: Rock samples

Year 8 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 completed a unit on the rock cycle, linked to an analysis of rock types in the local area, and the ways in which those rocks had formed over time.

For this task, students were required to analyse five rock samples and use their observations to infer how the rock was formed. They were also required to complete a Venn diagram to highlight the similarities and differences between sedimentary, igneous and metamorphic rocks, and to apply their knowledge to an everyday situation. These tasks formed part of an in-class written examination over two class lessons.

Analysis task: Rock samples

Task 3:

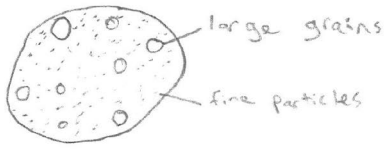
Draw a labelled diagram below to show the features of each rock specimen (1-5) provided in class.

Describe the structure of the rock.

Explain how it was formed. What evidence suggests this?

Identify (name) each of the rock specimens.

Specimen 1 Specimen A

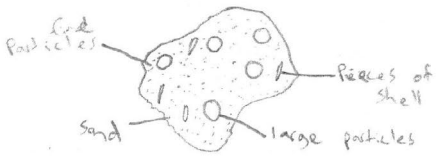


This rock has lots of large particles and it is rough all around it.

It may have been formed at a beach or under a waterfall because it has some large grains. this ~~suggests that~~ is because ~~of~~ it had been in rough waters or in a rough current.

It is a sedimentary rock

Specimen 2 Specimen D



This rock is very rough with large and fine particles and with some pieces of shell and sand

This rock has formed at a beach because of the sand and shells.

This is a sedimentary rock

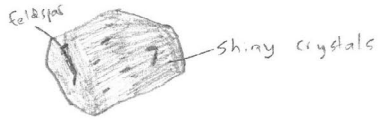
Annotations

Constructs diagrammatic and textual representations of rock samples to describe significant features.

Uses knowledge of rock formation to infer the environment and conditions in which the rock was formed, based on data.

Analysis task: Rock samples

Specimen 3 Specimen C

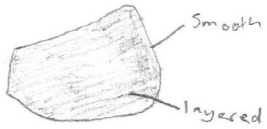


This rock is made from slow cooling magma. It tells us that because its kinda rough and has large crystals.

This rock is a bit smooth and contains large crystals and feldspar.

This rock is igneous. Quartz

Specimen 4 Specimen B



This rock is smooth and can be seen with many layers. It is also a dark colour.

This rock was formed over years with something being dumped on top. and through lots of pressure and some heat it formed.

This rock is Metamorphic.

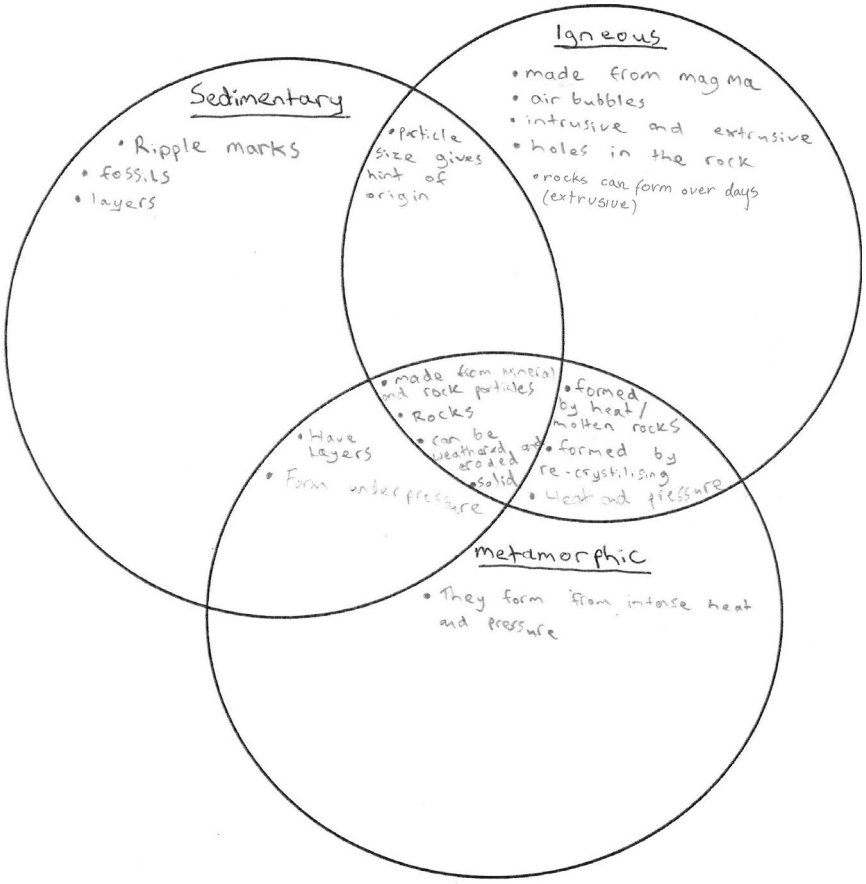
Annotations

Identifies that large crystals correlate with slow cooling processes.

Analysis task: Rock samples

Task 4

Complete the Venn Diagram (below) to highlight the similarities and differences between Sedimentary, Igneous and Metamorphic rocks.



Task 5:

Many geological materials are used in the construction industry, e.g. gravels for concrete production and as road building material and limestone for sculptures. An architect (building designer) plans to use a natural material (rock) to face a new government building. She will arrange for thin slabs of the rock to be attached to cover and to decorate the walls. **Suggest** one of the rock types that you have examined for this purpose, and explain why you believe it is a suitable choice for the building. (**Justify** your choice.)

A rock that I think is suitable for covering a building is Granite because of the ability to polish it, its variety of colours, its resistance to weathering, and the strength comming from its interlocking crystal structure.

Annotations

Identifies similarities and differences between the processes of formation of sedimentary, igneous and metamorphic rocks.

Identifies that igneous rocks can form very quickly.

Uses knowledge of properties of rocks to suggest a suitable material for a stated purpose.

Annotations (Overview)

The student uses appropriate language and representations to communicate science ideas, methods and findings.

Board game: Digestive system

Year 8 Science achievement standard

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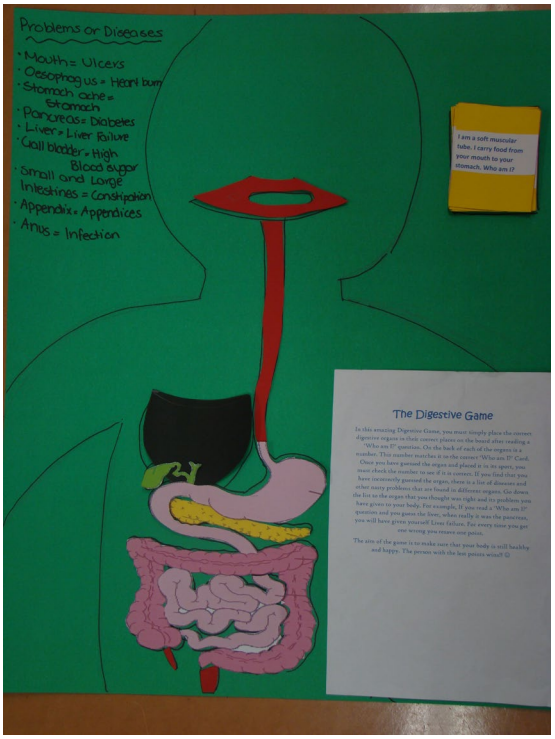
Summary of task

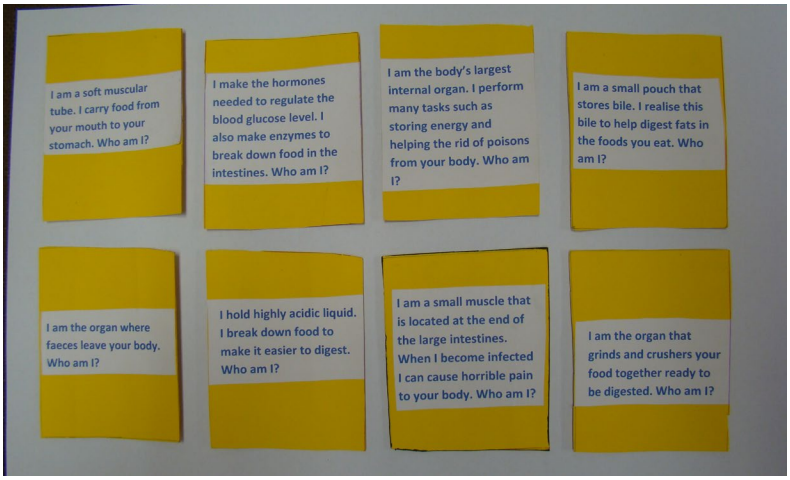
Students had explored the respiratory system and reproductive system, focusing on the structure of the body systems and the function of their component organs, tissues and cells.

Students were asked to work in pairs to research the digestive system and construct a board game that demonstrated their understanding of the main organs of the system, their structure and function, and what would happen if some of the organs weren't functioning.

Students were provided with five 40-minute lessons to complete the task.

Board game: Digestive system





Annotations

Identifies the component organs of the digestive system.

Identifies a range of problems or diseases that affect organs of the digestive system.

Constructs questions that demonstrate understanding of the function of a range of components of the digestive system.

Constructs questions that link structure (soft muscular tube) of organs and tissues with function (carry food from the mouth to the stomach) for some organs.

Annotations (Overview)

The student uses appropriate language and representations to communicate science ideas through a specific text type (board game).

Written test: Cells

Year 8 Science achievement standard

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Summary of task

Students had completed a unit on cell structure and function, including investigating physical and digital models of different cells, viewing a range of samples under a microscope and researching the structure and function of cells in particular tissues.

Students were required to complete a written test following completion of the unit. They completed the test over 50 minutes in closed-book conditions. A selection of test questions is included in the attached sample.

Written test: Cells

12. a) Explain how multicellular organisms benefit from having specialised cells.

Specialised cells have their own unique 'job' to do and in large multi-cellular organisms this would be benificial as these specialised cells would than ~~than~~ designed to do this job, making results more efficent and correct. Specialised cells would also be designed to combat diseases related to their speciality, therefore increasing their chance of survival.

b) Pick one type of cell from the diagram below and describe how it is suited to its specialised role in the body.

Nerve cells are best designed to it's specialised role in the body, as the nerves can reach out and transfer information faster.

This specialised role could mean life or death if it wasn't suited for that role as reactions and messages are transferred though the nerve cells.

The nerve cells also have 'hands' at the end of their transfer lines to reach out and securely transfer information.

Annotations

Recognises that specialised cells form particular functions.

Describes some structural features of a nerve cell that make it suited to transferring information.

Written test: Cells

c) Skin cells, blood cells, and the cells that line the digestive tract reproduce more often than other types of cells such as nerve and muscle cells. Explain why this is the case.

Skin cells, blood cells and the cells that line the digestive tract reproduce more often because in their line of work they are more likely to die or get damaged. Skin cells often die or get damaged as of cuts, grazes and scratches. Blood cells and cells that line the digestive tract often need replacing because of germs, bacteria and disease trying to take control of the body. White blood cells are the ones fighting these diseases away.

Annotations

Explains that some cells must reproduce more often than others due to their functional environment.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

Investigation report: Coffee cup evaluation

Year 8 Science achievement standard

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Summary of task

Students were presented with a scenario in which they were required to determine the best coffee cup to be used by a local coffee shop. Students determined the variables that they thought would qualify a coffee cup as ‘the best’. They designed and carried out an investigation to test their chosen variables and presented their findings in the form of a written report. Students worked in groups over three lessons to undertake the practical and submitted an individual report completed in their own time.

Investigation report: Coffee cup evaluation

The best coffee cup

Aim:

To find out which coffee cup is the best choice for a coffee shop to use. The three factors being tested are insulation, cost and design.

Hypothesis:

The most important factor is insulation. This will keep customers satisfied and satisfied customers mean more customers which means more money for the coffee shop! We think that the brown cup with the double wall and rippled cardboard will be the best at keeping the heat in the cup and keeping the coffee hottest for the longest amount of time.

Materials:

Coffee cups
Thermometers
Kettle
Stopwatch
Measuring cylinder
Styrofoam block

Method:

1. Collect the first two cups to test.
2. Place them on a Styrofoam clock so that they are not touching the metal work bench.
3. Put a thermometer through the lid of each cup.
4. Boil water in a kettle.
5. Use a measuring cylinder to measure 200 mL of water and place it into each cup.
6. Put the lids on the cups and start the stopwatch.
7. Record the temperature of the thermometers after every 30 seconds for 20 minutes.
8. Repeat the experiment for the other four cups testing two at a time.
9. Repeat the whole experiment.

Variables:

Independent variable – cup

Dependent variable– temperature change

Controlled variables – amount of water in each cup, time for each test, type of thermometer used

Annotations

Describes factors to be investigated to solve a problem.

Identifies independent, dependent and controlled variables.

Investigation report: Coffee cup evaluation

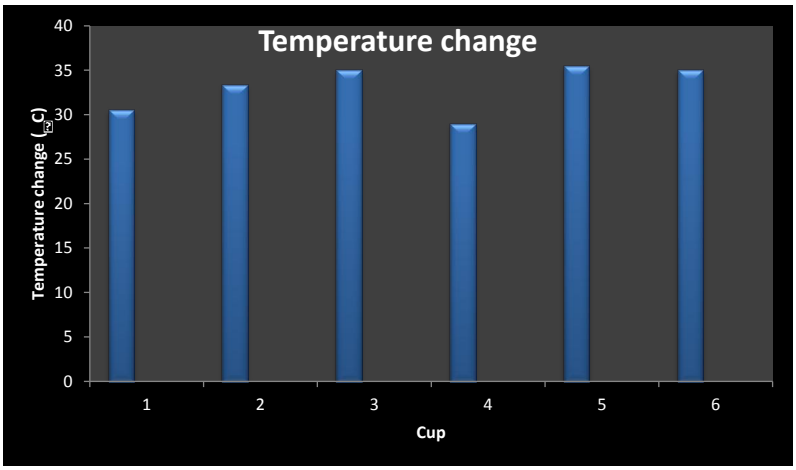
Results:

Cost and material

Cup	Cup Cost ($)	Design
1	0.49	Good design and environmentally friendly
2	0.42	Boring brown colour, rippled cardboard, double walled
3	0.46	Colourful red design with patterns
4	0.15	Plain white, styrofoam
5	0.12	Nice coffee patterns, thin
6	0.31	Plain red colour, rippled cardboard

Temperature change after 20 minutes

Cup	Test 1 (°C)	Test 2 (°C)	Average (°C)
1	31	30	30.5
2	33	34	33.5
3	35	35	35
4	30	28	29
5	36	35	35.5
6	35	35	35



Annotations

Represents qualitative and quantitative data, including summary data in the form of tables and graphs.

Graphs summary data to reveal trends.

Investigation report: Coffee cup evaluation

The graph shows that cup 1 kept the temperature of the water hot for the longest which makes them the best insulators.

Discussion:

When a hot object cools down, heat leaves it and moves off to another material or into the environment. Heat can do this by conduction, evaporation and radiation. We were looking for a coffee cup that stops heat from escaping by acting as an insulator and keeping the heat inside the cup.

We thought that the brown cup with the double wall and rippled cardboard would be the best at keeping the heat in but it wasn't as good as the Styrofoam cup. This is because Styrofoam is a material that has lots of tiny air bubbles in it that stop heat from passing through it.

Our experiment worked out well and gave us good results. By using the Styrofoam as a stand we kept the cups off the cold metal bench which was a good way to control extra heat loss. Our results were pretty close for both of the tests. We could get better results if we used an electronic thermometer and used hot milk instead of water since milk is the main ingredient in coffee shop coffee and might change temperature differently to water.

Conclusion:

From our results cup 4 is the best. Even though it had a plain design, it will still be best for the customers since it will keep their coffee nice and hot!

Annotations

Explains observations using scientific knowledge.

Suggests modifications to the method in order to improve the quality of data.

Annotations (Overview)

The student uses appropriate language and representations to communicate science ideas, methods and findings in a range of text types.

Research report: Science careers

Year 8 Science achievement standard

By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.

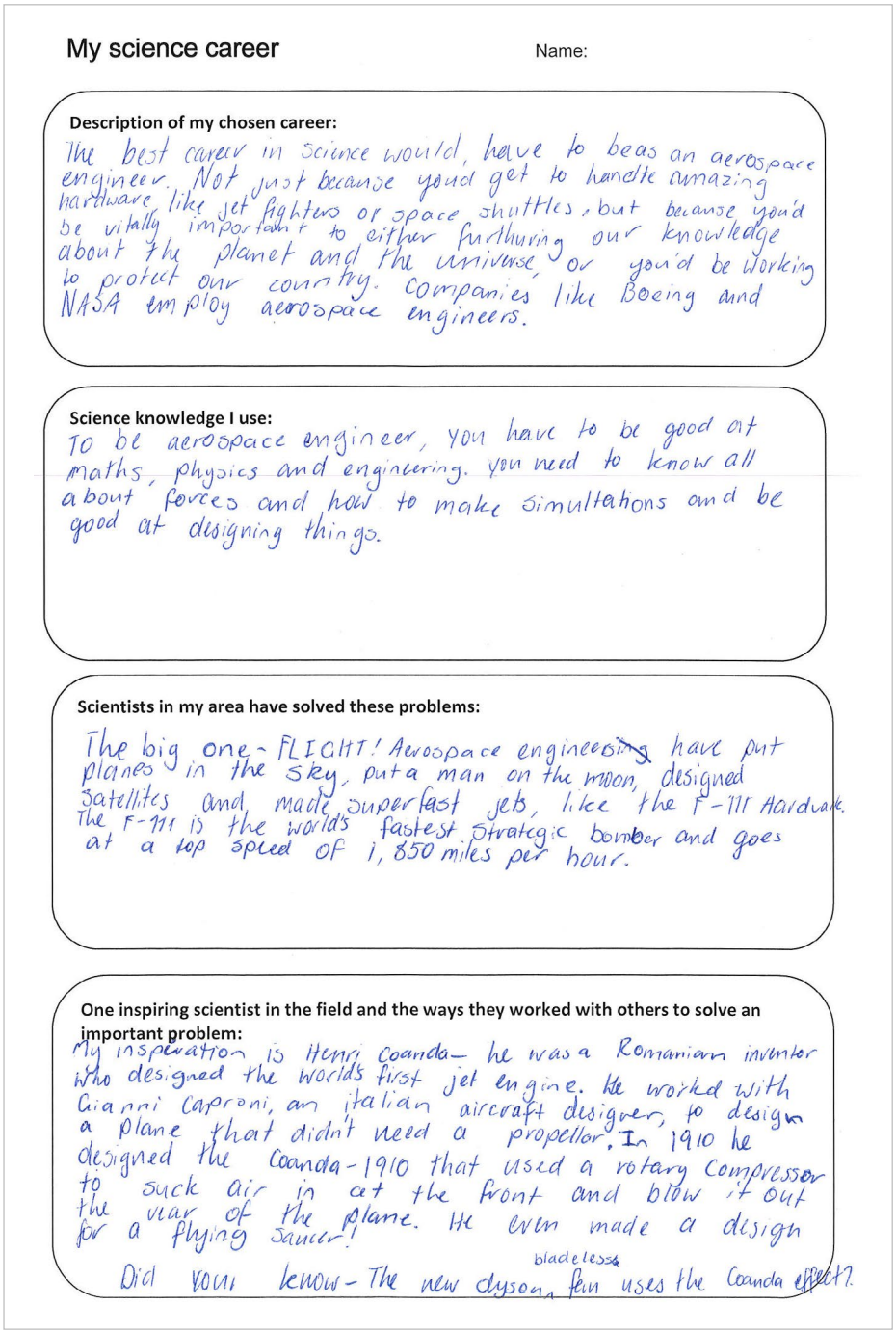
Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types.

Summary of task

Over the course of the year, students had investigated a range of science careers, prominent scientists and contemporary research related to each area of study.

For this task, students were asked to reflect on their science learning and identify a potential science career they would be interested in pursuing. They were asked to research the occupation and to identify its contributions to solving contemporary problems, including providing specific information on an ‘inspirational’ scientist’s work.

Research report: Science careers



My science career

Name:

Description of my chosen career:

The best career in science would have to beas an aerospace engineer. Not just because youd get to handle amazing hardware like jet fighters or space shuttles, but because you'd be vitally important to either furthuring our knowledge about the planet and the universe, or you'd be working to protect our country. Companies like Boeing and NASA employ aerospace engineers.

Science knowledge I use:

To be aerospace engineer, you have to be good at maths, physics and engineering. you need to know all about forces and how to make simultations and be good at designing things.

Scientists in my area have solved these problems:

The big one - FLIGHT! Aerospace engineers have put planes in the sky, put a man on the moon, designed satellites and made superfast jets, like the F-111 Aardvark. The F-111 is the world's fastest strategic bomber and goes at a top speed of 1,850 miles per hour.

One inspiring scientist in the field and the ways they worked with others to solve an important problem:

My inspiration is Henri Coanda- he was a Romanian inventor who designed the worlds first jet engine. He worked with Gianni Caproni, an italian aircraft designer, to design a plane that didn't need a propellor. In 1910 he designed the Coanda-1910 that used a rotary compressor to suck air in at the front and blow it out the rear of the plane. He even made a design for a flying saucer!

Did you know - The new dyson bladeless fan uses the Coanda effect.

Annotations

Identifies a range of science knowledge used in aerospace engineering.

Describes how two scientists collaborated to design the jet engine.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

Investigation report: Mousetrap racer

Year 8 Science achievement standard

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

> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.*
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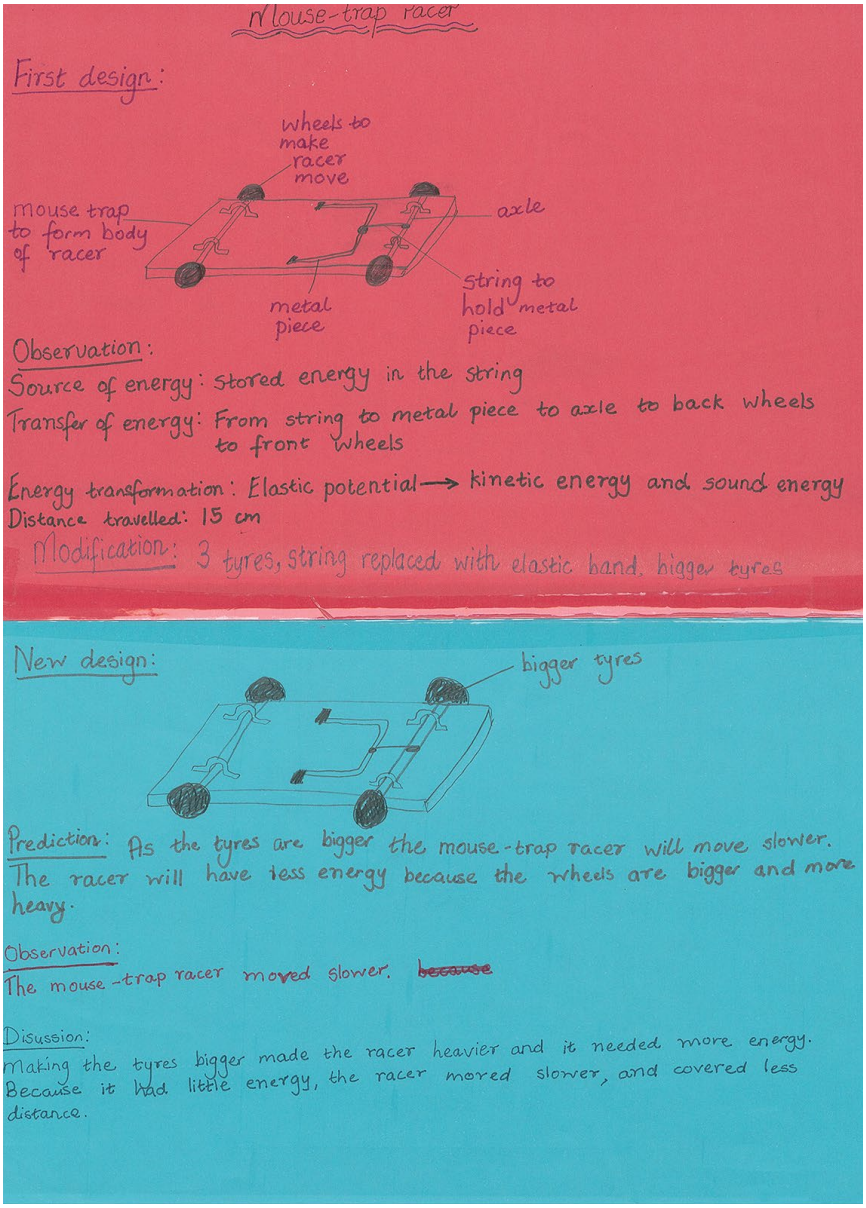
Summary of task

Students had investigated forms of energy and energy transfers and transformations.

As part of the unit, students were required to undertake a practical investigation to build a mousetrap racer. They were asked to observe the mousetrap racer's motion when released and explain the energy transfers and transformations that took place. They were then required to modify the racer and make a prediction about how its motion might change, using their knowledge of energy transfers and transformations.

Investigation report: Mousetrap racer



Annotations

Describes how energy transfer causes movement.

Identifies different forms of energy that are transformed in the system, including elastic potential energy, kinetic energy and sound energy.

Suggests a modification that can be investigated scientifically.

Makes a prediction using knowledge of energy transfers in the system.

Explains observations using knowledge of energy transfers in the system.

Annotations (Overview)

The student uses appropriate language and representations to communicate science ideas, methods and findings.

Investigation report: Burning steel wool

Year 8 Science achievement standard

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

> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.*
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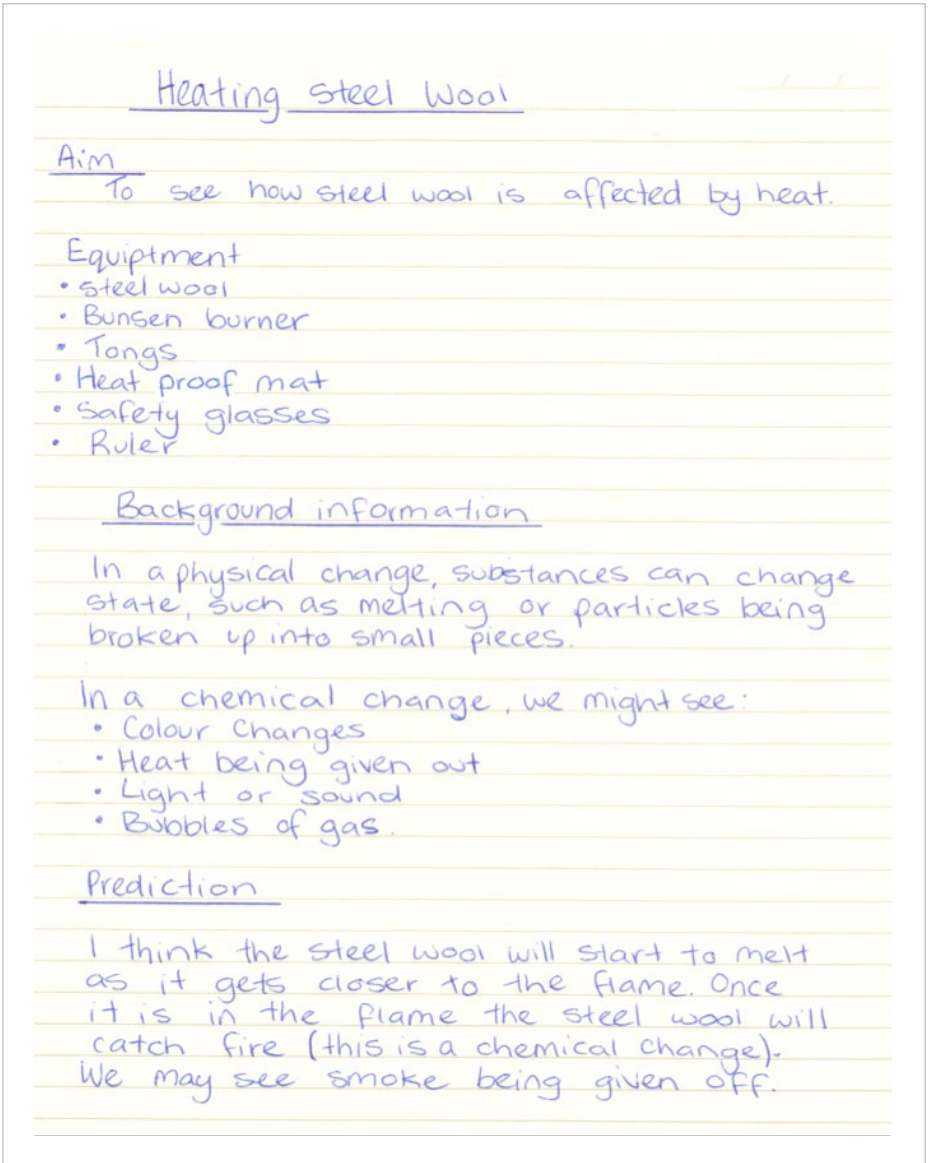
Summary of task

Students had been investigating a range of chemical and physical changes, such as melting chocolate, heating sugar and adding chemicals to water and had identified the key observations that give evidence for a chemical change. Previously they had completed work on the kinetic theory of matter in relation to the behaviour of solids, liquids and gases and changes of state.

Students were asked to complete an investigation into burning steel wool. They were provided with a piece of iron wool, a Bunsen burner, a pair of tongs, a heat-proof mat and safety glasses. They were asked to heat the steel wool with the Bunsen, at first holding the steel wool 30 cm above the tip of the Bunsen flame. They were then told to lower the steel wool gradually until they thought that a physical change was occurring with the steel wool, then further until they thought a chemical change was occurring. They were asked to list evidence for the changes that they would be looking out for, and to predict the heights at which the changes would occur.

Before students began the task they discussed safety requirements for this investigation; they identified that the students should wear safety glasses when working with Bunsen burners, hold the iron wool in the tongs at a distance from their bodies, and be careful not to flick the burning wool.

Investigation report: Burning steel wool



Heating steel Wool

Aim
To see how steel wool is affected by heat.

Equiptment
- steel wool
- Bunsen burner
- Tongs
- Heat proof mat
- Safety glasses
- Ruler

Background information

In a physical change, substances can change state, such as melting or particles being broken up into small pieces.

In a chemical change, we might see:
- Colour changes
- Heat being given out
- Light or sound
- Bubbles of gas.

Prediction

I think the steel wool will start to melt as it gets closer to the flame. Once it is in the flame the steel wool will catch fire (this is a chemical change). We may see smoke being given off.

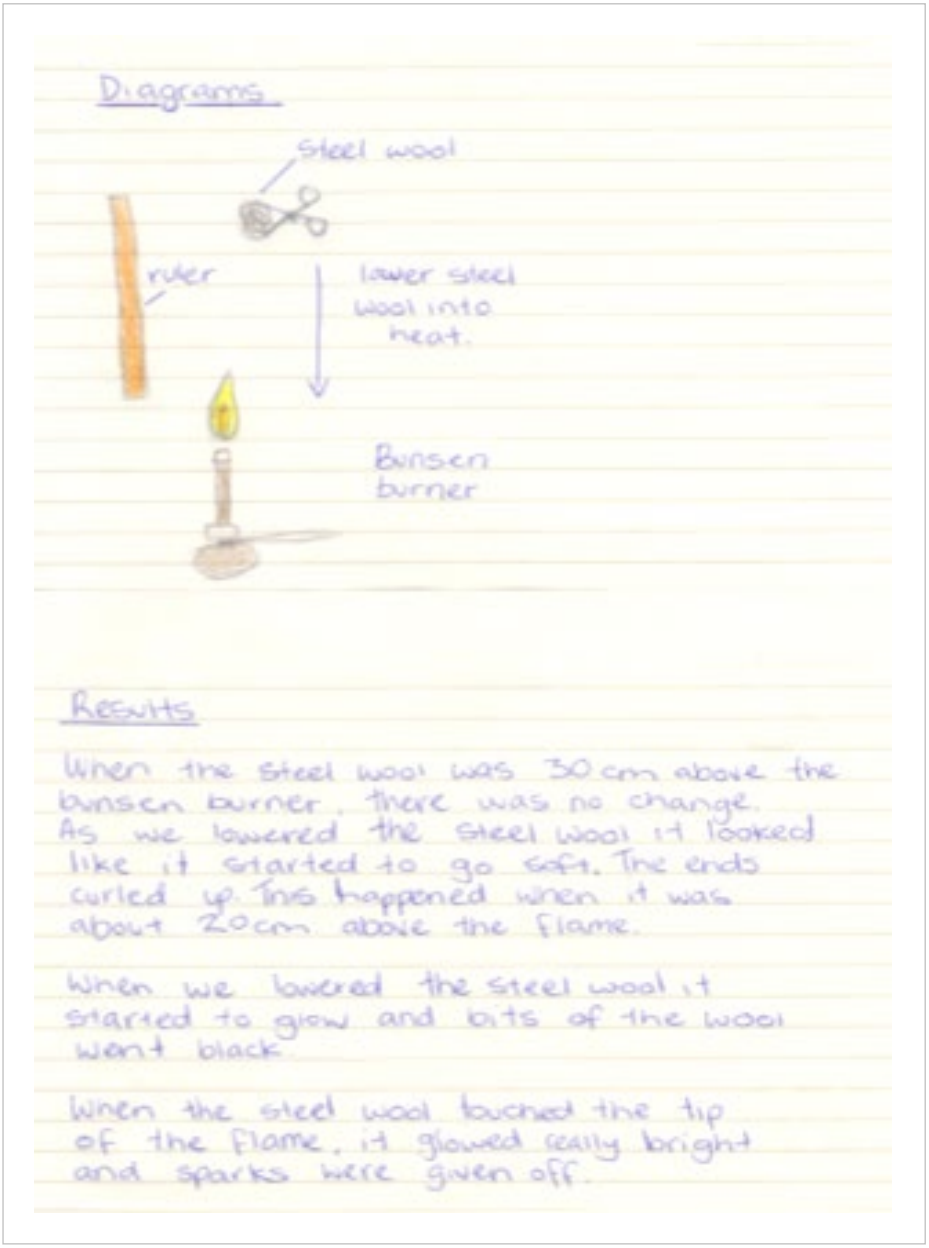
Annotations

Identifies evidence of a physical change.

Identifies evidence of a chemical change.

Makes a prediction based on previous knowledge of physical and chemical changes.

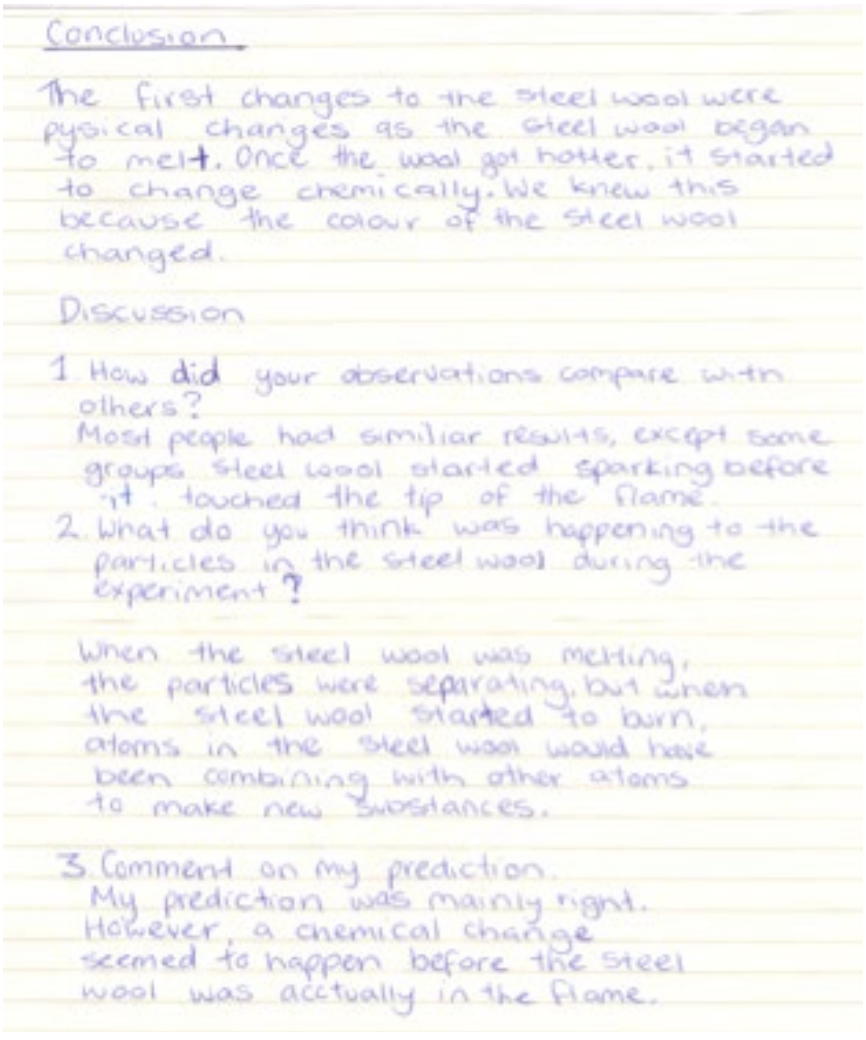
Investigation report: Burning steel wool



Annotations

Records observations.

Investigation report: Burning steel wool



Conclusion

The first changes to the steel wool were pysical changes as the steel wool began to melt. Once the wool got hotter, it started to change chemically. We knew this because the colour of the steel wool changed.

Discussion

1. How did your observations compare with others?
Most people had similiar results, except some groups steel wool started sparking before it touched the tip of the flame.
2. What do you think was happening to the particles in the steel wool during the experiment?

When the steel wool was melting, the particles were separating, but when the steel wool started to burn, atoms in the steel wool would have been combining with other atoms to make new substances.

3. Comment on my prediction.
My prediction was mainly right. However, a chemical change seemed to happen before the steel wool was acctually in the flame.

Annotations

Describes and compares observations in terms of physical and chemical changes.

Uses the particle model to explain observations, in this case, differences between the melting of the steel wool and the oxidation/combustion reactions occurring later.

Relates observation to original prediction.

Annotations (Overview)

The student uses appropriate language and representations to communicate science ideas, methods and findings.

Investigation report: Classifying chemical and physical changes

Year 8 Science achievement standard

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

> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.*
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Summary of task

Students had studied the difference between physical changes and chemical reactions. They had engaged in a number of investigations as part of the chemistry unit and had developed a good understanding of the safety requirements of working in a laboratory environment.

For this investigation, students were provided with a number of experiments to conduct. Prior to conducting the experiments they were required to develop and obtain teacher approval for their risk assessment and safety considerations. For each experiment, they were asked to make observations, and to record their observations in an appropriate table. They were required to classify the observed change as a physical change or a chemical reaction, and to justify their classification based on their observations.

Students completed the investigation planning and practical component over two lessons in class, and constructed their report as a homework task.

Investigation report: Classifying chemical and physical changes

Experiment report

Aim

The aim of this experiment is to classify be able to successfully identify physical and chemical reactions, observe experiments and classify chemical reactions.

Introduction

A physical change is when you change the state of an object and is easily reversible. A chemical reaction is when you change the object completely to make a new product and is very hard/impossible to reverse. The observations I made to prove that it's a chemical are a colour change, a gas is produced and light or heat is absorbed. A reactant is a substance you start with and they react/change to make new substances. A product is the substance you finish with and they are produced in the chemical change.

Risk Assessment

The risks associated with this experiment are, experiment may stain clothes, using a Bunsen burner, mixing chemicals, some chemicals may hurt/irritate skin, keep away from face, may come in contact with eyes, gases produced. You can minimise the risks by were goggles to protect eyes, were a science coat to prevent stains on uniform, don't lean test tube towards face, don't lean on benches, be responsible and read instructions carefully.

Results

Experiment number	Observations	Physical or chemical change	Evidence
1	The copper carbonate went black once heated and turned into a liquid. There was also a gas being produced.	Chemical change	There was a colour change, a gas was formed, a new substance was formed and the copper carbonate could not be changed back to its original substances
2	At around 24 seconds the chocolate was already 40 degrees it also had started to melt at this point. AT 52 degrees the chocolate was fully melted this process took approximately 2 minutes	Physical change	This is a physical change because it is quite easy to bring the chocolate back to its original state by freezing it. There is absolutely no evidence of a chemical change, there was no colour change, the chocolate is still the same type of substance, there was no noise and

Annotations

Defines physical changes and chemical reactions with reference to ease of reversal and the formation of a new substance.

Identifies some indicators of chemical change.

Identifies safety risks and appropriate precautions.

Constructs a table to organise data.

Investigation report: Classifying chemical and physical changes

			also no smoke or flame.
3	Water in the compound evaporated and there was only one type of sodium carbonate at the end. Water condensed on the side of the tube.	Chemical change	There was a colour change, the water changed state and a gas also formed.
4	When blowing up the balloon, it expanded.	Physical change	IT is a physical change because when the balloon is blown up air can easily be let back out by letting go of the balloon. Also because there was no noise, flame, smoke or colour change.
5a	Condensation formed and because hot when the magnesium was placed into the acid	Physical change	It is a physical change because there was no colour change and only water droplets were formed on the side of the test tube.
5b	A lot of condensation occurred, the test tube got quite warm. When we put the stick with the fire on the end up the test tube it made a loud pop noise. It also smelt like smoke.	Chemical change	The evidence that shows a chemical change occurred is there was a loud pop noise which is a sign that a chemical change has occurred, there was also smoke and condensation which is another sign for a chemical reaction.
6	When salt was placed into the water it sunk to the bottom and turned a foggy colour.	Physical change	It is a physical change because the water was poured back into the sink the salt was still there at the bottom of the bowl with no change.
7	There was a texture change, the iron and the copper sulphate started as a blue colour then faded.	Chemical change	It is a chemical changes because a new substance was formed and it was impossible to see

Annotations

Classifies a range of changes as physical or chemical and provides evidence to justify their choice.

Investigation report: Classifying chemical and physical changes

			the iron and the copper sulphate in their original state. There was also a colour and texture change. These changes show that this experiment was a chemical change.
8	The test tube went fizzy. The baking soda and hydrochloric rose and a gas formed	Chemical change	It was a chemical change because a gas was produced and all of the substances combined. They were unable to be taken apart.
9	A tablet was crushed and became a powdery substance. The feel of the tablet was grainy.	Physical change	It is a physical change because even though the tablet can't be put back into its original substance there was no other evidence like a noise, flame, smoke or colour change to prove it was a chemical change.
10	When burning the magnesium in the air it turned into ashes.	Physical change	Even though the substances cannot be reversed there was a lack of evidence illustrating a chemical change.
11	When putting sodium iodide into the lead nitrate it went yellow and clumpy.	Chemical change.	IT is a chemical reaction because there was a colour change that went from clear to yellow also it went from a water texture to a lumpy texture. This proves that it is a chemical change because it is impossible to separate the sodium iodide and the lead nitrate because of the new substance that has been formed.
12	Paper was folded	Physical change	A physical change

Annotations

Investigation report: Classifying chemical and physical changes

	leaving a crease in it		occurred because it was only a piece of paper which was folded. It could then be unfolded.
13a	Five drops of hydrogen peroxide was placed into the manganese dioxide it went black and the size decreased.	Chemical change	This experiment was a chemical change because there was gas formed and a colour change occurred. Also because once the mixed hydrogen peroxide with the manganese dioxide it is impossible to separate them back to their original form.
13b	The test tube smoke up then the smoke floated to the bottom of the test tube.	Chemical change	This is a chemical change because once the smoke had been caught in the test tube from the magnesium dioxide it was unable to be put it back because it just floats into the atmosphere.
14	When the silver nitrate was placed in the sodium chloride it fizzed then turned white, with a bit of white solid on the top.	Chemical change	The evidence that it is a chemical change is that both the silver nitrate and the sodium combined together, so it is impossible for them to be put back to their original substance.
15	When magnesium was placed into the copper sulphate it fizzed and floated to the top. It also went from a nice blue colour to a bit green.	Chemical change	The experiment was a chemical reaction because there was a colour change which is what happens in a chemical reaction. The two products also fizzed and combined together making it impossible to put them back to their original substances.
16	When the copper sulphate into was placed the sodium	Chemical change	A colour change was formed and it change to a lumpy

Annotations

Classifies changes as physical or chemical change based on the presence of common indicators of chemical change.

Investigation report: Classifying chemical and physical changes

	hydroxide it fizzed a little bit then it turned from blue to an aqua colour. IT was also a bit lumpy at the bottom of the test tube.		state. It is impossible to change the copper sulphate and the sodium oxide which mixed together back to their original state.
17	When A***, a classmate, was blowing into the straw, the carbon dioxide started turning foggy from a clear colour	Physical change	IT is a physical change because most likely if the test tube was left for a few hours the fogginess in the carbon dioxide would fade away. There was also no noise or any great colour change.

Conclusion

I was able to complete the aim by scientifically sorting and classifying each change as a chemical reaction or a physical change.

Annotations

Annotations (Overview)

The student uses appropriate language and representations to communicate science findings and ideas.

Investigation: Trebuchet design and function

Year 8 Science achievement standard

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

> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.*
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Summary of task

As part of a unit focused on energy transfers and transformations in simple machines, students investigated catapult design and function. In this task, students were required to build and investigate the function of a simple trebuchet.

After building and testing their trebuchet, students were required to investigate the effect of varying one variable on the function of the trebuchet. Students conducted their investigation in small groups and completed their report independently. They received some teacher feedback on their draft report, then wrote the final report under exam conditions, with access to their draft report and planning notes.

Investigation: Trebuchet design and function

THE TREBUCHET - WAR MACHINES

Aim:

The aim of this investigation is to test the effect of the fulcrum position on a trebuchet, and seeing how far the object (Load) travels.

Variables:

Independent Variable - The variable which will be changed is the position of the fulcrum.

Dependent Variable - The variable which will be measured is how far the object (load) travels.

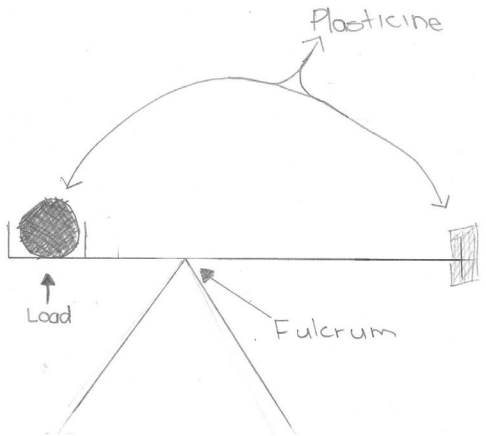
Controlled Variable - The variables which will be controlled are the same object each time, the same person releasing, the same ~~person~~ place/surface released on.

Hypothesis:

It is expected that the closer the fulcrum is to the load, the harder it is to launch the object closer to the fulcrum is to the effort, would be easier.

Materials:

- Ruler
- Trebuchet (Effort)
- Plasticine (Effort)
- Rubber



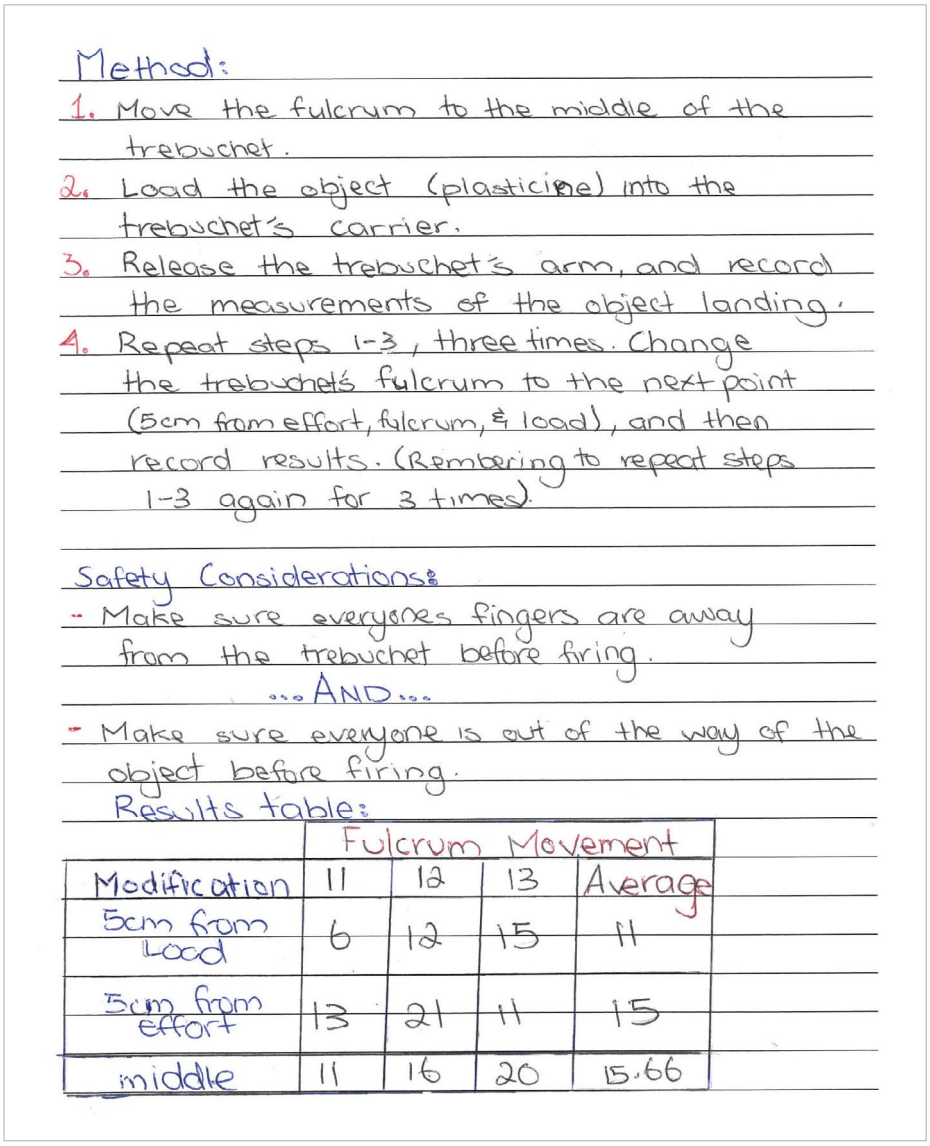
Annotations

Identifies a question that can be investigated scientifically.

Identifies variables to be changed and measured.

Identifies a range of variables to be controlled.

Investigation: Trebuchet design and function



Method:

1. Move the fulcrum to the middle of the trebuchet.
2. Load the object (plasticine) into the trebuchet's carrier.
3. Release the trebuchet's arm, and record the measurements of the object landing.
4. Repeat steps 1-3, three times. Change the trebuchet's fulcrum to the next point (5cm from effort, fulcrum, & load), and then record results. (Rembering to repeat steps 1-3 again for 3 times).

Safety Considerations:

- Make sure everyones fingers are away from the trebuchet before firing.

...AND...

- Make sure everyone is out of the way of the object before firing.

Results table:

	Fulcrum Movement			
Modification	11	12	13	Average
5cm from Load	6	12	15	11
5cm from effort	13	21	11	15
middle	11	16	20	15.66

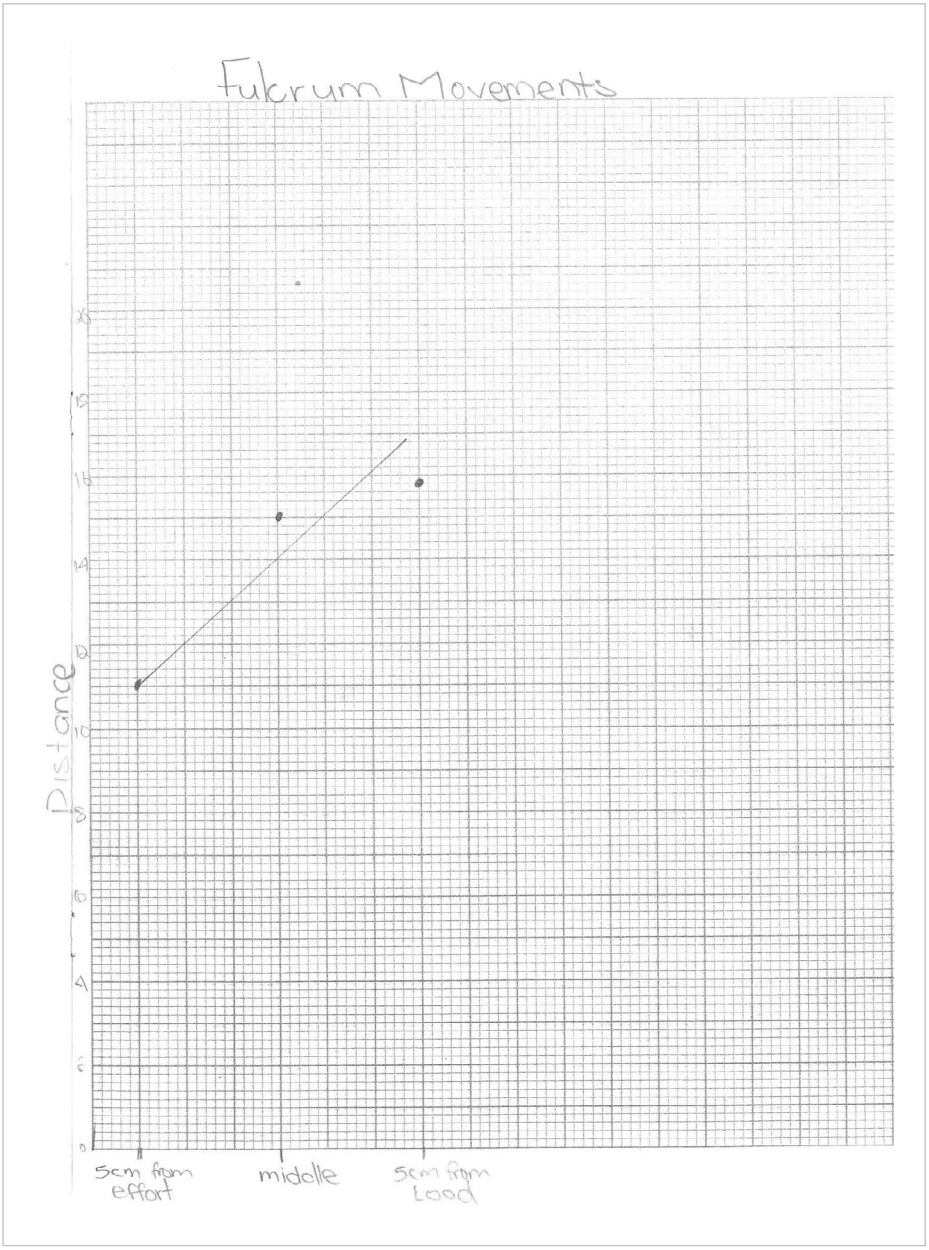
Annotations

Plans an investigation, including repeat trials.

Identifies safety considerations.

Constructs a table to present data.

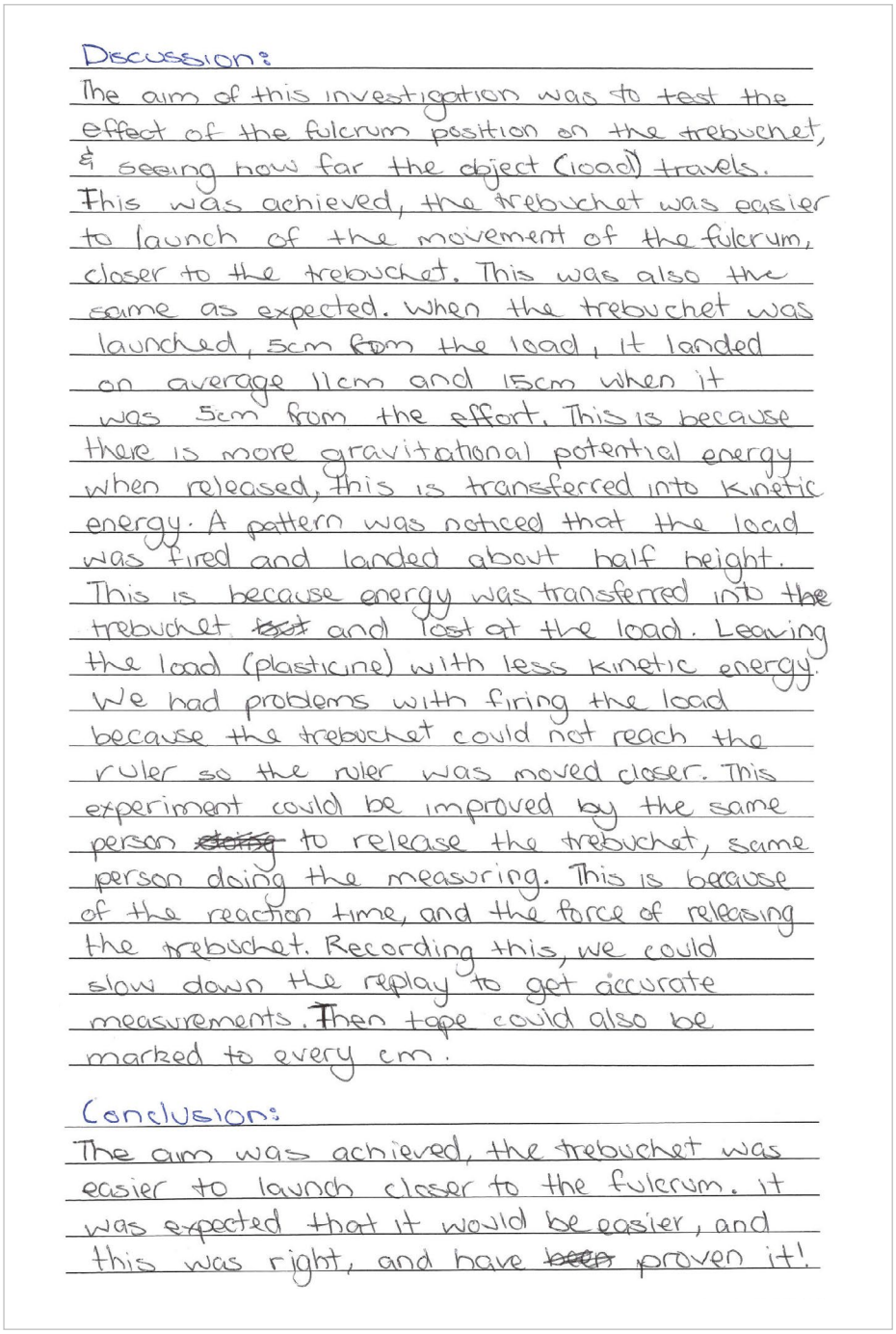
Investigation: Trebuchet design and function



Annotations

Represents summary data points and attempts to represent the trend graphically.

Investigation: Trebuchet design and function



Discussion:

The aim of this investigation was to test the effect of the fulcrum position on the trebuchet, & seeing how far the object (load) travels. This was achieved, the trebuchet was easier to launch of the movement of the fulcrum, closer to the trebuchet. This was also the same as expected. When the trebuchet was launched, 5cm from the load, it landed on average 11cm and 15cm when it was 5cm from the effort. This is because there is more gravitational potential energy when released, this is transferred into kinetic energy. A pattern was noticed that the load was fired and landed about half height. This is because energy was transferred into the trebuchet ~~test~~ and lost at the load. Leaving the load (plasticine) with less kinetic energy. We had problems with firing the load because the trebuchet could not reach the ruler so the ruler was moved closer. This experiment could be improved by the same person ~~doing~~ to release the trebuchet, same person doing the measuring. This is because of the reaction time, and the force of releasing the trebuchet. Recording this, we could slow down the replay to get accurate measurements. Then tape could also be marked to every cm.

Conclusion:

The aim was achieved, the trebuchet was easier to launch closer to the fulcrum. It was expected that it would be easier, and this was right, and have ~~been~~ proven it!

Annotations

Uses knowledge of energy transfer and transformation to explain patterns in the data.

Identifies improvements in the method that could improve the accuracy of the data.

Uses patterns in data to justify conclusions.

Annotations (Overview)

The student uses appropriate scientific language and representations to communicate ideas, methods and findings.

Poster: Occupations in mining

Year 9 Science achievement standard

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

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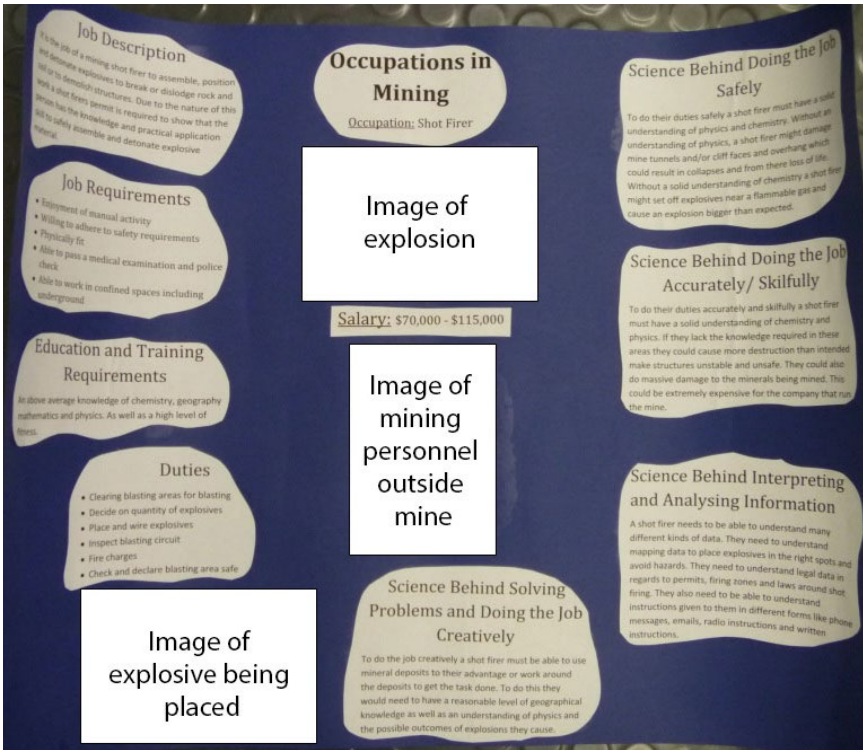
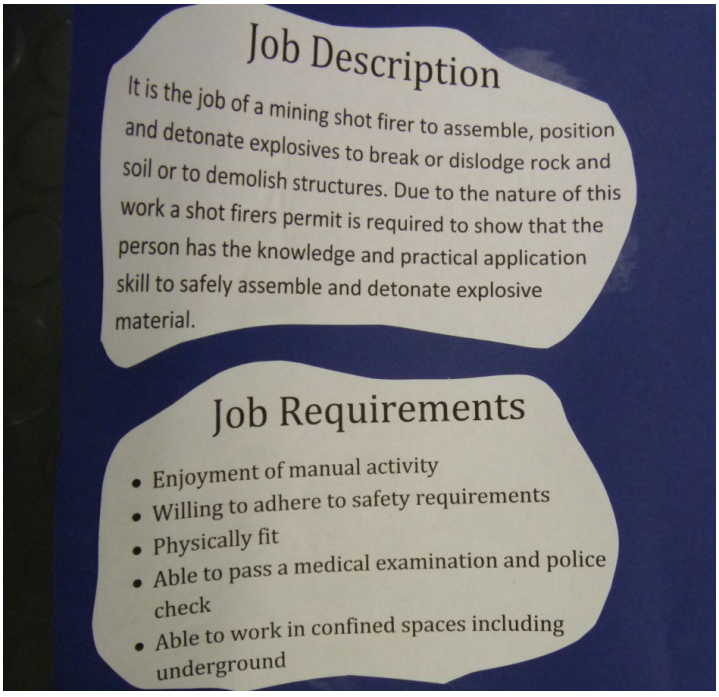
Summary of task

Students watched a short film about the range of careers available in the mining industry and were provided with a website to further explore each role.

They were asked to select a role to research further and to develop an informative poster for their peers. They were required to provide a broad description of the role and to describe the science understanding and skills required to do the job safely, accurately and skillfully. They were also asked to identify the science required to interpret and analyse information and to be creative and solve problems within the job. Students completed their research during a 50-minute lesson, and constructed their poster as a homework task.

Poster: Occupations in mining

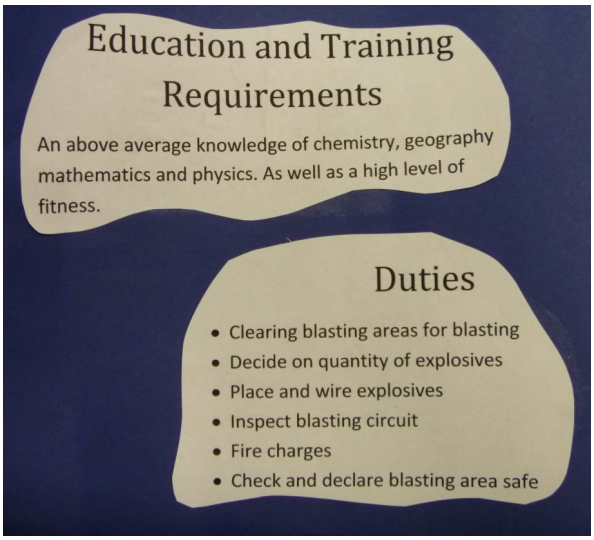


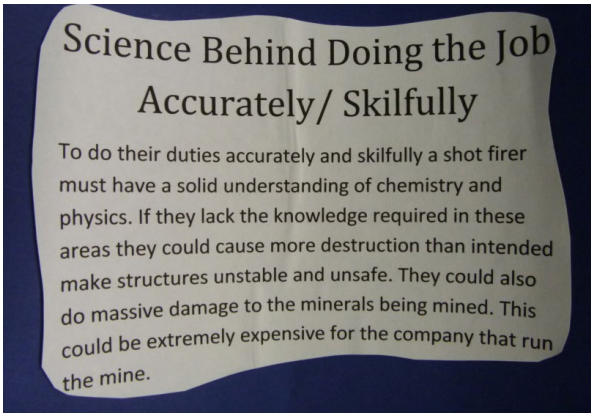


Annotations

Recognises that a shot firer needs sufficient knowledge and skill to do their job safely.

Poster: Occupations in mining



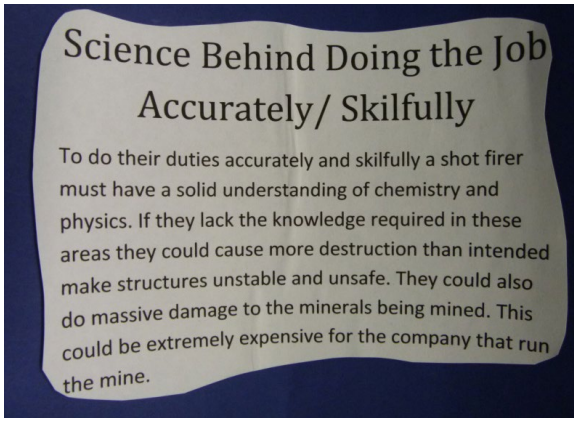


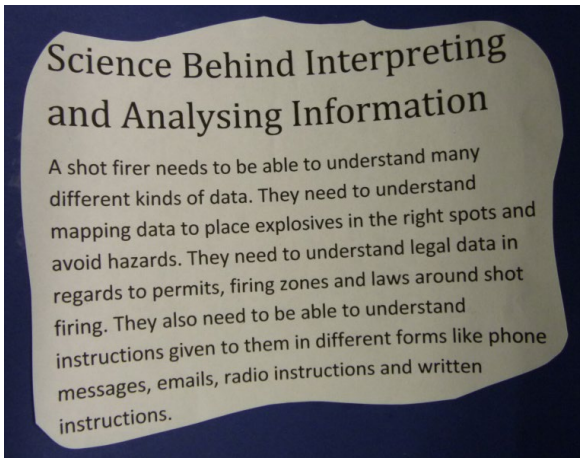
Annotations

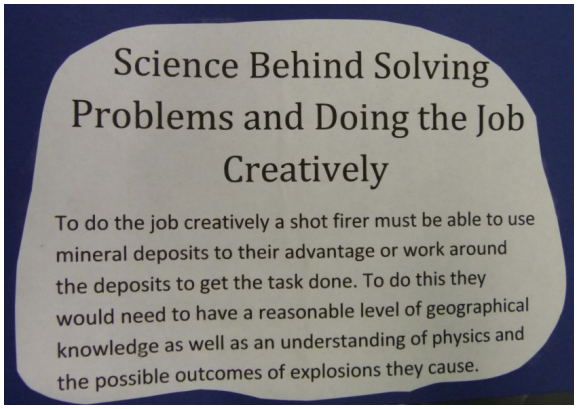
Identifies that science understanding is a prerequisite for the job.

Recognises that a shot firer needs a deep understanding of chemistry and physics to do their job effectively and to minimise unintended consequences.

Poster: Occupations in mining







Annotations

Recognises that a shot firer needs literacy skills and skills in data analysis.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

Letter: Water fluoridation

Year 8 Science achievement standard

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

> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare processes of rock formation, including the time scales involved. They analyse the relationship between structure and function at cell, organ and body system levels. Students examine the different science knowledge used in occupations. They explain how evidence has led to an improved understanding of a scientific idea and describe situations in which scientists collaborated to generate solutions to contemporary problems.*
>
> *Students identify and construct questions and problems that they can investigate scientifically. They consider safety and ethics when planning investigations, including designing field or experimental methods. They identify variables to be changed, measured and controlled. Students construct representations of their data to reveal and analyse patterns and trends, and use these when justifying their conclusions. They explain how modifications to methods could improve the quality of their data and apply their own scientific knowledge and investigation findings to evaluate claims made by others. They use appropriate language and representations to communicate science ideas, methods and findings in a range of text types.*

Summary of task

Students watched a *Catalyst* episode as a stimulus for a discussion about water fluoridation in Australia. As a whole class, they discussed why adding fluoride to water is controversial and identified the research evidence that might help them understand the positive effects and/or risks of water fluoridation.

They were then provided with a range of websites to conduct further research, and were required to write a letter to the Federal Minister for Health and Medical Research with their recommendation regarding mandatory water fluoridation. They were required to include a clear explanation of the scientific evidence that underpins their position.

Letter: Water fluoridation

Local Councils Shouldn't Maintain the Right for Optional Water Fluoridation

Dear Federal Health Minister,

I support water fluoridation although I also believe every local council has the right to choose whether their water is fluoridated or not. It's up to the local councils because everyone in this country has the right to choose what health benefits they get and what they consume.

The fluoridation of water helps a tooth's protective layer transform from hydroxyapatite to fluroapatite which is a significantly stronger and is like upgrading from iron to steel. This change is ideal when the consumer is a young child.

When fluoridated water was first introduced the federal government made a mistake of letting the state governments decide whether to fluoridate their water or not. The State governments made the same mistake with the local councils. The lack of enforcement made by the federal and state governments created doubt amongst the public. Theories started to come to light about why the government suddenly came out with the idea of water fluoridation.

These insignificant rumours, over time became state wide beliefs among the Queensland public. The Queensland public now show an outstanding rejection for water fluoridation. Because of fluoride's use for pest control people have become genuinely afraid of fluoridated water and believe the effects it has on pests will be the same on humans. But fluoride is delivered in water at a safe level and all the chemical compounds are completely safe and dissolve 100% in water.

Townsville is the only town in QLD with fluoridated water; tests have shown people in Townsville have 45% stronger, healthier teeth than people in Brisbane and by extension the rest of QLD. Despite the obvious and overpowering reasons to change to fluoridated water the idea of having chemicals in the water supply still scares some people.

Every year 2000 children under the age of 5 in QLD are taken to hospital for serious tooth decay. This leaves the doctors and nurses overwhelmed and medical resources that can be easily saved for unpreventable medical needs.

No negative effects have been found in water fluoridation and they are an extra benefit to toothpaste. This means less trips to the dentist and saving you thousands of dollars throughout your life whether you have private healthcare or not. Although it still is your responsibility to take care of the nation's health.

Annotations

Provides scientific knowledge to support the claim that fluoridation improves dental health.

Identifies scientific evidence that has led to a better understanding of the benefits of water fluoridation.

Refers to scientific evidence to refute claims that fluoridation of water is unsafe.

Annotations (Overview)

The student uses appropriate language to explain science ideas to a non-scientific audience.