Love Trust Courage Forgiveness

Drake Primary School – Working Scientifically Enquiry Progression

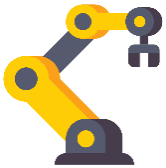
Scientific Enquiry Skills:

	**Asking questions** Asking relevant questions that can be answered from learning of scientific concepts.
	**Making predictions** Using prior knowledge to make informed suggestions on what may happen in a scientific enquiry.
	**Setting up tests** Carefully following a method and using equipment accurately to carry out a scientific enquiry.
	**Observing and measuring** Using the senses and taking measurements, using a range of equipment, to make observations about a scientific enquiry.
	**Recording data** Using tables, a variety of graphs, labelled diagrams and models to record observations, measurements, results and findings.
	**Interpreting and communicating results** Using information, results and data to present findings, including oral and written explanations.
	**Evaluating** Assessing the success of a scientific enquiry by evaluating the prediction, method and results and identifying further questions for enquiry.

Science Enquiry Approaches:

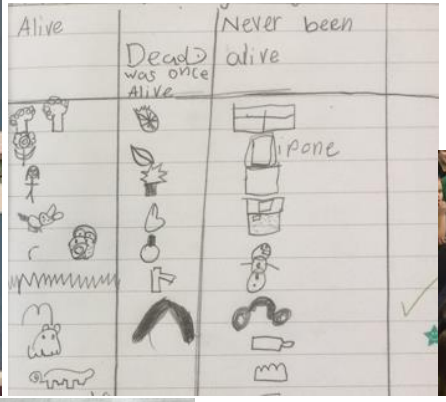
	**Comparative / fair testing** Conducting a test that controls all but one variable to answer a scientific question.
	**Research** Using information from a variety of sources to answer scientific questions.
	**Observation over time** Observing changes that occur over a long or short period of time.
	**Pattern-seeking** Identifying patterns and looking for relationships to make links between scientific concepts.
	**Identifying, grouping and classifying** Using observations, data and findings to name, label and organise items in a variety of ways.
	**Problem-solving** Applying prior scientific knowledge to solve problems and answer further questions.

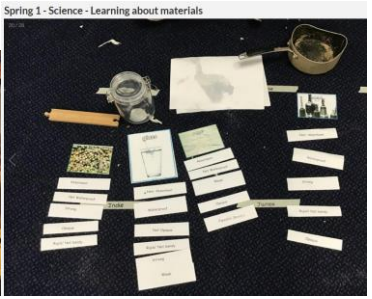
	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Fair testing 	Begin to understand the importance of repeating a line of enquiry through adult questioning e.g. Do all stones sink?	Begin to suggest why a test may be unfair.	To be able to identify why a test is unfair and make suggestions how to make it fair.	Begin to recognise the different variables and explain what a fair test is.	To recognise when a simple fair test is needed and with help, decides how to set up a fair test and control variables.	Recognise when and how to set up comparative and fair tests and identify the variables.	To be able to design a fair test and recognise the controls variables where necessary (e.g. explains which variables need to be controlled and why).
Research 	To be able to select books based on a scientific theme e.g. weather, materials, animals etc.	To be able to select relevant information based on a scientific theme from secondary sources that have been provided.	To be able to use simple secondary sources which have been provided to find answers, e.g. books, videos, photographs or people.	To begin to select relevant secondary sources from a selection provided to help answer questions around a scientific theme.	To recognise when and how secondary sources (e.g. books, internet, experts, diagrams) might help answer questions that cannot be answered through practical investigations.	To begin to develop a research method to answer a specific question and select the relevant secondary sources to support this.	To recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact.
Observation over time 	Discuss what they can see, touch, smell, hear or taste Use simple equipment to help them make observations e.g. magnifying glass.	Observe objects, materials and living things and describe what they see using scientific vocabulary.	Observe something closely and describe changes over time using simple equipment such as magnifying glass, metre stick etc.	Begin to make decisions about what to observe during an investigation and how this will be done.	Make systematic and careful observations.	Plan and carry out comparative and fair tests, making systematic and careful observations.	Make their own decisions about which observations to make, using test results and observations to make predictions or set up further comparative or fair tests.
Pattern seeking 	Begin to take measurements of size using non-standard units e.g. multilink cubes or Lego blocks. Begin to use diagrams and labels	To begin to understand that measurements involving numbers help scientists to make conclusions. Adults to model this to the children in group investigations.	With adult support, begin to use simple equipment such as rulers to take measurements, and independently use tallies to count the number of times.	Begin to use a range of simple equipment with support to make accurate measurements using standard units (m, cm, °C, kg, g, ml). Record their findings using scientific	To independently make accurate measurements using standard units (e.g. cm, m, °C, N, g, kg, ml), using a range of simple equipment, e.g. rulers, measuring	To be able to take measurements, in standard units, using a range of scientific equipment, with increasing accuracy and precision. Record data and results of increasing complexity using	To take measurements, in standard units, using a range of scientific equipment, with increasing accuracy and precision and take repeat readings when appropriate.

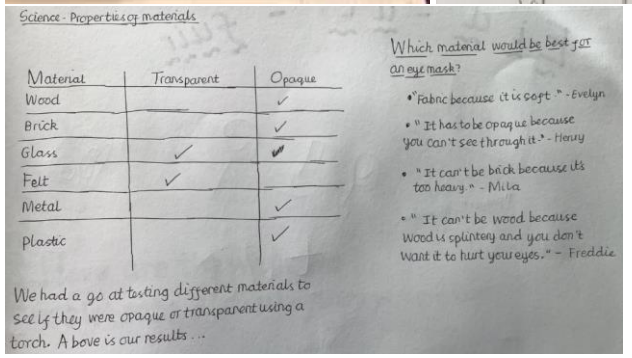
	to show what they have observed.	Independently use non-standard units to measure results. Begin to record simple data in charts with support and modelling.	Gather data using simple charts and tables such as tally charts.	language and present in note form, writing frames, diagrams, tables and charts.	cylinder and thermometers. Choose appropriate ways to record and present information, findings and conclusions for different audiences (e.g. displays, oral or written explanations).	scientific diagrams, labels, classification keys, tables, bar and line graphs and models.	Choose the most effective approach to record and report results, linking to mathematical knowledge. Make systematic measurements and create more complex data displays.
Identifying and classifying 	Can identify and classify objects that they observe with the support from adults through questioning.	Sort and group objects, materials and living things, according to simple observational features and criteria given.	Decide how to group materials based on a criterion, living things and objects, noticing changes over time and beginning to see patterns.	Talk about criteria for grouping, sorting and categorising, beginning to see patterns and relationships.	Identify similarities/differences/changes when talking about scientific processes. Use and begin to create simple keys.	Use and develop keys to identify, classify and describe living things and materials.	Identify and explain patterns seen in the natural environment and during scientific investigations.
Problem solving 	Answer simple questions about what they have found out.	Talk about their findings and explain what they found out with support and modelling.	Use simple scientific language to explain what they have found out.	Draw, with help, a simple conclusion based on evidence from an enquiry or observation.	Use recorded data to make predictions, pose new questions and suggest improvements for further enquiries.	Use a simple mode of communication to justify their conclusions on a hypothesis. Begin to recognise how scientific ideas change over time.	Identify validity of conclusion and required improvement to methodology. Discuss how scientific ideas develop over time.

Examples of working scientifically at Drake:

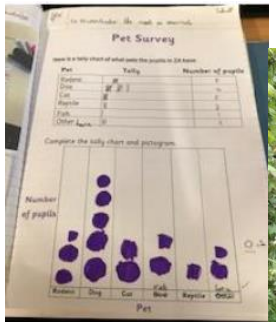
EYFS	Through continuous provision, short teacher input, drawings, labels, drawings with teacher written quotes and photos on Tapestry. 
KS1	Focus on individual enquiry skills (e.g. predicting or recording results). For example, the teacher might model a prediction, encouraging the children to use the word 'because…' to explain and justify their ideas. Focus is on the quality of the individual sections. At the end of Year 2, children may write up one whole enquiry, but this is not expected every time children do practical work. **Examples:** e.g. Identifying and classifying:



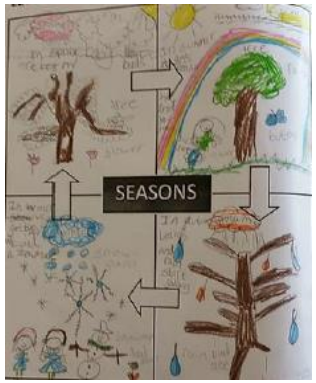


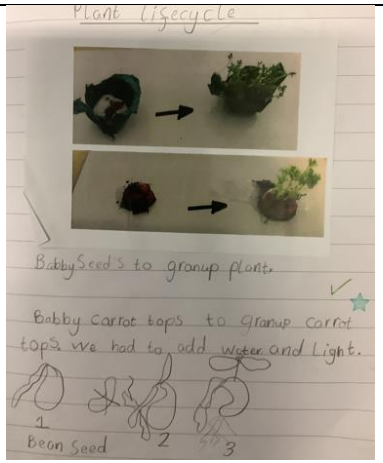


Pattern seeking:

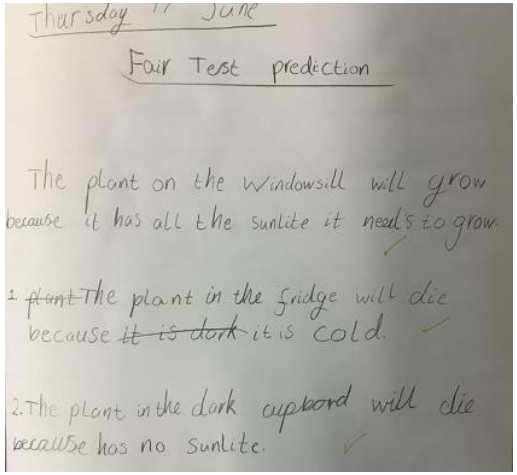


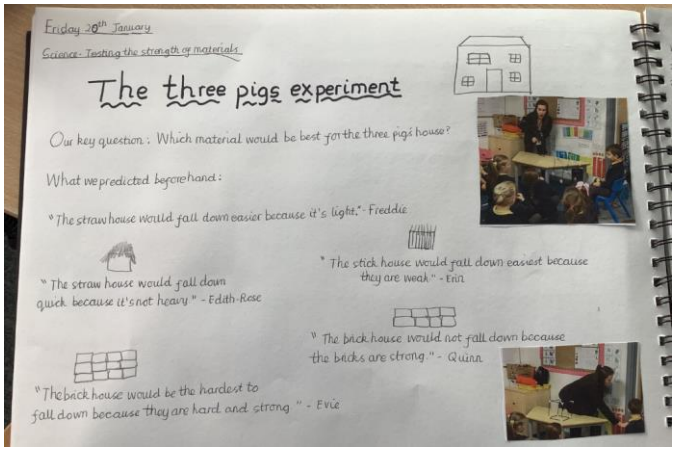
Observing over time:

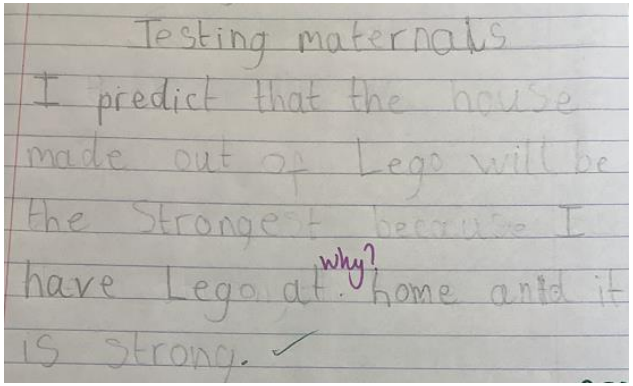




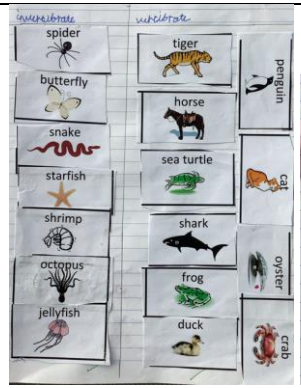
Fair testing:

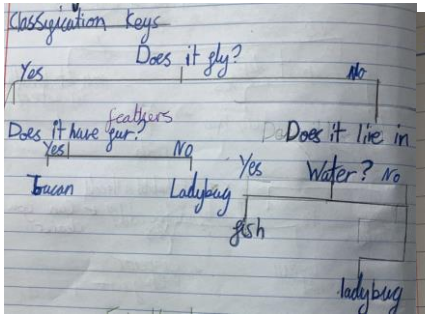


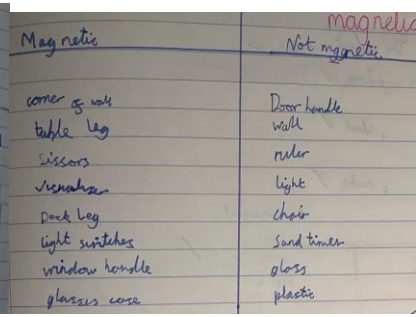


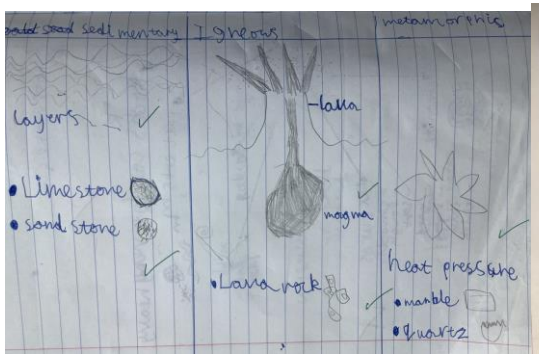


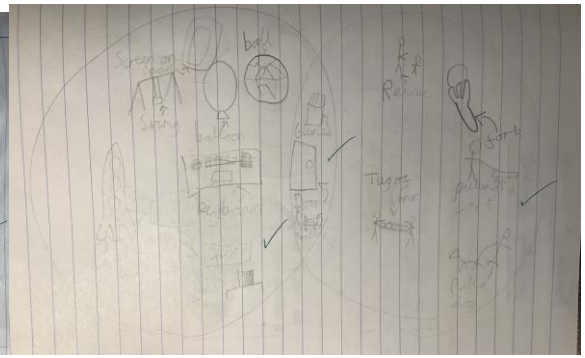
LKS2	Children will develop their writing skills. Focus on individual enquiry skills to high quality. In Year 3 and 4, children may write up a whole enquiry, but this is not expected every time children do practical work. **Examples:** Identifying and classifying:



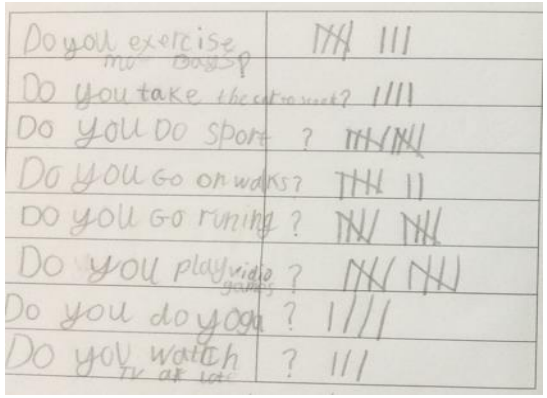


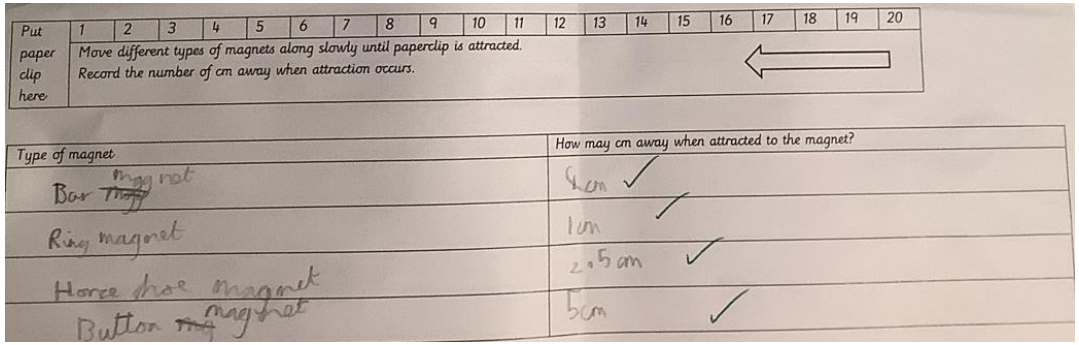






Pattern seeking:





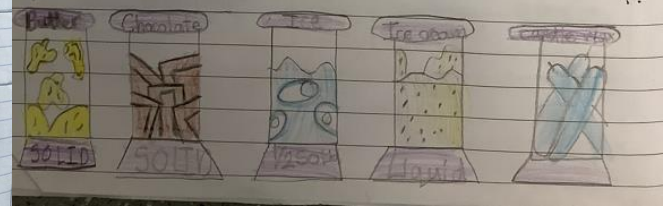
Observing over time:

Item	Time	Observation
Chocolate	10:00	solid
	11:30	Solid
	13:00	solid
	14:30	solid
Ice	10:00	solid
	11:30	Half solid, Half liquid
	13:00	SOME solid, more WATER
	14:30	Small SOLID MOST WATE

Time	Changes
2:30	fresh NO Change
2:45	Still fresh NO Change
3:00	Still fresh Bit damp
3:15	A bit slushie

Conclution

My prediction was correct because the Ice cream and Ice melted. Ice cream and Ice melted. Candle wax, chocolate, and butter didn't melt. At HOWEVER, my prediction was wrong because SURPRISINGLY The butter didn't melt!!



7 days

1 day later…

Fair testing:

Distance from load (cm)	Elastic band stretch (cm)
5 cm	6 cm
7.5 cm	7 cm
8 cm	8.5 cm
11.5 cm	9.5 cm
16 cm	16.5 cm

Conclusion

When the fulcrum was near to the load it was easier but when it is far away it was harder to lift.

Aim: We will investigate how well these protections shield us from harmful UV rays.

Prediction: I predict that suncream will work the best because it protects your skin.

I think that the sunglasses will be the worst because they protect your eyes not your body.

Question

How does the ramp material effect how far the car will travel?

Equitment

- Toy car
- Wood
- Bubble wrap
- Plastic
- Foam
- carpet - rough
- Carpet - Smooth

Prediction

I predict the car will travle furthest on plastic because it is the smoothest. I predict the car will not travel far on the bubble wrap because its bumpy.

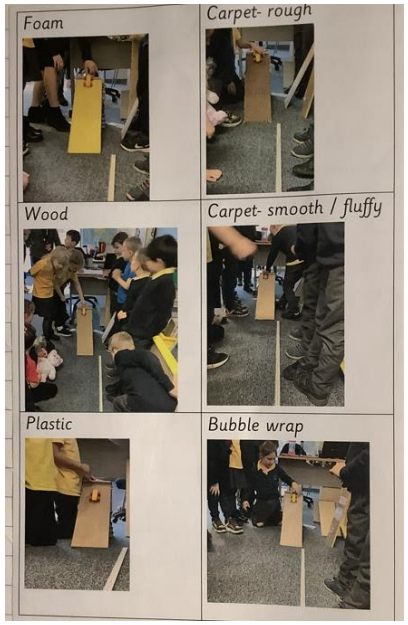
Variables

change = material

Mesure = how far car trorles

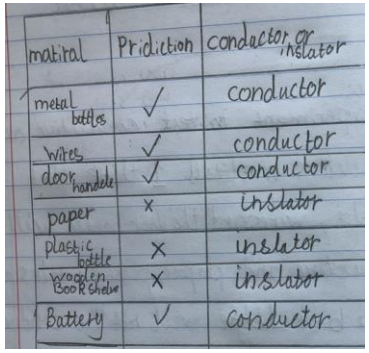
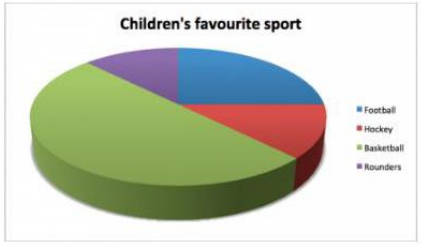
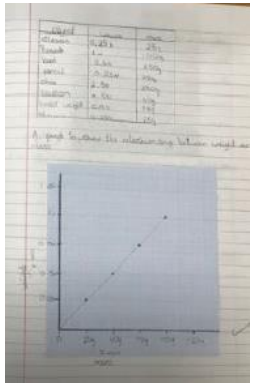
Keep the same = car

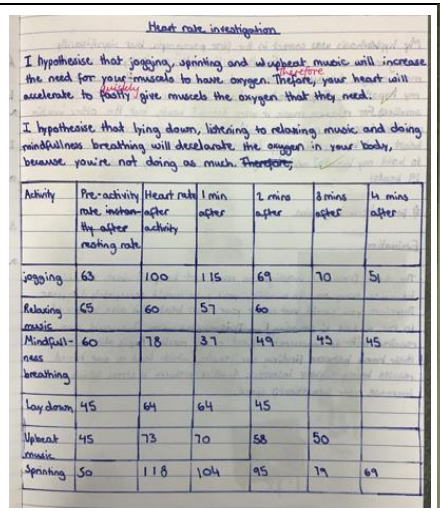
Ramp material	How far the car travelled
Bubble wrap	14cm
carpet - rough	17cm
Carpet - Smooth	22cm
Wood	27cm
Foam	34cm
Plastic	38cm



Conclusion

We found out that the car will go further on a plastic ramp. The glided along the plastic. There was less friction between the car wheels and the plastic. The car did not go far on the bubble wrap because it was a bumpy surface.

UKS2	Children will be more confident using the enquiry 'write up.' In Year 5 and 6, children may write up a whole enquiry, but this is not expected every time children do practical work. The 'fair test' lends itself well to a full 'write up' but, in some practical work they will just focus on one section to a high standard (e.g. writing the results in detail). **Examples:** Identifying and classifying:  Pattern seeking:   Observing over time:

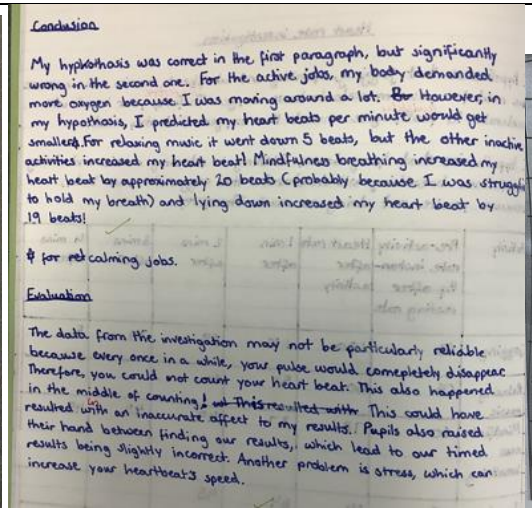


Heart rate investigation

I hypothesise that jogging, spinning and upbeat music will increase the need for your muscels to have oxygen. Therefore, your heart will accelerate to quickly give muscels the oxygen that they need.

I hypothesise that lying down, listening to relaxing music and doing mindfullness breathing will decelarate the oxygen in your body, because you're not doing as much. Therefore,

Activity	Pre-activity rate instantly after resting rate	Heart rate after activity	1 min after	2 mins after	3 mins after	4 mins after
jogging	63	100	115	69	70	51
Relaxing music	65	60	57	60		
Mindfull-ness breathing	60	78	37	49	42	45
lay down	45	64	64	45		
Upbeat music	45	73	70	58	50	
Spinning	50	118	104	95	79	69



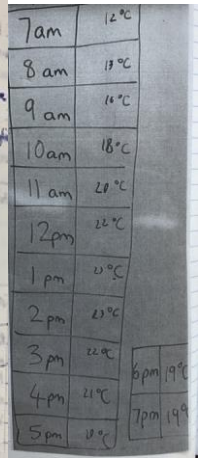
Conclusion

My hypothesis was correct in the first paragraph, but significantly wrong in the second one. For the active jobs, my body demanded more oxygen because I was moving around a lot. However, in my hypothesis, I predicted my heart beats per minute would get smaller. For relaxing music it went down 5 beats, but the other inactive activities increased my heart beat! Mindfulness breathing increased my heart beat by approximately 20 beats (probably because I was struggling to hold my breath) and lying down increased my heart beat by 19 beats!

& for relaxing jobs.

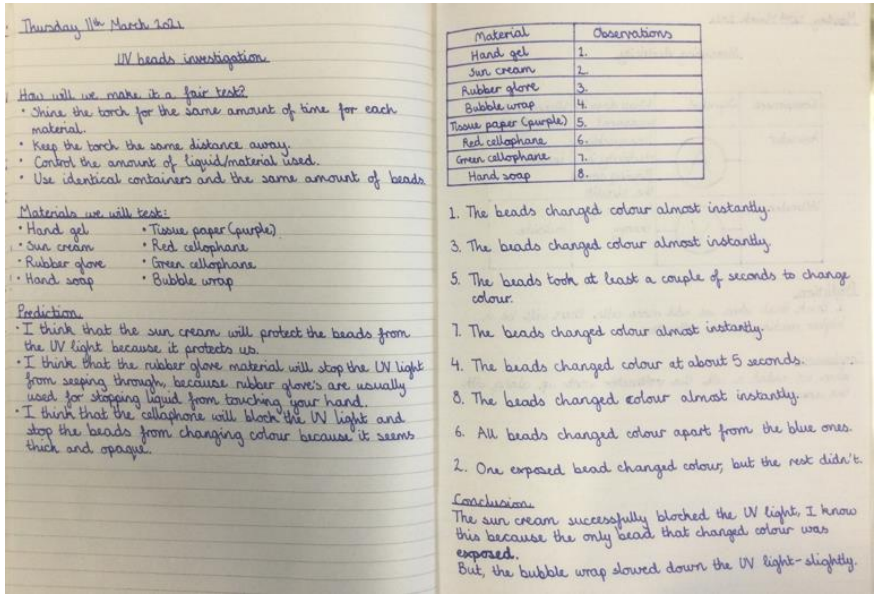
Evaluation

The data from the investigation may not be particularly reliable because every once in a while, your pulse would completely disappear in the middle of counting. ~~It resulted with~~ This could have resulted with an inaccurate affect to my results. Pupils also raised their hand between finding our results, which lead to our timed results being slightly incorrect. Another problem is stress, which can increase your heartbeat's speed.



7am	12°C
8 am	17°C
9 am	16°C
10am	18°C
11 am	20°C
12pm	22°C
1 pm	23°C
2 pm	23°C
3 pm	22°C
4 pm	21°C
5 pm	19°C
6pm	19°C
7pm	19°C

Fair testing:



Thursday 11th March 2021

UV beads investigation

How will we make it a fair test?
- Shine the torch for the same amount of time for each material.
- Keep the torch the same distance away.
- Control the amount of liquid/material used.
- Use identical containers and the same amount of beads

Materials we will test:
- Hand gel
- Sun cream
- Rubber glove
- Hand soap
- Tissue paper (purple)
- Red cellophane
- Green cellophane
- Bubble wrap

Prediction
- I think that the sun cream will protect the beads from the UV light because it protects us.
- I think that the rubber glove material will stop the UV light from seeping through, because rubber glove's are usually used for stopping liquid from touching your hand.
- I think that the cellaphane will block the UV light and stop the beads from changing colour because it seems thick and opaque.

Material	Observations
Hand gel	1.
Sun cream	2.
Rubber glove	3.
Bubble wrap	4.
Tissue paper (purple)	5.
Red cellophane	6.
Green cellophane	7.
Hand soap	8.

1. The beads changed colour almost instantly.
3. The beads changed colour almost instantly.
5. The beads took at least a couple of seconds to change colour.
7. The beads changed colour almost instantly.
4. The beads changed colour at about 5 seconds.
8. The beads changed colour almost instantly.
6. All beads changed colour apart from the blue ones.
2. One exposed bead changed colour, but the rest didn't.

Conclusion
The sun cream successfully blocked the UV light, I know this because the only bead that changed colour was exposed.
But, the bubble wrap slowed down the UV light - slightly.

Predictions

1. I think that when the light source is further away from the object the shadow will be longer because the object will block more light.
2. I think that when the angle of the torch is higher the shadow will be shorter because the object will block less light.
3. I think that if the object is opaque it the shadow will be darker because less light can travel through.

Prediction:

I predict that the plastic will be the fastest surface because it is the smoothest.

Variables that we are changing: ~~Surface~~ material travelled on.

Variables we are keeping the same: same car, same length of surface, same starting point, same person releasing the car and same person timing.

Find the average time

Surface	Test 1	Test 2	Test 3	Average Time
Bubble wrap	0.57	2.60	0.62	1.79
Paper	0.72	4.78	0.68	2.18
Foam	0.45	0.62	0.62	1.69
Plastic	0.80	0.58	0.76	1.74
Thick carpet	0.47	0.57	0.60	1.64
Short carpet	0.47	0.85	1.00	2.59

Result:

The results of the test ~~~~ show that thick carpet was the ~~fastest~~ slowest. This shows my prediction was incorrect

Why was thick carpet fastest?

This picture shows my team doing the friction experiment we put a toy car on different surfaces to see which was the fastest

September 2023

Paper strength

The wooden ~~box~~ block is the odd one out because glass and metal is able to break easy but the wooden ~~box~~ block (not really)

Our Hypothesis:

To investigate which type of paper will be strongest

Prediction:

I think that the sugar Paper will be the strongest. I think this because the way Mr Daniel ~~and~~ rugged the sugar paper, it looked the strongest.

Variables:

Change - the material (Paper type)

Measure - the weight, and variety, paper can hold

Control - same lenght of paper, the liquid used (water), hang the weights from the paper.

Equipment list:

1. Paper
2. water (50cm each time)
3. tape
4. Jug
5. Scissors
6. cable
7. tray

conclusion:

After completing the investigation I discovered my prediction was incorrect because I predicted sugar paper but cracking paper won. Sugar paper = 1010 Greaseproof paper = 60