Science

Year 8
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 8 SCIENCE

This portfolio provides the following student work samples:

Sample 1	Written test: Particle model
Sample 2	Investigation report: Bouncing ball
Sample 3	Analysis task: Rock samples
Sample 4	Board game: Digestive system
Sample 5	Written test: Cells
Sample 6	Investigation report: Coffee cup evaluation
Sample 7	Research report: Science careers
Sample 8	Investigation report: Classifying chemical and physical changes
Sample 9	Investigation: Trebuchet design and function
Sample 10	Poster: Occupations in mining
Sample 11	Letter: Water fluoridation

In this portfolio, the student compares physical and chemical changes (WS8) and uses the particle model to explain the behaviour of substances (WS1, WS8). The student identifies different forms of energy and describes how energy transformations cause change in a system (WS2, WS9).

Science

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Above satisfactory

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, WS10), 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 (WS11).

The student demonstrates an ability to identify and construct a question or problem for scientific investigation (WS6, WS9) and to plan an experimental investigation (WS2, WS6), including identification of appropriate safety precautions (WS8, WS9). The student identifies variables to be changed, measured and controlled (WS2, WS6, WS9). The student constructs representations of data to reveal and analyse patterns and trends (WS2, WS3, WS6, WS9) and uses data when justifying their conclusions (WS2, WS6, WS9). The student uses scientific knowledge to evaluate claims made by others (WS11) and explains how modifications to investigation methods could improve the quality of data (WS2, WS6, WS9). 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).

Written test: Particle model

Year 8 Science achievement standard

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

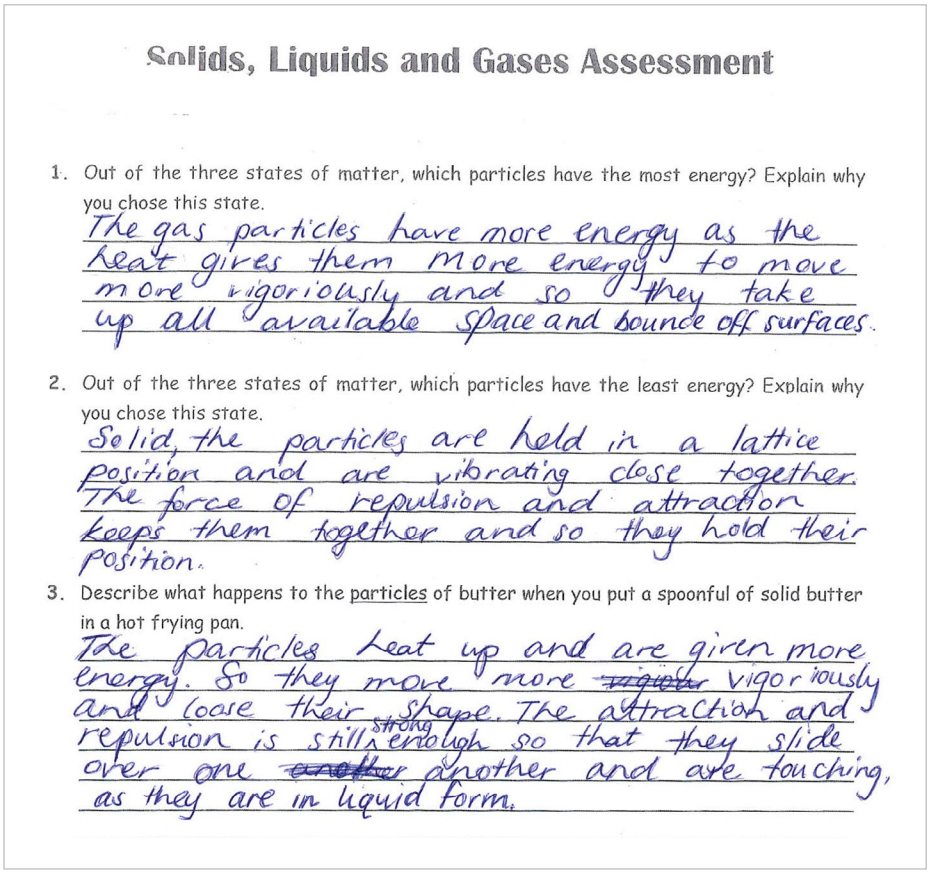
> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare 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.*
>
> *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 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.

The gas particles have more energy as the heat gives them more energy to move more vigoriously and so they take up all available space and bounce off surfaces.

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

Solid, the particles are held in a lattice position and are vibrating close together. The force of repulsion and attraction keeps them together and so they hold their position.

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

The particles heat up and are given more energy. So they move more ~~rigidly~~ vigoriously and loose their shape. The attraction and repulsion is still strong enough so that they slide over one ~~another~~ another and are touching, as they are in liquid form.

Annotations

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

Although ~~the~~ the air is warm, the ~~air~~ water particles around the cold soft drink condense as ~~they cool~~ do the particles cool down, they lose energy and so they form a liquid on the outside of the can.

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.

The gas will become compressed. Because the particles will be forced next to each other they will eventually build up pressure in the ~~syringe~~ syringe and turn into a liquid.

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 and eventually form a liquid.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

Investigation report: Bouncing ball

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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> *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 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: *The effect the drop height of a tennis ball has on its bounce height*

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.**

I have used my research in my planning and my observations.

Planning

What is the topic of my investigation? **Give it a suitable title.**

In this investigation we shall be observing how changing the height that we drop a tennis ball from affects the largest height the ball will reach after making contact with the ground and bouncing.

Title: The effect the drop height of a tennis ball has on its bounce height

What do I predict will happen (Hypothesis)?

I predict that when I increase the independent variable (the drop height), that the dependent variable (the bounce height) shall also increase, although the ball will not bounce as high as it is dropped. I predict that the bounce will constantly only reach about 80% of the drop height.

Why I think it will happen (give some scientific reasoning –Hint energy and its transformation might help).

At the top of its fall, the ball has a certain amount of GPE (Gravitational Potential Energy), which as it galls it gains more KE (Kinetic Energy) and loses GPE. It continues to lose GPE and KE, until the ball touches the ground, where the friction between the ball and the ground causes the ball to convert some of its KE into TE (Thermal Energy) and SE (Sound Energy) and the EPE (Elastic Potential Energy) becomes KE, although it does not replace the amount that is lost as TE and SE. This

Annotations

Identifies the energy forms and energy transfers and transformations that occur in the system.

Investigation report: Bouncing ball

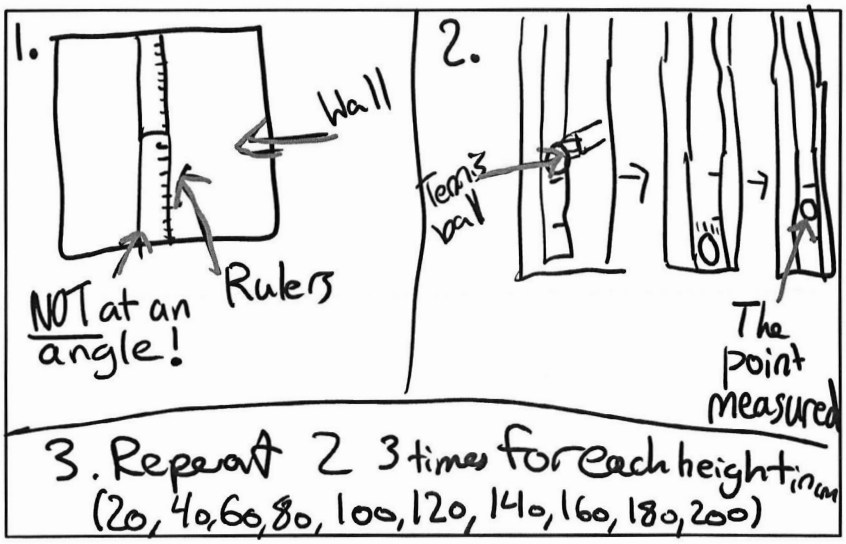
means that as the ball uses its KE to go higher, it becomes GPE, it has less KE meaning that it doesn't go as high, and is why I predict that the bounce height will not be as large as the drop height. When the ball is dropped from a larger height, it has more GPE, meaning that it will have more KE after the bounce allowing it to bounce higher. This is why increasing the drop height will increase the bounce height of the tennis ball.

Conducting

What am I going to do? (Method)

1. Place 2 meter rulers on top of each other, on a wall so that the height is not affected by lean.
2. Drop the ball from 20 centimeters (20 centimeters, then the bottom of the ball), and measure the highest point at which the bottom of the ball reaches (which is the bounce height).
3. Continue to repeat step 2, going up by 20 centimeters each time, completely each trial thrice (20 centimeters thrice, etc.).

Note: The point we are measuring is the lowest point of the ball.



Which variables are you going to?

Annotations

Investigation report: Bouncing ball

- Change (Independent)
  - Height at which the ball is dropped from
- Measure (Dependent)
  - The height the ball bounces too
- Keep the same (Controlled). Think of as many of these as you can.
  - Type of ball (tennis ball)
  - Altitude that the experiment is conducted at, as this effects the gravity and therefore the GPE
  - The condition of the ball is important, as a constantly used ball will have a slightly different bounce
  - The point of the ball that is measured (the bottom)
  - The temperature at which the experiment is conducted, as this affects elasticity

What will I need (equipment)

- 2 meter rulers
- Tennis ball

How can I make it a fair test?

As in all experiments, it is crucial that the controlled variables are followed like law so that the experiment's results are as reliable as possible. It is especially important the variables such as the type of ball are kept the same, as they will dramatically affect the route the results of the experiment will take. For example, if we change the point of the tennis ball we measure partway through the experiment, which will severely affect the results. Making sure the tennis ball we use is not used for anything thing else is also vital, as wear and tear can effect a ball's bounce.

Processing

Results (table) – you will also need another groups result to compare.

Our results					
Height (cm)	Bounce height: test 1 (cm)	Bounce height: test 2 (cm)	Bounce height: test 3 (cm)	Average Bounce height (cm, 2dp)	Bounce height difference from previous (cm, 2dp)

Annotations

Identifies variables to be changed and measured and provides a detailed analysis of variables to be controlled.

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

Designs appropriate tables to present data for analysis, including summary data.

Investigation report: Bouncing ball

20	13	8	10	10.33	N/A
40	23	24	19	22	+11.77
60	36	35	38	33.33	+11.33
80	46	46.5	45	45.83	+12.5
100	57.5	56	58	57.16	+11.33
120	67	68	68.5	67.83	+10.67
140	79	78	81	79.33	+11.5
160	92	89	93	91.33	+12
180	97.5	100	97	98.16	+6.83
200	108	110	106	108	+9.84

Other groups results

Height (cm)	Bounce height: test 1 (cm)	Bounce height difference from previous (cm)
20	14	N/A
40	22	+8
60	30	+8
80	49	+19
100	60	+11
120	67	+7
140	76	+9
160	81	+5
180	96	+15
200	102	+6

Other groups results

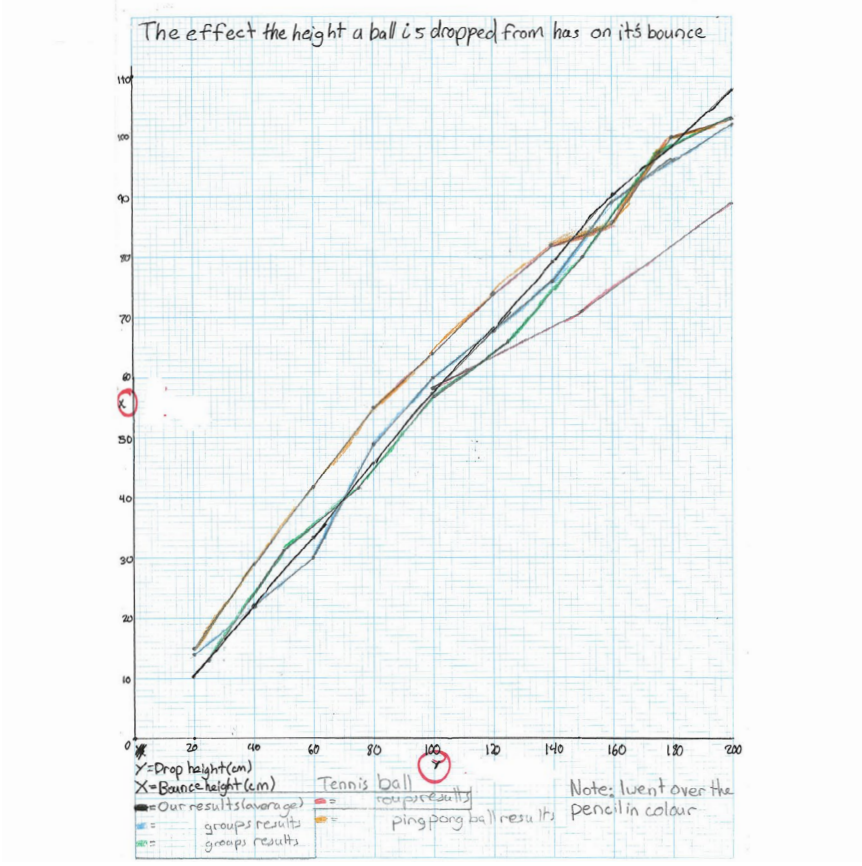
Height (cm)	Bounce height: test 1 (cm)	Bounce height: test 2 (cm)	Bounce height: test 3 (cm)	Average bounce height (cm, 2dp)	Bounce height difference from previous (cm)
25	13	15	17	15	N/A
50	30	32	32	31.33	+16.33
75	37	43	45	41.66	+10.33
100	54	55	61	56.66	+15
125	60	69	69	66	+9.34
150	77	82	81	80	+14

Annotations

Investigation report: Bouncing ball

175	95	98	99	97.33	+17.33
200	104	105	104	104.33	+7
Other groups results					
Height (cm)	Bounce height: test 1 (cm)	Bounce height: test 2 (cm)	Bounce height: test 3 (cm)	Average bounce height (cm, 2dp)	Bounce height difference from previous (cm)
100	59	62	52	58	N/A
150	72	68	74	71	+13
200	91	94	82	89	+18

Draw a graph of your results and the other group's results onto a single graph on graph paper.



Annotations

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

Investigation report: Bouncing ball

What do your results suggest you? Can you see any trends from the graph?

According to my results, and the results of the other groups, a trend can be seen in the data that when the drop height is increased, so does the bounce height. Also, the bounce height is not as high as the drop height. So, when the independent variable (the drop height) is increased, so does the dependent variable (the bounce height). Another trend I noticed that the bounce height was usually about half of the drop height, which means that most of time approximately half of the KE (Kinetic Energy) is turned into TE (Thermal Energy) and SE (Sound Energy) when the ball bounces, and the EPE (Elastic Potential Energy) giving it some KE (although not enough to dramatically change the bounce height). In relative terms, the percentage of the drop height the bounce height reaches is approximately the same even when the height is changed. So, a tennis ball will always bounce to about half the height that it is dropped from.

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.

Whenever I increased the balls height from the ground, I increased its GPE (Gravitational Potential Energy), as one of the factors determining GPE is the height of the mass. As the ball falls, the GPE gradually transforms into KE (Kinetic Energy), increasing at a steady rate during the fall. When the ball makes contact with the

Annotations

Analyses patterns in data to justify observed trends and identifies a consistent relationship in results.

Explains observations through a thorough analysis of the energy transfers and transformations that occurred and references collected data.

Investigation report: Bouncing ball

ground, about half of the KE is lost as the KE transforms into TE (Thermal Energy) and SE (Sound Energy), although some is gained as EPE (Elastic Potential Energy), before the KE bounces the ball back up, slowly converting the KE into GPE before it only has GPE and begins to fall again. The reason increasing the height makes it bounce higher is back it has more GPE to convert into KE, although a relatively consistent percentage is lost as TE and SE. The ball always bounces to approximately half of the drop height because when the height is increased, the amount of TE and SE released increases with the height by the same relative amount so the percentage of the drop height that the bounce height is remains the same.

Was the outcome different from your prediction? Explain.

The outcome was the same as my prediction; that increasing the drop height would increase the bounce height. The one thing I did not expect was as much KE (Kinetic Energy) to be lost as TE (Thermal Energy) and SE (Sound Energy); I thought maybe only about 10 or 20%, whereas in fact most of the time between 45% was lost. However, as I predicted, the percentage of the drop height that the ball bounced to was always relatively constant.

Evaluating

What difficulties did you experience in doing this investigation?

The investigation ran very smoothly, with one or two difficulties occurring along the way. Because the ball was dropped from a human hand, occasionally the ball was released at an angle meaning that it went away from the ruler. This increased the time we had to spend performing the experiment, and also meant that the condition of the ball was affected by the increased use, possibly affecting the data. However, it does not appear that the affect has been that great, as there are no anomalies in the data except with one piece of data, were it increased by slightly more than the trend, although as it was in the middle of the data it is unlikely that it has to do with wear and tear. Also, having it dropped from a human hand also meant that occasionally the drop height would change; affecting the data. This is probably what caused the anomaly. Next time, using a stable clamp which does not vary in position much may have been a more effective method. The other issue we had is that the person holding the ruler's fingers occasionally interfered with the view of the measurements on the ruler, and also occasionally interfered with the drop when the ball hit the person's fingers. It may have been more effective to use tape to hold the

Annotations

Identifies how modifications to the method could improve the quality of the data, including the use of more accurate measurement technology.

Investigation report: Bouncing ball

rulers on the wall so the drop is not interfered with. Another issue we could have had was what the exact bounce height of the ball was, as we may have misjudged it with the naked eye. To counter this, the member of our group who had the role of recording the data (Student's name) filmed it, and then went over the video to pinpoint the exact bounce height. This increased the reliability of our data.

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?

Our group's results are fairly similar to the data of the other groups. However, the bounce height varied between groups. This is likely because we were all using different balls, meaning that the experiments would all have slightly different results as the balls are not likely to be exactly the same. Taking group for example, all of their data was slightly smaller and at a slightly different rate. This, however, is because they only did one test per height, not multiple, as well as less heights tested, meant that the wear and tear on the ball was different and less significant, effecting the difference between the groups of results. However, overall most of the data was very similar making using it as the base of a statement more conclusive as multiple individual experiments on the same thing produced very similar data.

How can I improve this investigation, for example fairness and accuracy?

To make sure that the ball drops from the same height (whenever we are testing a certain height) and at the same angle each time I would put the ball in a clamp, and then loosen it so for each test the ball is released in the exact same conditions as the previous, so the test is fairer and the results are a more accurate retelling of the experiment. Also, in the laboratory that we conducted this experiment in the floor was made of linoleum. Linoleum is not a very bouncy material; therefore we could have conducted the experiment on several surfaces to see if the surface affects the experiment. For example, carpet would have different results and is less bouncy because it absorbs more heat energy. However, science backs up the idea that the bounce height should always increase when the drop height is increased, as there is more energy in the experiment. One final change we could make in the experiment is how the rulers are attached to the wall. A person physically holding the ruler often meant that their hand occasionally interfered with the ball dropping, if the ball hit the person's hand, which could mean that the ball is more worn down which could have adverse effects on the experiments results. Also, having a person hold the ruler means that their finger could get in the way of the observation. By having the ruler

Annotations

Investigation report: Bouncing ball

taped to the wall, and the measurements covered written on the tape, there would be less interference in the experiment making the data more precise and be achieved faster.

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?

Data for another ball (Ping Pong ball):

Ping Pong Ball data	
Drop Height (cm)	Bounce Height (cm)
20	15
40	29
60	42
80	55
100	64
120	74
140	82
160	86
180	100
200	103

When comparing the data from bouncing the ping pong ball to the bounce of a tennis ball from the same height (on the same surface), a ping pong ball seems to bounce higher. A tennis ball occupies more space, and has more mass, meaning that it has more GPE (Gravitational Potential Energy). Therefore, the difference in the bounce height is going to be effected instead by the actual bounce. Neither of the balls produced much more SE (Sound Energy) or TE (Thermal Energy) than the other, so

Annotations

Investigation report: Bouncing ball

the important factor must be the EPE (Elastic Potential Energy). This is what differs in the design of the balls. The surface of the ping pong ball is much more elastic than the tennis ball, and so the ball has more EPE. We know this because the percentage of the drop height an object bounces is to is it's elasticity; if it bounces to 15% of the drop height, it's elasticity is .15, and because the ping pong ball bounces at higher constant percentage (so it bounces higher) this is proof it is more elastic. The ping pong ball has an elasticity of approximately .65, whereas a tennis ball has an elasticity of approximately .55. When the ball bounces, it is like a spring in a trampoline. The gravitational force pulls the ball down towards the ground; putting pressure on the ball, when it bounces the pressure is released and the EPE is converted into KE (Kinetic Energy). Because the ping pong ball has a much higher elasticity, it has much more EPE meaning that it has more EPE to become KE, allowing it to bounce higher. This begins the loop telling us that the ping pong ball must have more elasticity, which in turn tells us that the ball has more EPE allowing it to have more KE, allowing the ball to bounce higher and the loop to continue. Obviously, because the drop heights were the same, this also means that different balls have a different energy exchange in the bounce: tennis balls lose about half of their KE to SE and TE, with little energy gained through EPE, whereas in a ping pong ball although the amount of SE and TE lost is approximately the same, the EPE converted to KE is much larger, meaning that only about 35% of the KE is lost. This means that when dropped from the same height onto the same surface a ping pong ball will bounce higher than a tennis ball.

Annotations

Uses scientific knowledge to explain variation in results for different balls.

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.

> *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 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:

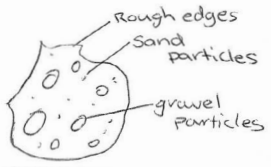
Draw a labelled diagram below to show the features of each rock specimen (1-5) provided in class.

Describe the structure of the rock.

Explain how it was formed. What evidence suggests this?

Identify (name) each of the rock specimens.

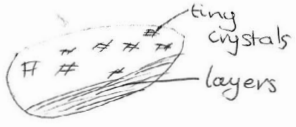
Specimen 1



The structure of this rock is made up of particles of sand and gravel. This rock would of been formed in water, by the rocky edge on the rock you can tell it was a fast flowing water source. The evidene that this rock was formed in water is the rough edges and the particle in the structure.

I believe this rock to be sedimentary. I think it might be a colgolemate rock because of the large gravel particles.

Specimen 2



the structure of this rock is made up of particles of clay. This rock would be formed on tectonic plate collision. It would be under in tense heat and presure causing the rock to go from shale to slate. The evidence that the rock was ~~formed~~ by heat is the layers.

I believe the rock to be a Metamorphic rock. I think it might be a slate rock because of the layers.

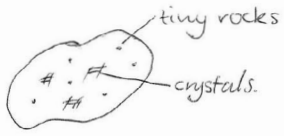
Annotations

Constructs detailed 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

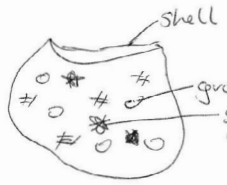
Specimen 3



The structure of this rock is made of peices of rock and crystals. This rock would be formed formed outside a volcano because of the small crystals. The colours of the rock are a dark red and black with shining crystals

I believe the rock to be igneous rock. I think it might be granite because of the colours and crystals.

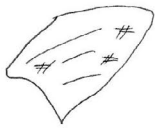
Specimen 4



The structure of this rock is made of peices of shell sand rock and gravel. This rock was formed in water. It would of been a very fast flowing water source because of the rough edges. The evidence that the rock was formed in water is because of the fossils.

I believe this rock is a sedimentary rock. I believe this because of the fossil, and the other particles.

Specimen 5

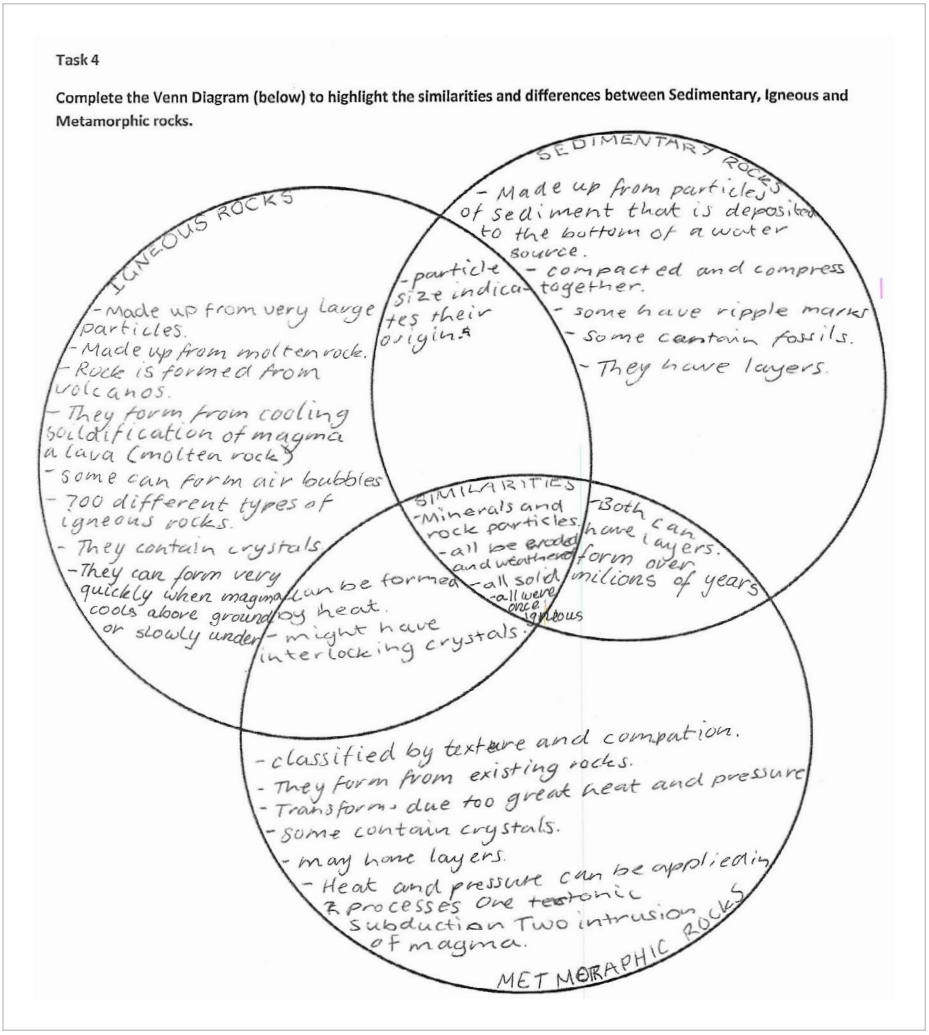


The structure of this rock is made of crystals and small gravel. This rock would of be formed by intense heat and pressure because of the uneven layers and the two different colours.

I believe this rock is metamopphic rock. Im not sure what the rock is though.

Annotations

Analysis task: Rock samples



Task 4

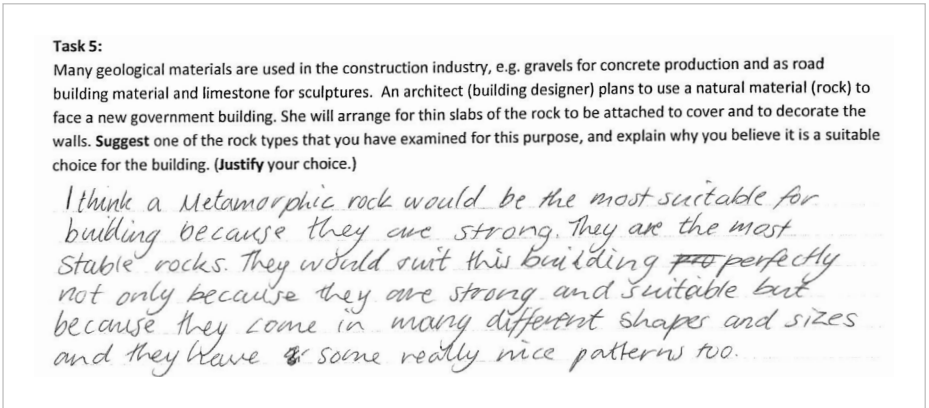
Complete the Venn Diagram (below) to highlight the similarities and differences between Sedimentary, Igneous and Metamorphic rocks.

Annotations

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

Identifies that extrusive igneous rocks can form quickly, and that sedimentary and metamorphic rocks form very slowly.

Analysis task: Rock samples



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.)

I think a Metamorphic rock would be the most suitable for building because they are strong. They are the most stable rocks. They would suit this building ~~pro~~perfectly not only because they are strong and suitable but because they come in many different shapes and sizes and they have some really nice patterns too.

Annotations

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

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 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.

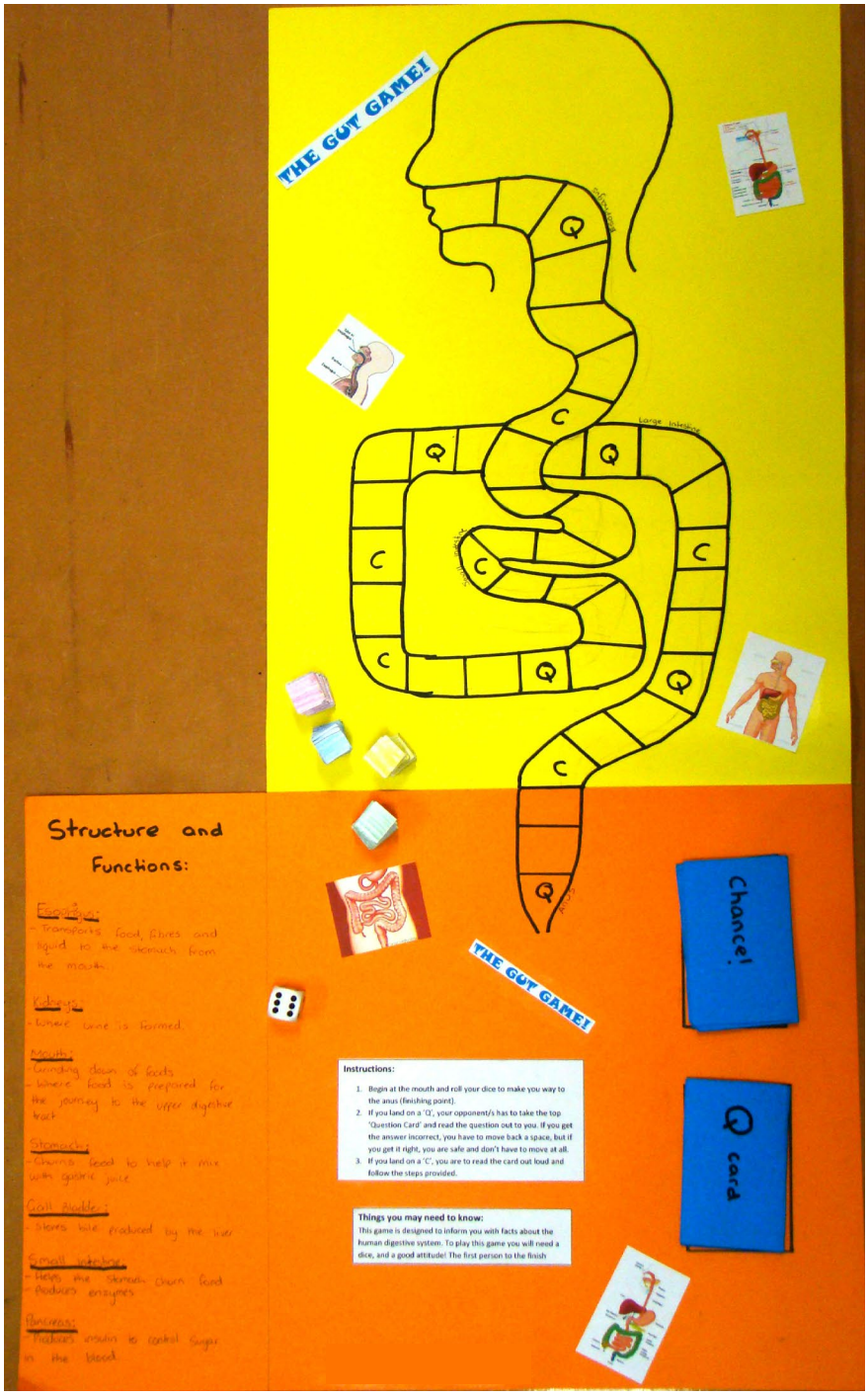
Students were provided with five 40-minute lessons to complete the task.

Science

Year 8

Above satisfactory

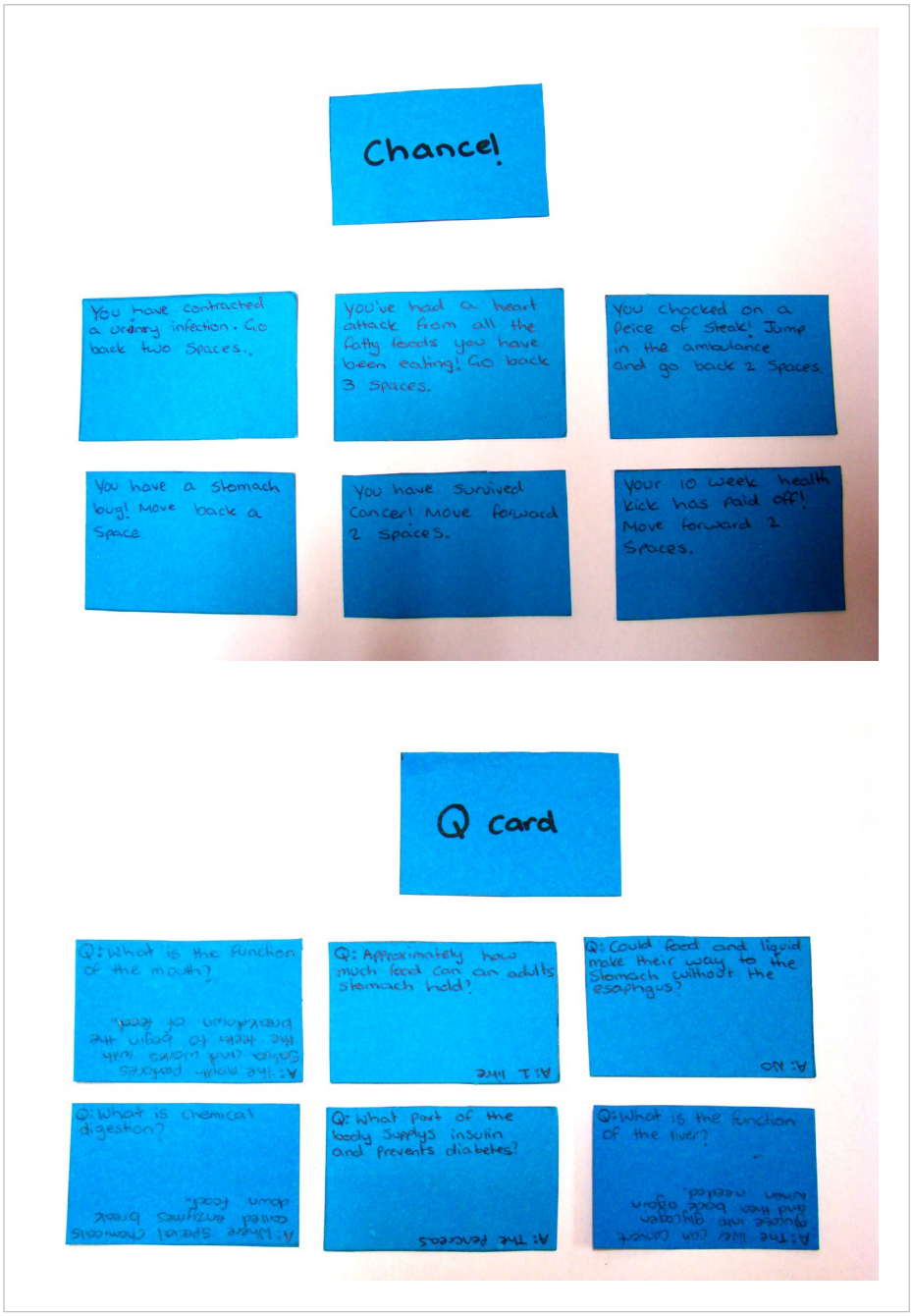
Board game: Digestive system



Annotations

Identifies the component organs of the digestive system.

Board game: Digestive system



Annotations

Identifies a range of problems or diseases that affect organs of the digestive system and that a healthy lifestyle is beneficial.

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

Science

Year 8

Above satisfactory

Board game: Digestive system

Annotations

Constructs questions that link cell and tissue structure with function for a range of 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

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 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.

Multicellular organisms benefit from having specialised cells for things such as being a large organism, made of many cells.

An advantage of specialised cells is that they can form a body, or systems, organs and tissues, which can function as one giant organism.

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

~~Nerve Cell~~

~~Nerve~~

~~Red Blood~~

Intestinal Epithelial Cell

It is suited to its job in an intestine because it have a large surface area, which is good for collecting food and nutrience

is connected to arteries for easy transefer of nutrience from food to blood cells, for carry to all parts of the body.

Labelled images of five cell types

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.

Having specialised cells means that multicellular organisms can have specialised tissues, organs and body systems that form particular functions, like absorbing nutrients, exchanging gases or reproducing. This means they are more complex organisms that have a greater chance of survival in their environments.

Annotations

Recognises that specialised cells perform specific functions in tissues, organs and systems and may represent a survival advantage for multicellular organisms.

Describes structural features of an intestinal epithelial cell that make it suited to transferring information.

Explains that some cells must reproduce more often than others due to mechanical or chemical damage in their functional environment.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

Investigation report: Coffee cup evaluation

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 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

Which coffee cup is the best?

Aim

To determine which coffee cup is the best choice for a coffee shop to use based on its cost, insulation ability and whether it is biodegradable.

Hypothesis

The Styrofoam cup will be the best insulator and may also be the cheapest cup. It may not be biodegradable though and so might not be the best choice for the environment.

Materials

6 different coffee cups with lids
6 analogue thermometers
Electric kettle
Stopwatch
Measuring cylinder
Beaker

Method

1. Collect six different types of coffee cups and their lids.
2. Label the cups 1 to 6.
3. Collect six thermometers.
4. Put some tap water into a beaker and place all six thermometers in there. Check to see that all of the thermometers show the same temperature after about 5 minutes.
5. Use a pen to place a hole in the top of each coffee cup. Try to make the hole so that the thermometer fits into it tightly and so that there are no cracks in the plastic of the lid.
6. Fill an electric kettle with water and boil.
7. Measure 200 mL of water using a measuring cylinder and place it into the first cup.
8. Repeat for the other five cups and put their lids on with the thermometers through the holes making sure that the thermometers are submerged in the water to the same depth.
9. Record the temperature of the thermometers after every minute according to the stopwatch for 20 minutes.
10. Repeat the experiment twice.

Variables

Independent variable (thing that was deliberately changed) – type of cup

Dependent variable (thing that changed as a result) – temperature

Controlled variables (things that were kept the same) – volume of water used, type of thermometer and starting temperature of the thermometers, position of the thermometers in the cups (submerged in the water but not touching the bottom or sides of the cups), the amount of time for each test (20 minutes),

Annotations

Describes factors to be investigated in order to solve a problem.

Identifies independent and dependent variables and a detailed list of controlled variables.

Investigation report: Coffee cup evaluation

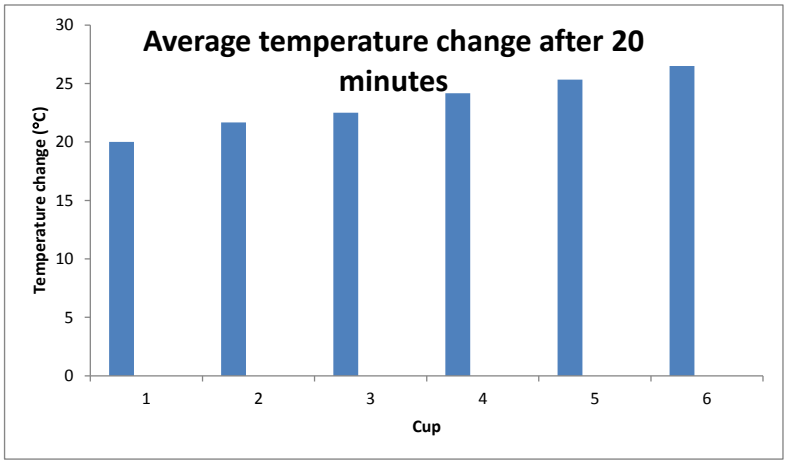
Results

Cost and material

Cup	Cup Cost ($)	Lid Cost	Total Cost	Material
1	0.15	0.04	0.19	Styrofoam cup and plastic lid
2	0.49	0.14	0.64	Biodegradable cardboard cup and plastic lid
3	0.31	0.04	0.35	Cardboard cup and plastic lid
4	0.46	0.05	0.51	Cardboard cup and plastic lid
5	0.42	0.21	0.63	Cardboard cup and plastic lid
6	0.12	0.21	0.33	Cardboard cup and plastic lid

Temperature change after 20 minutes

Cup	Test 1 (°C)	Test 2 (°C)	Test 3 (°C)	Average (°C)
1	23	18	19	20
2	23	21	21	21.67
3	23	22.5	22	22.5
4	26	23.5	23	24.167
5	27	25	24	25.33
6	27	28.5	24	26.5



Annotations

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

Graphs summary data to illustrate trends.

Investigation report: Coffee cup evaluation

The graph shows that overall, cup 1 maintained the temperature of the water for the longest and was therefore the best insulator. It also shows that cup 6 was the least effective insulator since it had the greatest temperature change over 20 minutes.

Discussion

Cup 1 was the best insulator. In order to explain this we need to understand how heat travels. The temperature loss took place in all of the cups due to something called conduction. Conduction is the transfer of heat energy from one substance to another. These substances need to be in contact with each other. In this experiment, heat was conducted from the water to the cups by conduction. This took heat energy away from the water which caused the temperature to drop. Styrofoam material doesn't conduct heat well and so is called an insulator. Cup 1 was a Styrofoam cup which allowed it to maintain the temperature of the water the best by losing the least amount of heat energy. The Styrofoam in cup 1 was also several times thicker than the materials the other cups were made of, adding to its insulating properties.

Although Styrofoam cups make the best insulators, many companies do not use them as they are not biodegradable, making them bad for the environment. There are also some concerns about chemicals from the Styrofoam leaching into the coffee.

Cup 1 maintained the temperature of hot water for the longest and so is the best insulator out of the six cups. It is also the cheapest so would be a good decision for the coffee shop based on money. The problem with this cup though is that it is the least biodegradable so a coffee shop might not want to use it. Cup 2 is totally biodegradable and was a good insulator but was quite expensive. So cup 3 might be the best choice. The cardboard cup would be biodegradable even though the lid wouldn't be, it is a medium insulator and is not too expensive.

The method for our experiment worked pretty well and gave us good results. Some of the results in test 1 were different from tests 2 and 3. This may have been because the lids weren't placed on the coffee cups fast enough which caused some heat to be lost by evaporation. As we got better at the experiment in tests 2 and 3, we got faster and were able to get the lids on faster. We should have left out the results from test 1 and dome a fourth test and used those results.

Another thing that might have affected the results is the overall volume of the cup. We only had 200 mL of water in each cup and that made some of the cups full and some not full. The cups that weren't full might have lost more heat faster. If we did the experiment again we could fill all of the cups then measure the temperature change and work out the rate of temperature change per mL.

Conclusion

Taking into account all of the variables cup 3 is the best choice for the coffee shop because it has a good balance of the three properties of cost, insulation and biodegradability.

Annotations

Explains observations using scientific knowledge.

Considers other pertinent data in order to solve the identified problem.

Describes detailed modifications to method in order to improve the quality of data, including a different selection of data as evidence.

Identifies an issue with the validity of the test and selects an appropriate modification to the method.

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

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

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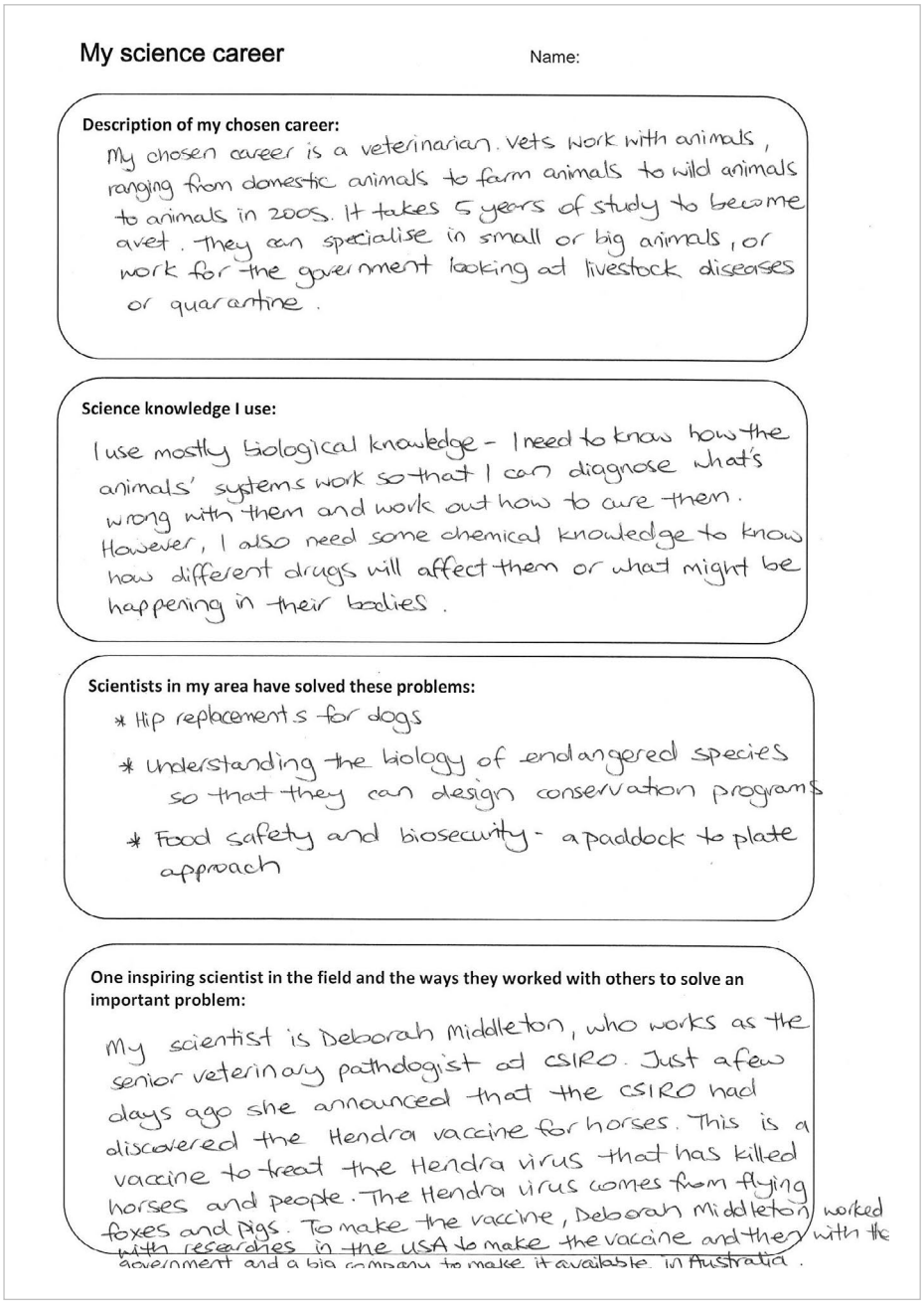
Summary of task

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:

My chosen career is a veterinarian. Vets work with animals, ranging from domestic animals to farm animals to wild animals to animals in zoos. It takes 5 years of study to become a vet. They can specialise in small or big animals, or work for the government looking at livestock diseases or quarantine.

Science knowledge I use:

I use mostly biological knowledge - I need to know how the animals' systems work so that I can diagnose what's wrong with them and work out how to cure them. However, I also need some chemical knowledge to know how different drugs will affect them or what might be happening in their bodies.

Scientists in my area have solved these problems:

* Hip replacements for dogs
* Understanding the biology of endangered species so that they can design conservation programs
* Food safety and biosecurity - a paddock to plate approach

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

My scientist is Deborah Middleton, who works as the senior veterinary pathologist at CSIRO. Just a few days ago she announced that the CSIRO had discovered the Hendra vaccine for horses. This is a vaccine to treat the Hendra virus that has killed horses and people. The Hendra virus comes from flying foxes and pigs. To make the vaccine, Deborah Middleton worked with researches in the USA to make the vaccine and they with the government and a big company to make it available in Australia.

Annotations

Identifies that science knowledge from across disciplines is required in veterinary science.

Describes how a scientist collaborated with other scientists, the government and industry to solve a contemporary problem.

Annotations (Overview)

The student uses appropriate language to communicate science ideas.

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.

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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

Investigation report: Changes in matter

The aim:

In order to write this report a series of experiments was undertaken to compare the physical and chemical changes of substances. The report shows how word equations are used to explain the products and the reactions of an experiment. It also will show how a scientist will be able to predict the products. Prior to conducting these experiments it was necessary to plan appropriately. The researcher needed to consider safety issues when planning the experiments. They also had the job of studying the data at the end of the experiments to look for patterns and trends. By using scientific knowledge the researcher will analyze the data and write the report.

Introduction

When conducting the experiments the researcher was looking for data to support the difference between a physical change and a chemical. A physical change to a substance means that no new substance is formed and the change is easily reversed. The substances still have the same particles but the actual object looks different. An example of this is when an ice cube is put into a glass of water; it then melts creating a liquid state. If needs be the ice cube could be remade by refreezing it.

A chemical reaction to a substance occur when individual substances are combined however once the particles are joined there is no way of isolating the individual parts again. An example of a chemical reaction is displayed when baking a cake. To make a cake various ingredients are combined and once the cooking has occurred there is no way to isolate or pick them back out of the cake. The flour is no longer flour as it exists in the packet.

Indicators that a chemical reaction rather than a physical change has taken place to substances are things such as a noise, a colour change, a flame or the production of gases.

Risk Assessment

When conducting experiments scientists and researchers must ensure that they are safe. This may mean that the experiment is done with a wide space around them in case something explodes. Another aspect of safety is the need to wear protective clothing such as goggles/glasses, gloves and lab coat. This ensures that chemicals do not go into eyes or touch the skin of the scientists. Sometimes the chemicals can burn and leave nasty blisters. Scientist should also use other utensils such as tongs to pick up items such as test tubes especially if a Bunsen burner has been used as the test tubes may be hot. Scientists should also protect their feet when conducting an experiment. They should wear closed in shoes in case a splash of chemical lands on their feet.

Results

Table One

This table shows the experiments that were conducted and the various observations that were made during the experiment. It also shows the type of change which occurred and the evidence used to support the decisions about the types of changes.

Annotations

Explains the difference between chemical and physical changes with reference to particles, and with the aid of examples.

Identifies common indicators of chemical change.

Suggests appropriate safety precautions when experimenting with chemicals.

Investigation report: Classifying chemical and physical changes

Experiment number	Description	Observation	Physical change or chemical reaction	Evidence
1	Heating copper carbonate	Change of colour Warm to touch	Chemical	The copper carbonate turned black, so it must have been reacting with something in the air?
2	Melting chocolate	Liquid chocolate Warm to touch	Physical	Only changed state but if it burned it would be a chemical change because you can't unburn something.
3	Warming washing soda	Bubbles a lot Changes colour	Chemical	IT changes colour, also bubbles a lot, indicating that a gas (a new substance) was formed
4	Blow 10 big breaths into a balloon	Balloon expanded	Physical	You can let the air out of the balloon and it will go back to its previous state because it's just been stretched – moving the particles in the balloon further apart
5a/b	Magnesium in acid Repeat the experiment but this time, collect the gas in a test tube placed over the reacting test tube. Without turning the top test tube right side up, place a lighted taper in the top test tube and note what happens.	Gas is produced Fizzing sound Bubbles Makes a popping sound	Chemical	A change of colour occurred, heat was produced, a gas (new substance) was formed, and it made a pop sound when put up to a flame (which was also a chemical reaction)
6	Dissolve salt in water	Salt dissolved (not visible) Water was hot	Physical	The salt is not visible doesn't mean it has disappeared – just that the particles are mixed in with the water particles without reacting
7	Reacting iron with copper sulphate	The iron wool turned red after sitting for a few minutes in the copper sulphate solution	Chemical	There was a change of colour and it looked like a new substance had formed on the iron wool.
8	Baking soda (sodium bicarbonate) and hydrochloric acid	Bubbles Gas	Chemical	The bubbles indicated that a new substance (a gas) had been produced
9	Crush an aspirin tablet	Smaller pieces of aspirin Turns into a white powder	Physical	Powdery substance can be made back into a tablet – crushing just moves the particles further apart, it doesn't change them.
10	Burning magnesium in air	Powerful light	Chemical	The metal was burnt causing a bright light and was then a white powder which was a new substance.
11	To a test tube containing 10 drops of lead nitrate, add 5 drops of sodium iodide	It turned yellow Solid in a liquid	Chemical	A colour change occurred, and a new substance (the solid) was formed.

Conclusion

The researcher had the aim of conducting various experiments safely and recording their results enabling them to write a report on how matter changes at a particle level. This report showed the various types of reactions which occur when elements and compounds are put together. Experiments were undertaken to show how things react. Results were analyzed to enable the researcher to classify the type of reaction as either chemical, which means that the products cannot be easily reversed back to the reactants, or physical meaning that the final state can be changed back to its original state.

Annotations

Constructs a table to organise data.

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

Explains physical changes with reference to particle arrangement.

Explains a substance dissolving in water as a physical change with reference to particle arrangement.

Annotations (Overview)

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

Science

Year 8

Above satisfactory

Investigation: Trebuchet design and function

Year 8 Science achievement standard

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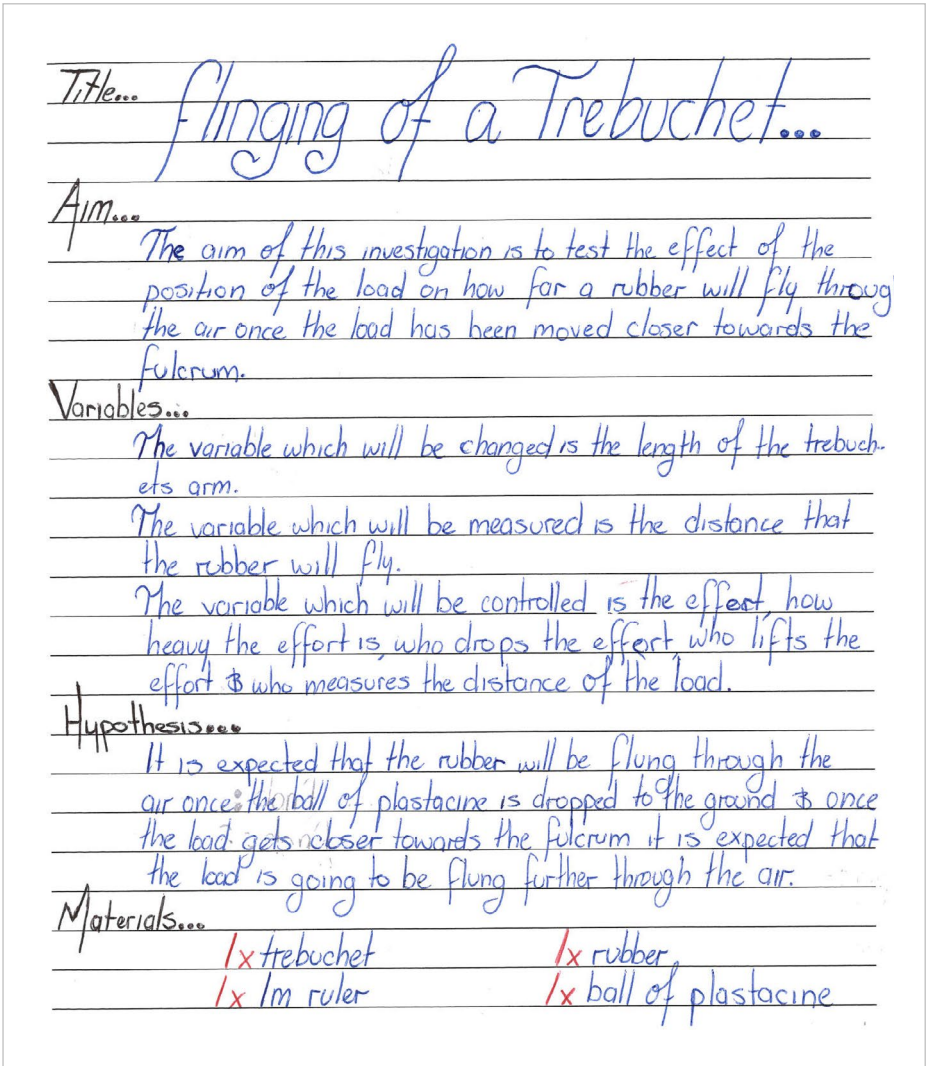
Summary of task

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



Title... flinging of a Trebuchet...

Aim...
The aim of this investigation is to test the effect of the position of the load on how far a rubber will fly throug the air once the load has been moved closer towards the fulcrum.

Variables...
The variable which will be changed is the length of the trebuch-ets arm.
The variable which will be measured is the distance that the rubber will fly.
The variable which will be controlled is the effort, how heavy the effort is, who drops the effort who lifts the effort & who measures the distance of the load.

Hypothesis...
It is expected that the rubber will be flung through the air once the ball of plastacine is dropped to the ground & once the load gets closer towards the fulcrum it is expected that the load is going to be flung further through the air.

Materials...
1x trebuchet
1x rubber
1x 1m ruler
1x ball of plastacine

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...

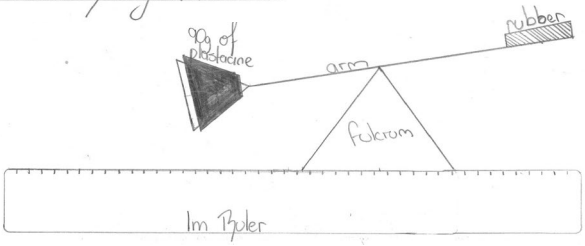
Step 1: the marble was placed in the bottle cap.
Step 2: the ball of plastacine was placed in the plastacine holder
Step 3: the end of the trebuchet arm (with the plastacine on it) was lifted upwards, untill the rubber touched the ground.
Step 4: the trebuchet arm was dropped & the length that the rubber flung was measured on a ruler & recorded in a table.
Step 5: steps 3 & 4 were repeated 2 more times & recorded in the table
Step 6: once the measurments were recorded they were added & divided by 3 then the averages were written down.
Step 7: the load was moved forward 2cm (towards the fulcrum) again & steps 1-6 were repeated.
Step 8: the load was moved forward 2cm again & steps 1-6 were repeated, once again.

Saftey Considerations...

Condition 1: don't aim at peoples faces.
Condition 2: don't use trebuchet as anything dangerous.
Condition 3: don't muck around whilst measuring/testing.

	Trial 1.	Trial 2.	Trial 3.	Average	
modification 1.	31 cm	30.5 cm	33 cm	31.5 cm	end of arm
modification 2.	31 cm	30 cm	30.5 cm	30.5 cm	2cm from end of arm
modification 3.	28 cm	29.5 cm	29 cm	28.8 cm	4cm from end of arm

Trebuchet Diagram...



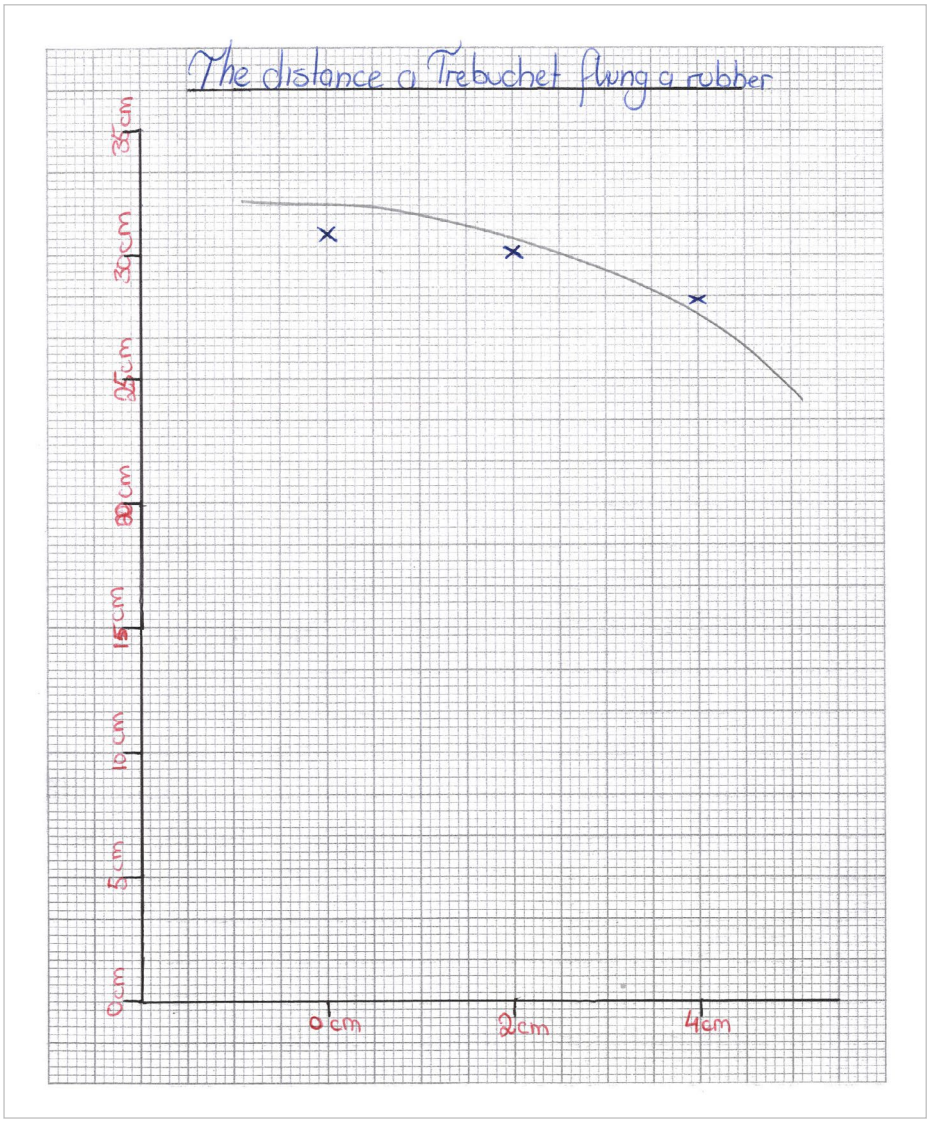
Annotations

Plans an investigation, including repeat trials and production of summary data.

Identifies appropriate safety considerations.

Constructs a table to represent data collected, including using appropriate conventions.

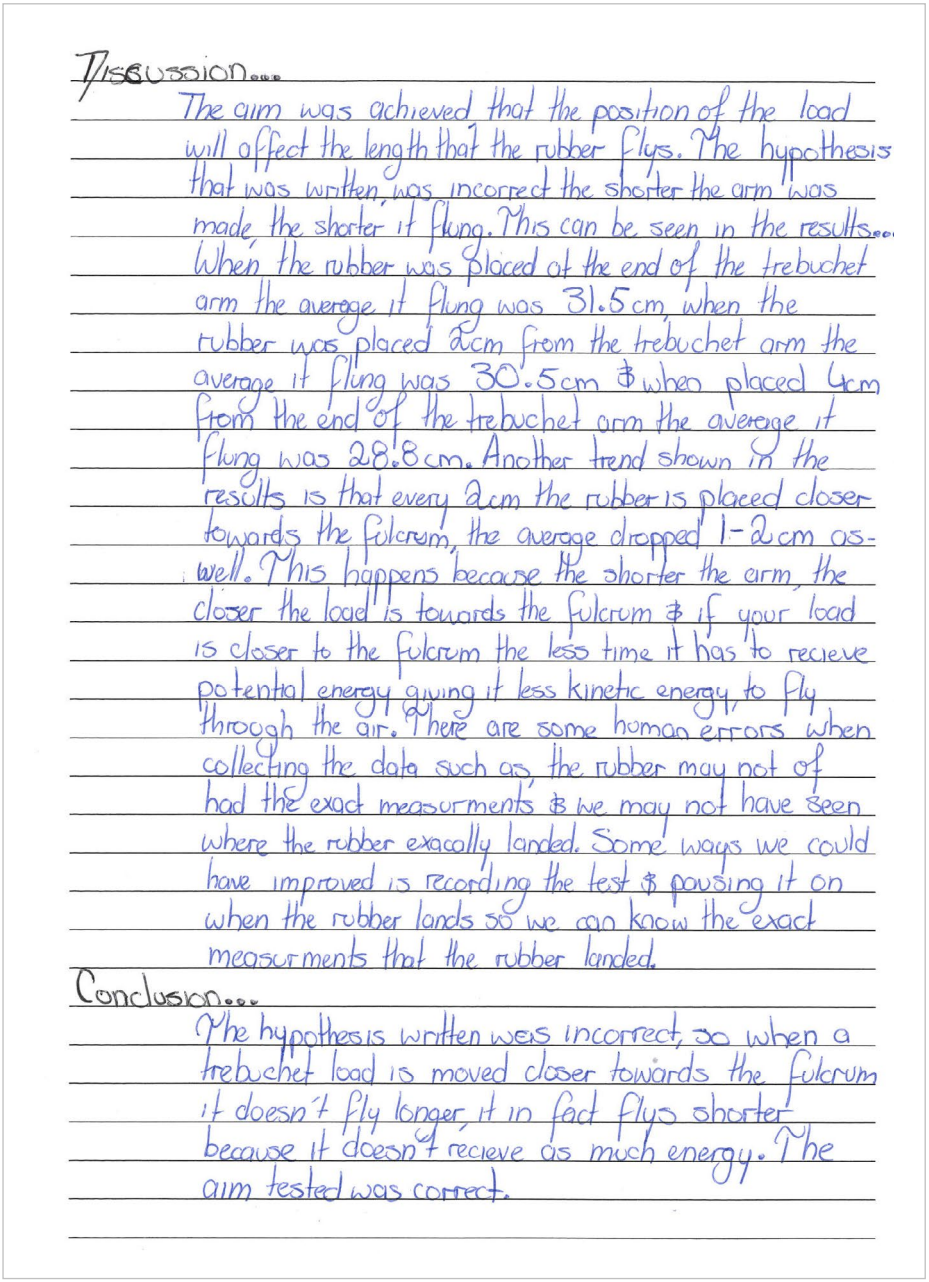
Investigation: Trebuchet design and function



Annotations

Selects an appropriate graphic representation (line of best fit) to communicate trends in data.

Investigation: Trebuchet design and function



Discussion...

The aim was achieved that the position of the load will affect the length that the rubber flys. The hypothesis that was written, was incorrect the shorter the arm was made, the shorter it flung. This can be seen in the results... When the rubber was placed at the end of the trebuchet arm the average it flung was 31.5cm, when the rubber was placed 2cm from the trebuchet arm the average it flung was 30.5cm & when placed 4cm from the end of the trebuchet arm the average it flung was 28.8cm. Another trend shown in the results is that every 2cm the rubber is placed closer towards the fulcrum, the average dropped 1-2cm as well. This happens because the shorter the arm, the closer the load is towards the fulcrum & if your load is closer to the fulcrum the less time it has to recieve potential energy giving it less kinetic energy, to fly through the air. There are some human errors when collecting the data such as, the rubber may not of had the exact measurments & we may not have seen where the rubber exacally landed. Some ways we could have improved is recording the test & pausing it on when the rubber lands so we can know the exact measurments that the rubber landed.

Conclusion...

The hypothesis written was incorrect, so when a trebuchet load is moved closer towards the fulcrum it doesn't fly longer, it in fact flys shorter because it doesn't recieve as much energy. The aim tested was correct.

Annotations

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

Identifies improvements to the method, including use of digital technologies, that would 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 8 Science achievement standard

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

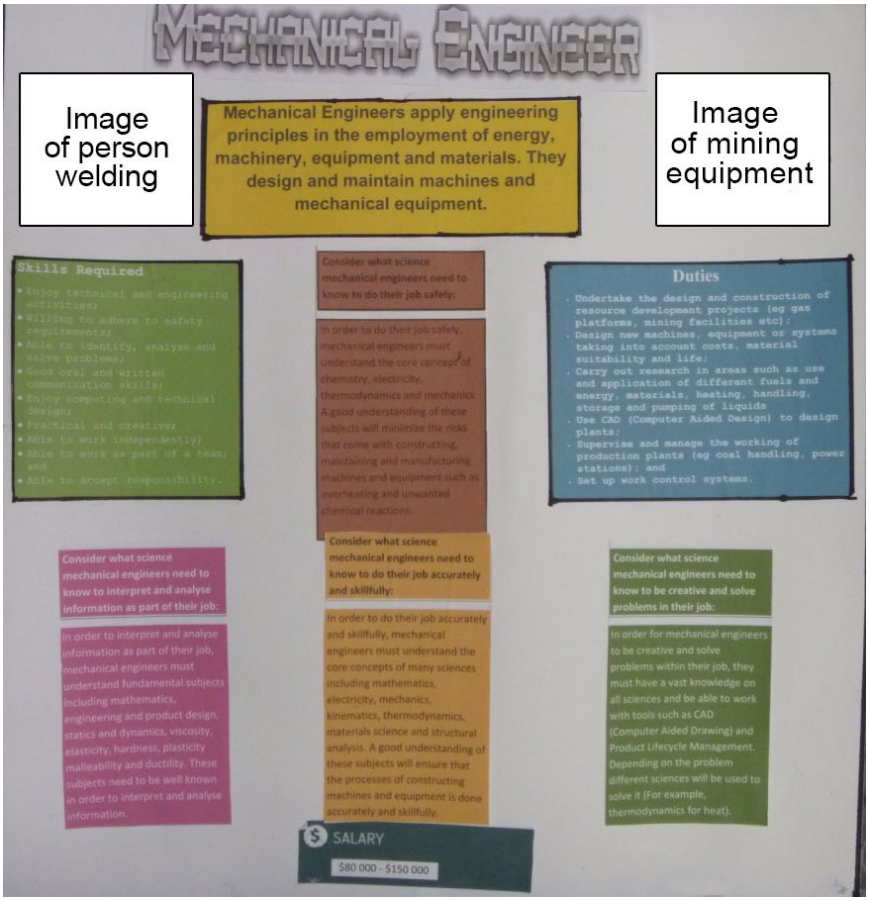
> *By the end of Year 8, students compare physical and chemical changes and use the particle model to explain and predict the properties and behaviours of substances. They identify different forms of energy and describe how energy transfers and transformations cause change in simple systems. They compare 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 short film about the range of careers available in the mining industry and were provided with a website to further explore each role.

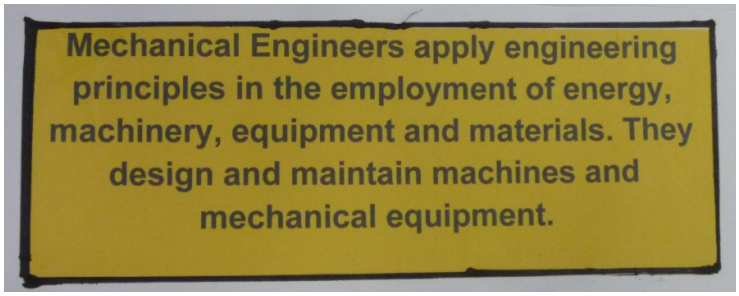
They were asked to select a role to research further and to develop an informative poster for their peers. They were required to provide a broad description of the role and to describe the science understanding and skills required to do the job safely, accurately and skillfully. They were also asked 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.

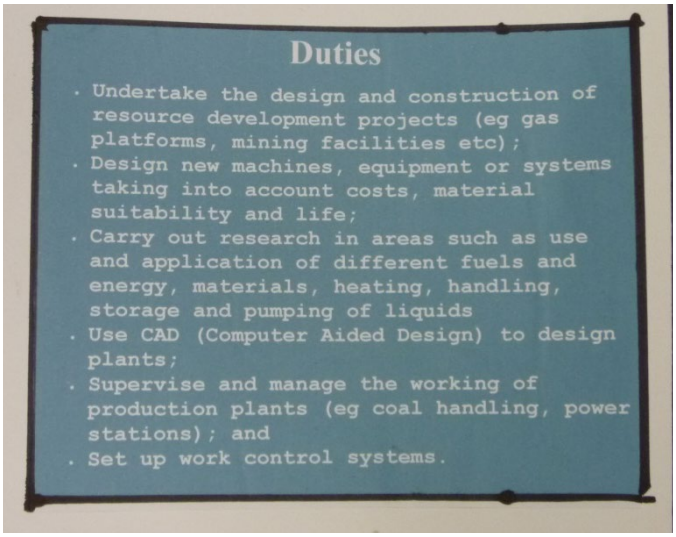
Poster: Occupations in mining



Annotations

Poster: Occupations in mining



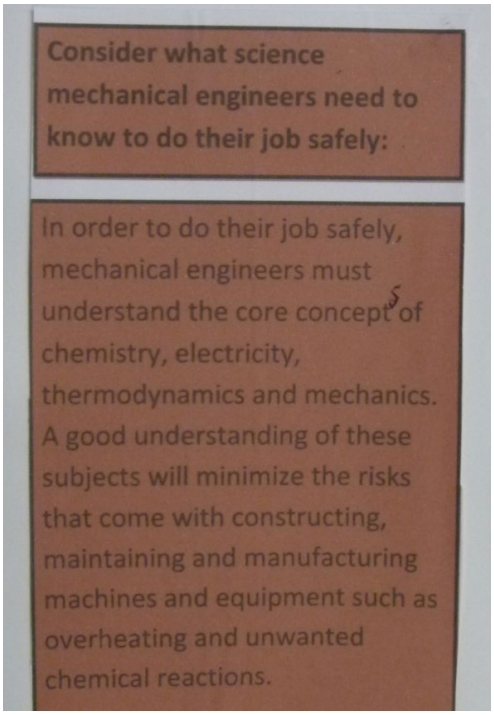


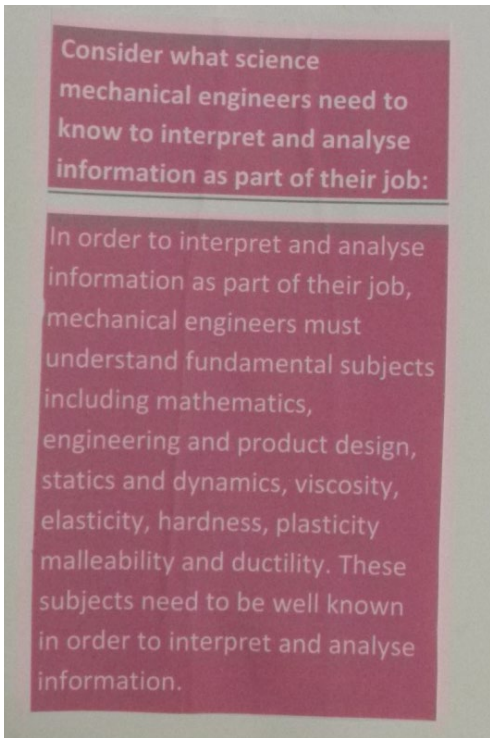
Annotations

Identifies that mechanical engineers apply scientific concepts to design and maintain mechanical equipment.

Identifies that mechanical engineers identify and analyse problems and communicate findings.

Poster: Occupations in mining



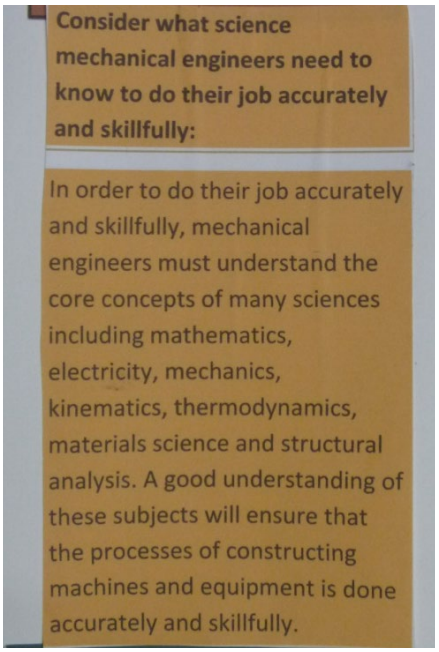


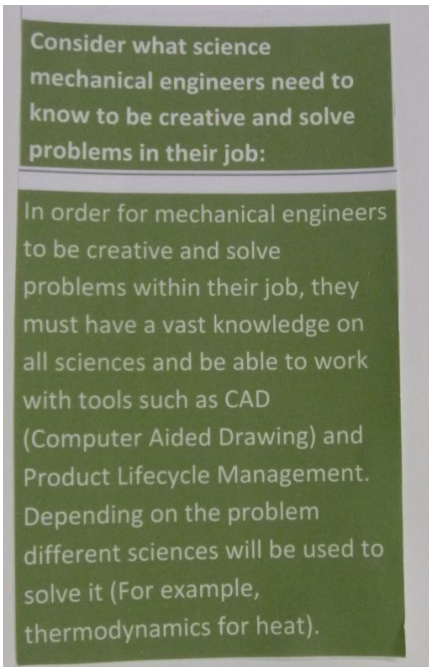
Annotations

Recognises that mechanical engineers need to understand a range of scientific concepts in order to do their job safely.

Recognises that mechanical engineers need to interpret and analyse information using knowledge of materials science.

Poster: Occupations in mining





Annotations

Recognises that mechanical engineers need to have a deep understanding of a range of physical science concepts in order to do their job accurately and skilflully.

Identifies that mechanical engineers draw on a range of scientific understanding to solve problems.

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.*
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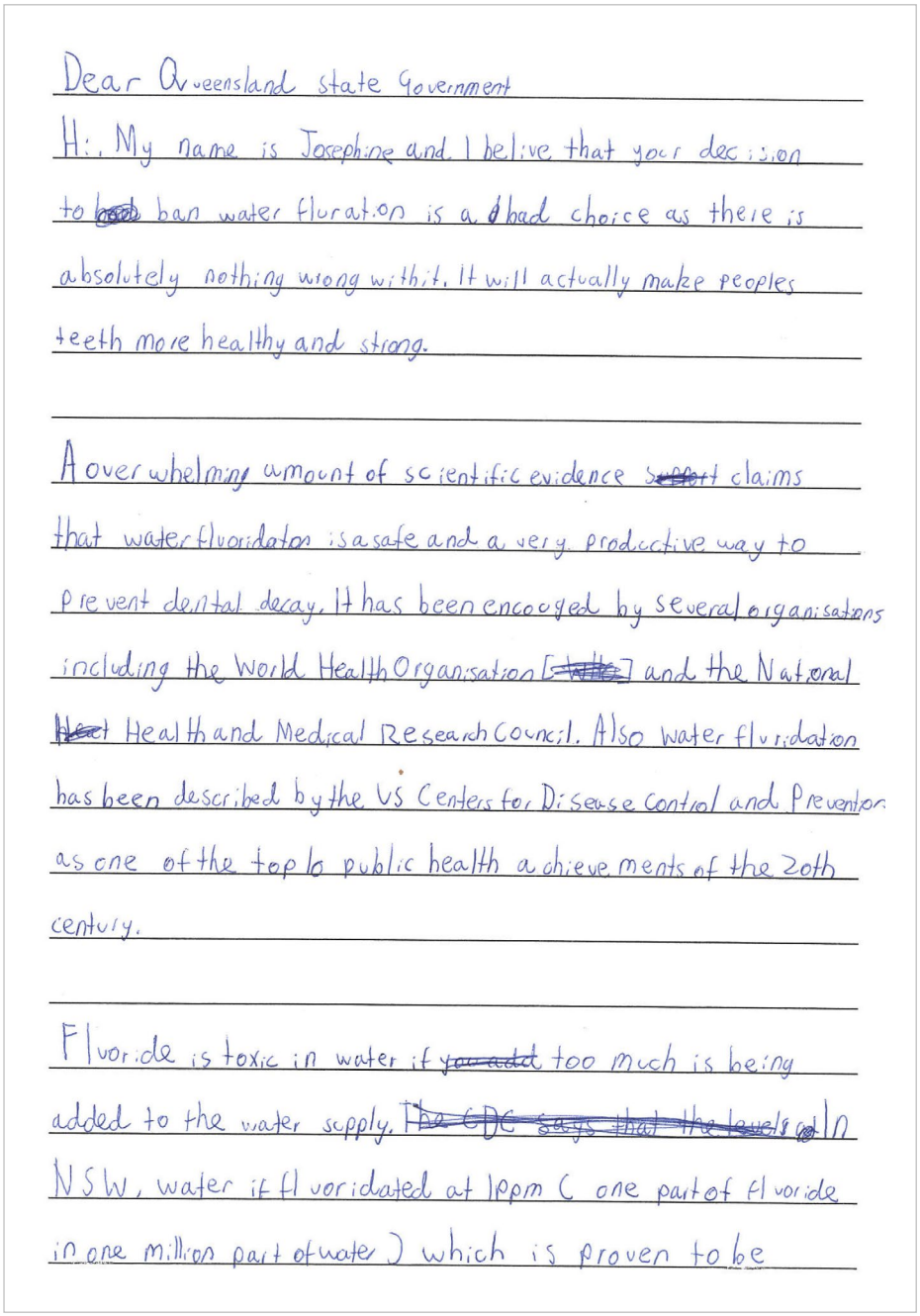
Summary of task

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 Government 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



Dear Queensland state Government

Hi. My name is Josephine and I belive that your decision to ~~bad~~ ban water flurat.on is a ~~d~~bad choice as there is absolutely nothing wrong with it. It will actually make peoples teeth more healthy and strong.

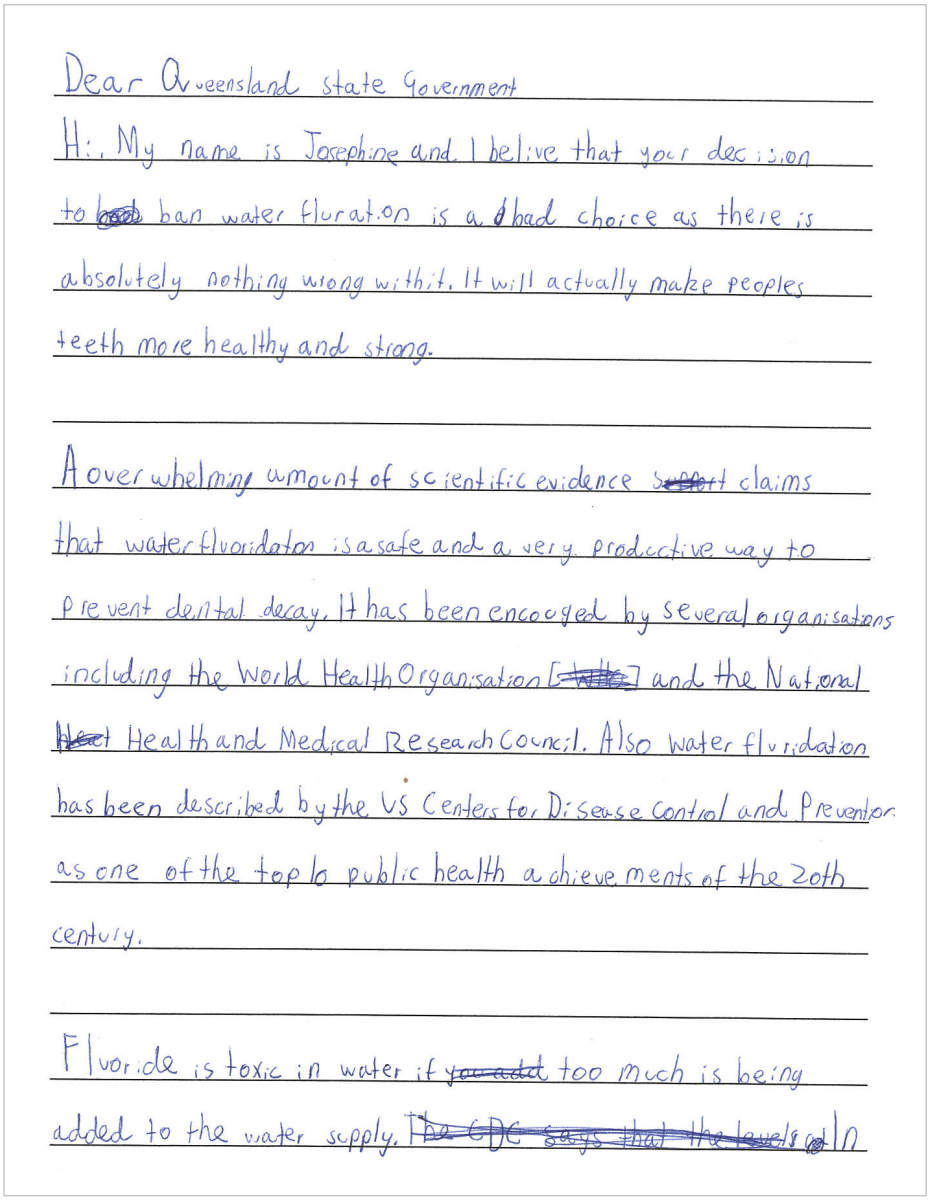
A over whelming amount of scientific evidence ~~support~~ claims that water fluoridation is a safe and a very productive way to prevent dental decay. It has been encouged by several organisations including the World Health Organisation [~~the~~] and the National ~~Heal~~ Health and Medical Research Council. Also water fluridation has been described by the US Centers for Disease Control and Prevention as one of the top 10 public health achievements of the 20th century.

Fluoride is toxic in water if ~~you add~~ too much is being added to the water supply. ~~The CDC says that the levels of~~ In NSW, water if fluoridated at 1ppm (one part of fluoride in one million part of water) which is proven to be

Annotations

Refers to authoritative scientific institutions to support the claim that fluoridation is effective in preventing dental decay.

Letter: Water fluoridation



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Fluoride is toxic in water if ~~you add~~ too much is being added to the water supply. ~~The CDC says that the levels of~~ In

Annotations

Refers to scientific evidence that establishes safe levels of fluoride in drinking water.

Identifies that science investigations can provide evidence to support or refute claims.

Identifies scientific knowledge that supports the claim that fluoridation improves dental health.

Annotations (Overview)

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