# Drake Primary School and Little Pirates

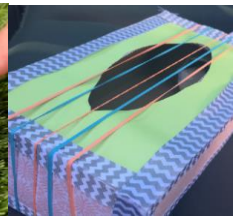
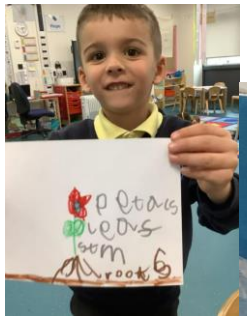
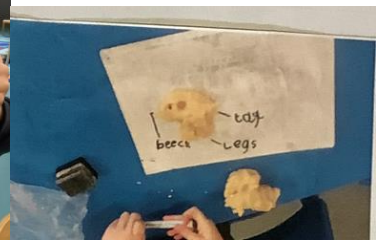
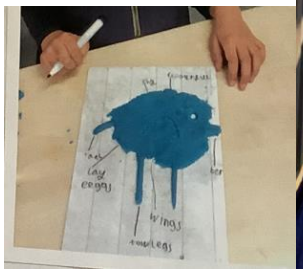
# Science Progression in Working Scientifically Enquiries

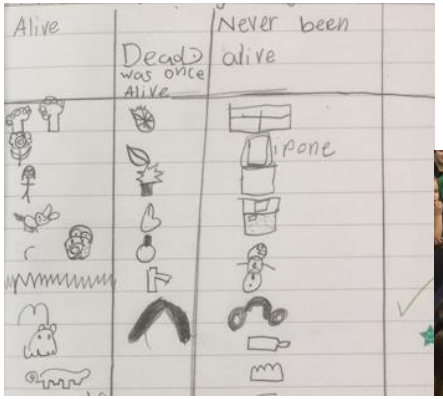
**Six types of scientific enquiry:**

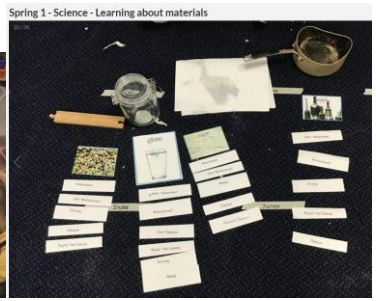
| | |
|---|---|
| **Comparative / fair testing**<br>Changing one variable to see its effect on another, whilst keeping all other variables the same. | **Pattern seeking**<br>Identifying patterns and looking for relationships in enquiries where variables are difficult to control. |
| **Research**<br>Using secondary sources of information to answer scientific questions. | **Identifying, grouping and classifying**<br>Making observations to name, sort and organise items. |
| **Observation over time**<br>Observing changes that occur over a period of time ranging from minutes to months. | **Scientific discovery**<br>Study breakthrough scientific discoveries and explore how scientific ideas have changed over time. |

**Seven enquiry skills:**

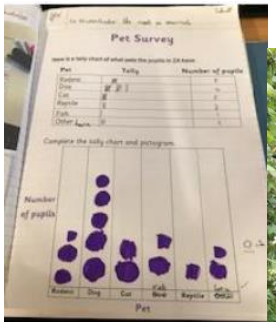
| | |
|---|---|
| **Asking questions**<br>Asking questions that can be answered using a scientific enquiry. |  |
| **Making predictions**<br>Using prior knowledge to suggest what will happen in an enquiry. |  |
| **Setting up tests**<br>Deciding on the method and equipment to use to carry out an enquiry. |  |
| **Observing and measuring**<br>Using sense and measuring equipment to make observations about the enquiry. |  |
| **Recording data**<br>Using tables, drawings and other means to note observations and measurements. |  |
| **Interpreting and communicating results**<br>Using information from the data to say what you found out. |  |
| **Evaluating**<br>Reflecting on the success of the enquiry approach and identifying further questions for enquiry. |  |

| | |
|---|---|
| EYFS | Through continuous provision, short teacher input, drawings, labels, drawings with teacher written quotes and photos on Tapestry.<br>             |
| KS1 | Focus on individual sections of the ‘write up.’<br>Children write individual sections of an ‘experiment write up.’ For example, the teacher might model a prediction, encouraging the children to use the word ‘because…’ to explain and justify their ideas.<br>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. Writing for a fair test will look different from writing for identifying and classifying.<br>e.g. Identifying and classifying: |

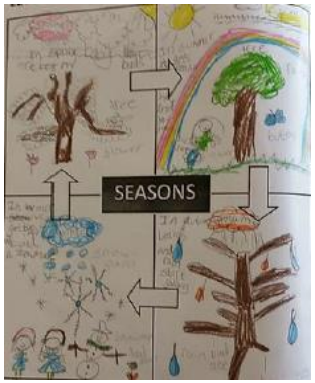


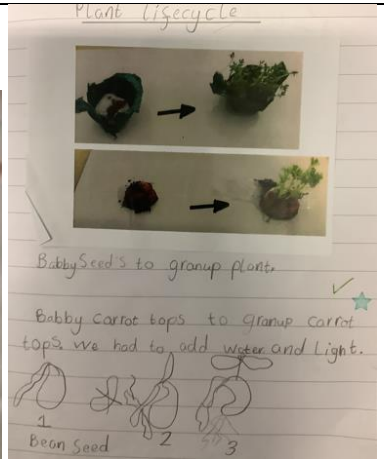

Pattern seeking:

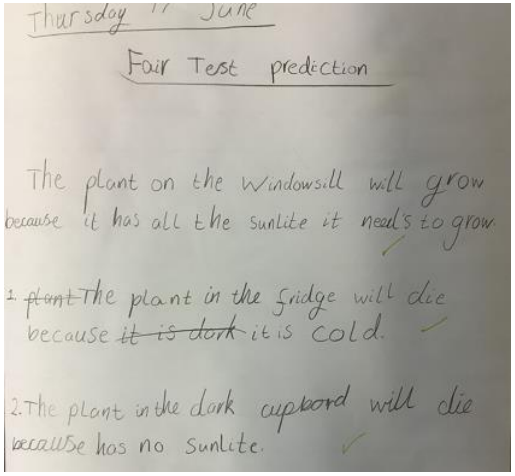

Observing over time:

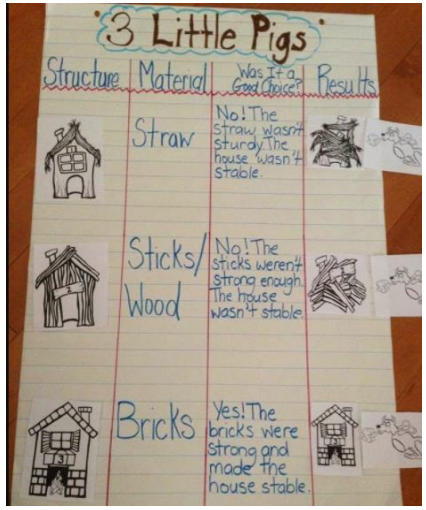


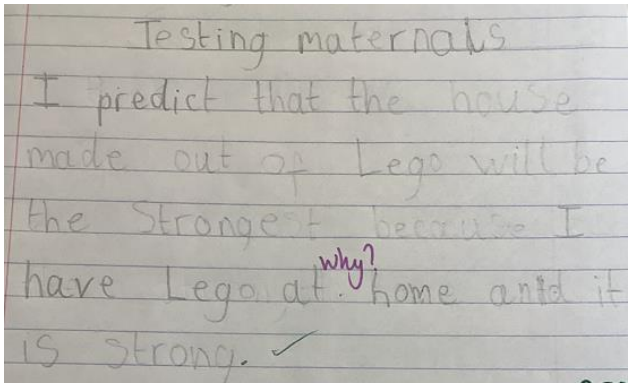




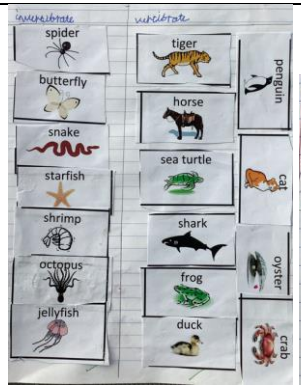

Fair testing:

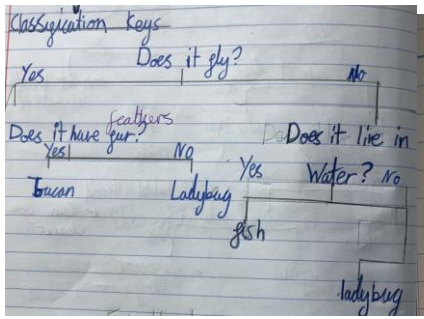


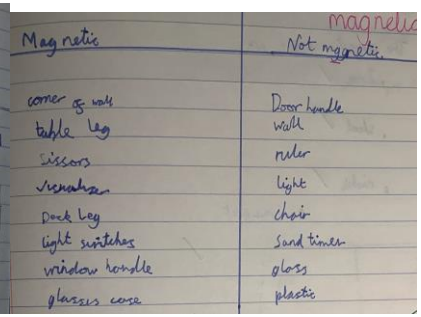



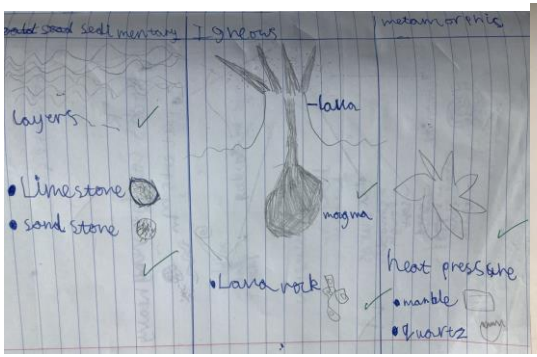



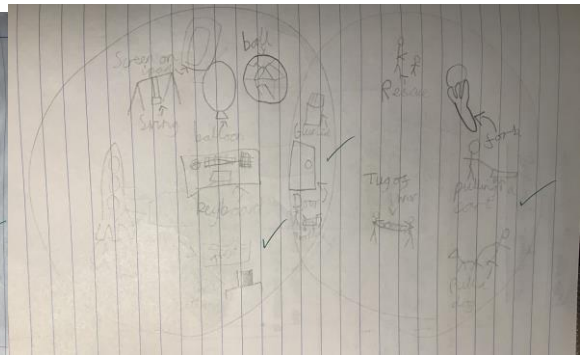

| | |
|---|---|
| LKS2 | Children will develop their writing skills. Still focus on doing one section of the 'write up' in high quality.<br>In Year 3 and 4, children may write up a whole enquiry, but this is not expected every time children do practical work.<br>Writing for identifying and classifying will look different from a fair test. E.g.<br>Identifying and classifying: |



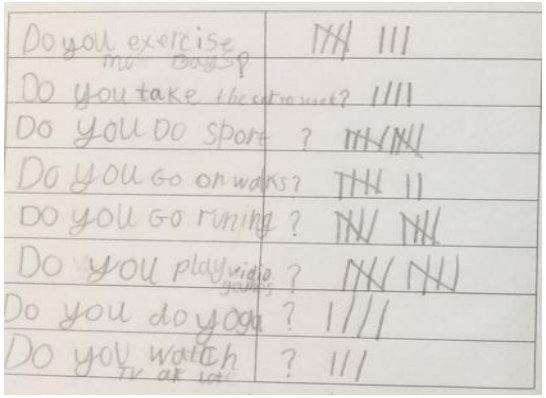



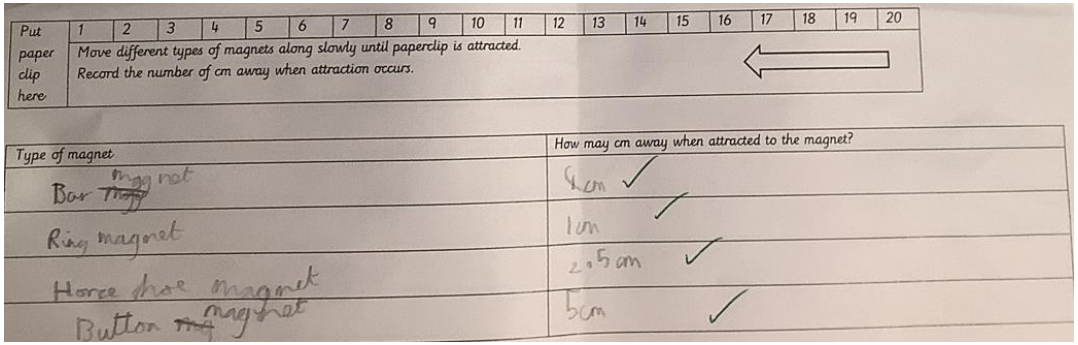



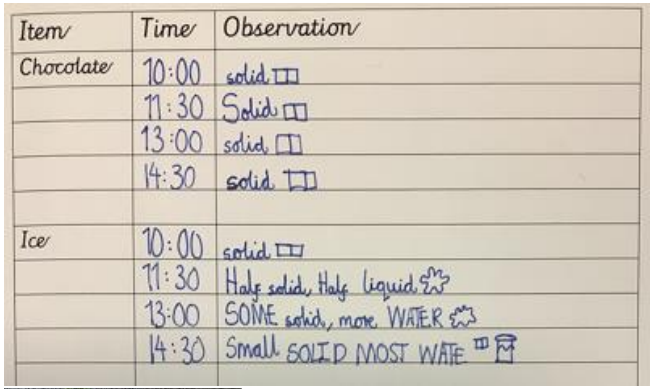



Pattern seeking:

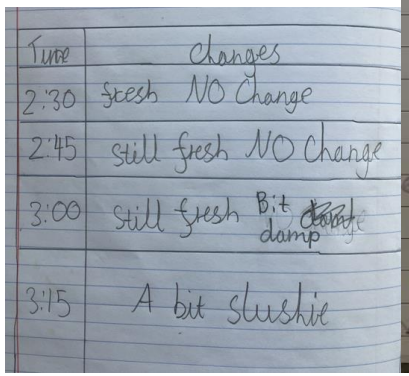


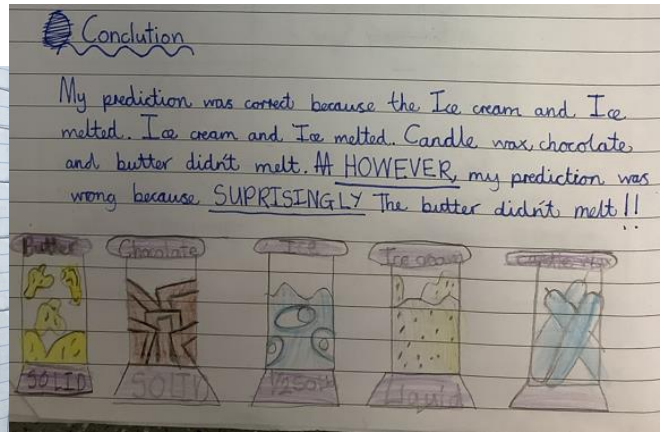
Observing over time:



| 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 |

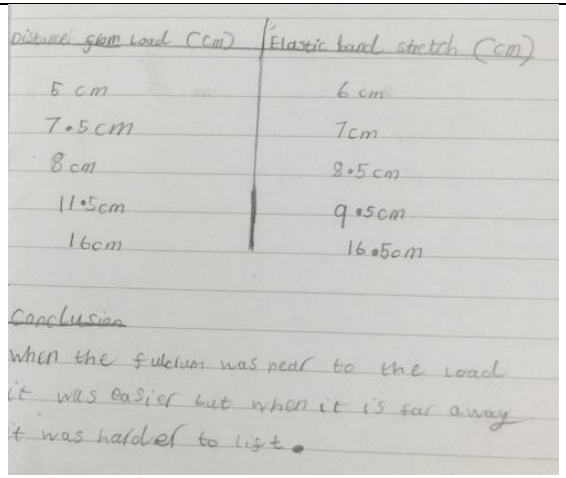


| Time | Changes |
|---|---|
| 2:30 | fresh NO Change |
| 2:45 | Still fresh NO Change |
| 3:00 | Still fresh Bit damp |
| 3:15 | A bit slushie |





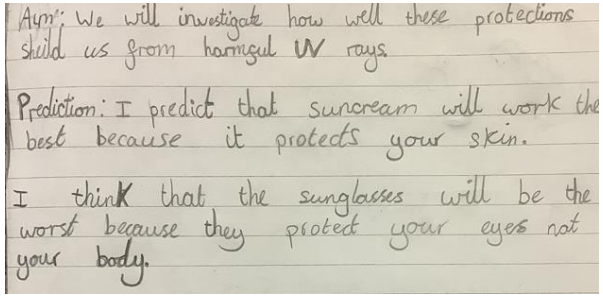

Fair testing:



| 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

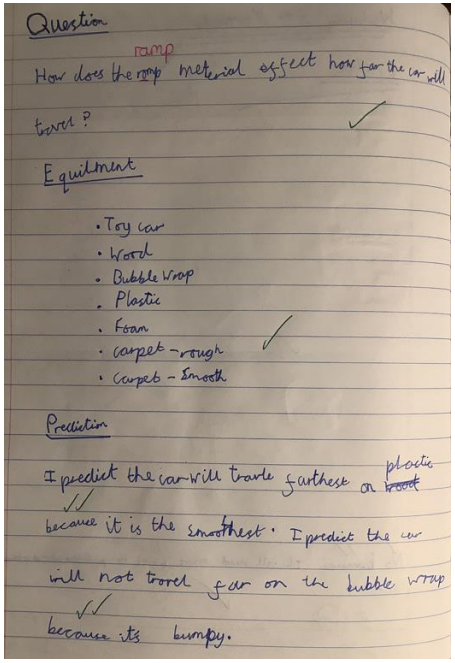
When the fulcrum was near to the load it was easier but when it is far away it was harder to lift.



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

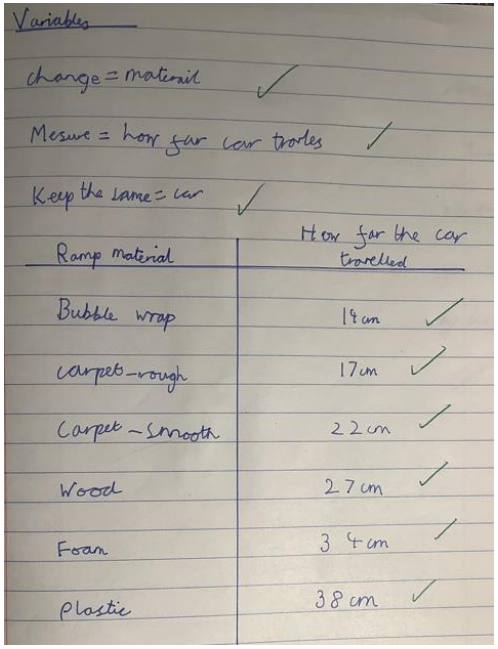
How does the ramp material effect how far the car will travel?

Equitment

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

Prediction

I predict the car will travle farthest 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 trotles

Keep the same = car

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

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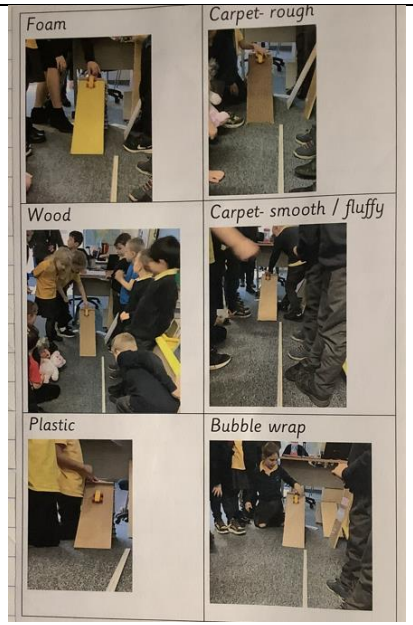

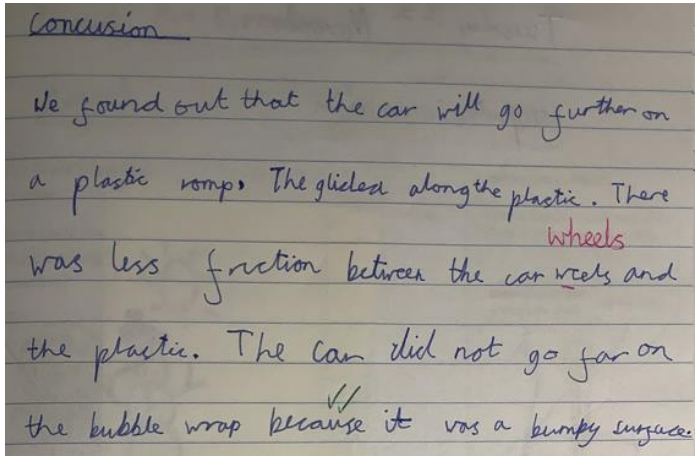

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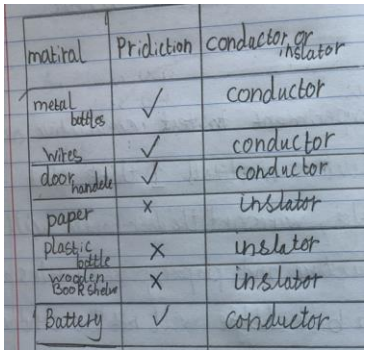
<tr>
<td>UKS2</td>
<td>Children will be more confident using the enquiry ‘write up.’ In Year 5 and 6, children may write up a whole enquiry, but this is not expected every time children do practical work. The ‘fair test’ lends itself well to a full ‘write up’ but, in some practical work they will just focus on one section to a high standard (e.g. writing the results in detail). Writing for identifying and classifying will look different from a fair test. E.g.<br><br>Identifying and classifying:<br><br>


<br><br>Pattern seeking:</td>
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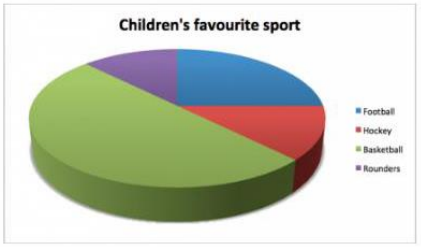
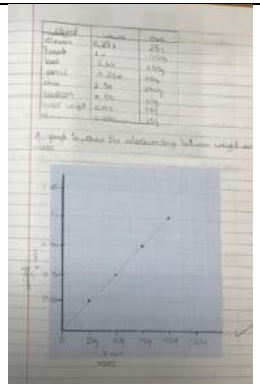
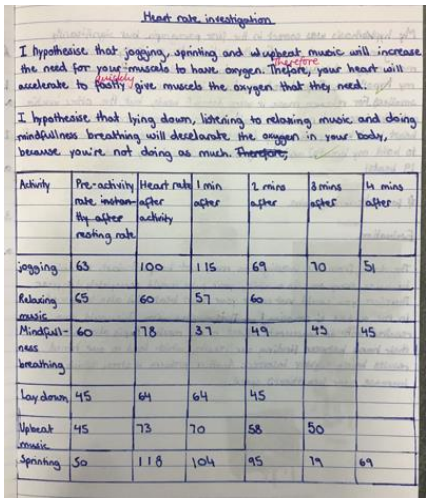


Observing over time:

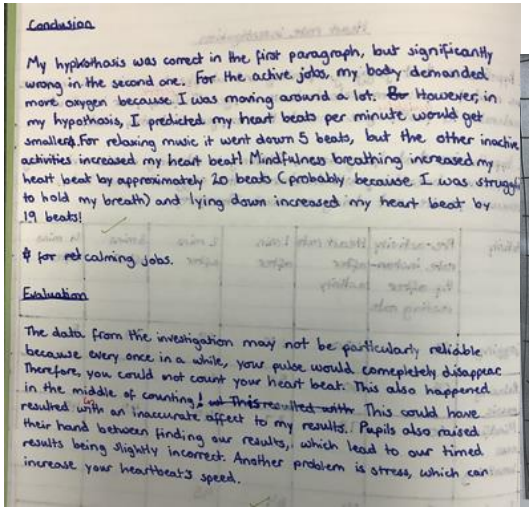


Heart rate investigation

I hypothesise that jogging, sprinting and upbeat music will increase the need for your muscals 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 classic | 65 | 60 | 57 | 60 | | |
| Mindfull-ness breathing | 60 | 78 | 37 | 49 | 43 | 45 |
| lay down | 45 | 64 | 64 | 45 | | |
| Upbeat classic | 45 | 73 | 70 | 58 | 50 | |
| Sprinting | 50 | 118 | 104 | 95 | 79 | 69 |



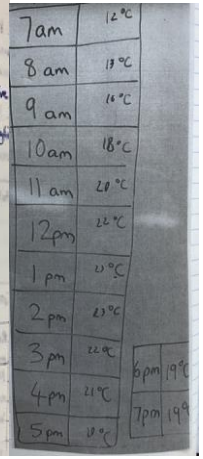
Conclusion

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!

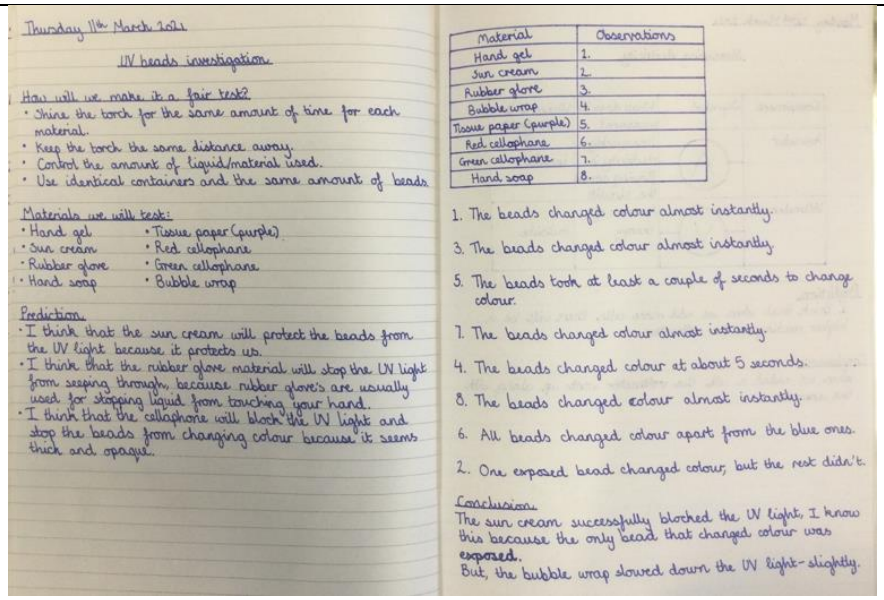
& for not calming jobs.

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! ~~so this 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.




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

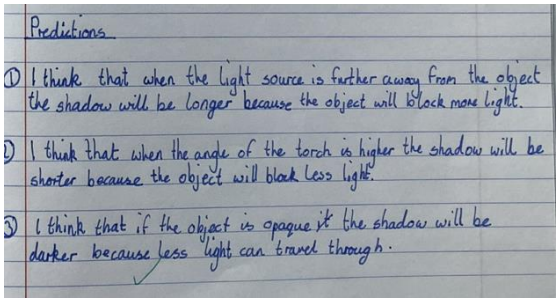
Materials we will test:
- Hand gel
- Sun cream
- Rubber glove
- Hand soap
- Tissue paper (purple)
- Red cellophane
- Green cellophane
- Bubble wrap

Predictions
- 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 cellophane 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. |

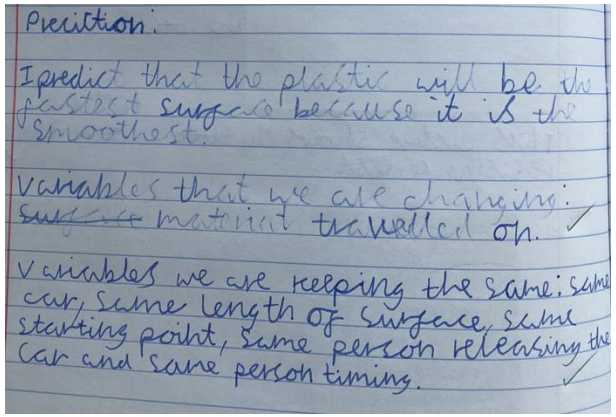
1. The beads changed colour almost instantly.
3. The beads changed colour almost instantly.
5. The beads took at least a couple of seconds to change colour.
7. The beads changed colour almost instantly.
4. The beads changed colour at about 5 seconds.
8. The beads changed colour almost instantly.
6. All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

Conclusions
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.

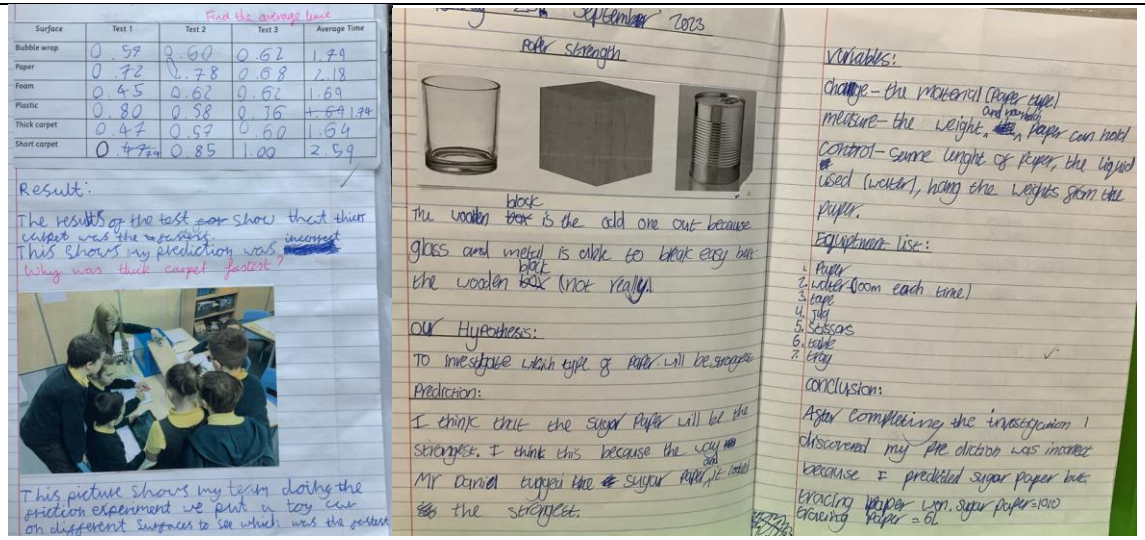


Prediction:

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 | 0.59 | 0.60 | 0.62 | 1.79 |
| Paper | 0.72 | 0.78 | 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. 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 block is the odd one out because glass and metal is made to break easy but the wooden block not really.

Our Hypothesis:

To investigate which type of paper will be stronger

Prediction:

I think that the sugar paper will be the strongest. I think this because the way Mr Daniel tugged the sugar paper, it looked the strongest.

Variables:

change - the material (paper type)

measure - the weight, and how much paper can hold

control - same length of paper, the liquid used (water), hang the weights from the paper.

Equipment list:

1. Paper
2. water (50ml each time)
3. tape
4. jug
5. scissors
6. table
7. tray

conclusion:

After completing the investigation I discovered my prediction was incorrect because I predicted sugar paper but tracing paper won. sugar paper = 1010 tracing paper = 61

| | KS1 | LKS2 | UKS2 |
|---|---|---|---|
| Asking questions and recognising that they can be answered in different ways. | ***Asking simple questions and recognising that they can be answered in different ways.***<br><br>• While exploring the world, the children develop their ability to ask questions (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). Where appropriate, they answer these questions.<br>• The children answer questions developed with the teacher often through a scenario.<br>• The children are involved in planning how to use resources provided to answer the questions using different types of enquiry, helping them to recognise that there are different ways in which questions can be answered. | ***Asking relevant questions and using different types of scientific enquiries to answer them.***<br><br>• The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions.<br>• The children answer questions posed by the teacher.<br>• Given a range of resources, the children decide for themselves how to gather evidence to answer the question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. They identify the type of enquiry that they have chosen to answer their question. | ***Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.***<br><br>• Children independently ask scientific questions. This may be stimulated by a scientific experience or involve asking further questions based on their developed understanding following an enquiry.<br>• Given a wide range of resources the children decide for themselves how to gather evidence to answer a scientific question. They choose a type of enquiry to carry out and justify their choice. They recognise how secondary sources can be used to answer questions that cannot be answered through practical work. |

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| Making observations and taking measurements. | ***Observing closely, using simple equipment.***<br><br>• Children explore the world around them. They make careful observations to support identification, comparison and noticing change. They use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations.<br>• They begin to take measurements, initially by comparisons, then using non-standard units. | ***Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.***<br><br>• The children make systematic and careful observations.<br>• They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements. | ***Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.***<br><br>• The children select measuring equipment to give the most precise results e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale.<br>• During an enquiry, they make decisions e.g. whether they need to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching); in order to get accurate data (closer to the true value). |
| Engaging in practical enquiry to answer questions. | ***Performing simple tests.***<br><br>• The children use practical resources provided to gather evidence to answer questions generated by themselves or the teacher. They carry out: tests to classify; comparative tests; pattern seeking enquiries; and make observations over time.<br>Identifying and classifying<br>• Children use their observations and testing to compare objects, materials and living things. They sort and group these things, identifying their own criteria for sorting.<br>• They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing. | ***Setting up simple practical enquiries, comparative and fair tests.***<br><br>• The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher.<br>• They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.<br><br>***Explanatory note***<br>A comparative test is performed by changing a variable that is qualitative e.g. the type of material, shape of the parachute. This leads to a ranked outcome.<br>A fair test is performed by changing a variable that is quantitative e.g. the thickness of the material or the area of the canopy. This leads to establishing a causative relationship. | ***Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.***<br><br>• The children select from a range of practical resources to gather evidence to answer their questions. They carry out fair tests, recognising and controlling variables. They decide what observations or measurements to make over time and for how long. They look for patterns and relationships using a suitable sample. |

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| Recording and presenting evidence. | ***Gathering and recording data to help in answering questions.***<br><br>• The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing.<br>• They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs.<br>• They classify using simple prepared tables and sorting rings. | ***Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.***<br><br>• The children sometimes decide how to record and present evidence. They record their observation e.g. using photographs, videos, pictures, labelled diagrams or writing. They record their measurements e.g. using tables, tally charts and bar charts (given templates, if required, to which they can add headings). They record classifications e.g. using tables, Venn diagrams, Carroll diagrams.<br>• Children are supported to present the same data in different ways in order to help with answering the question. | ***Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.***<br><br>• The children decide how to record and present evidence. They record observations e.g. using annotated photographs, videos, labelled diagrams, observational drawings, labelled scientific diagrams or writing. They record measurements e.g. using tables, tally charts, bar charts, line graphs and scatter graphs. They record classifications e.g. using tables, Venn diagrams, Carroll diagrams and classification keys.<br>Children present the same data in different ways in order to help with answering the question. |
| Answering questions and concluding. | ***Using their observations and ideas to suggest answers to questions.***<br><br>• Children use their experiences of the world around them to suggest appropriate answers to questions. They are supported to relate these to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources. | ***Using straightforward scientific evidence to answer questions or to support their findings.***<br><br>• Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. The answers are consistent with the evidence. | ***Identifying scientific evidence that has been used to support or refute ideas or arguments.***<br><br>• Children answer their own and others' questions based on observations they have made, measurements they have taken or information they have gained from secondary sources. When doing this, they discuss whether other evidence e.g. from other groups, secondary sources and their scientific understanding, supports or refutes their answer.<br>• They talk about how their scientific ideas change due to new evidence that they have gathered.<br>• They talk about how new discoveries change scientific understanding. |

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| Evaluating and raising further questions and predictions. | | ***Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.***<br><br>• They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.<br>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions<br>• Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface.<br>• Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.<br><br>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions<br>• Children use their evidence to suggest values for different items tested using the same method e.g. the distance travelled by a car on an additional surface.<br>• Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry. | ***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.***<br><br>• They evaluate, for example, the choice of method used, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources used.<br>• They identify any limitations that reduce the trust they have in their data.<br>Using test results to make predictions to set up further comparative and fair tests<br>• Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests. |
| Communicating their findings. | | ***Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.***<br><br>• They communicate their findings to an audience both orally and in writing, using appropriate scientific vocabulary. | ***Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.***<br><br>• They communicate their findings to an audience using relevant scientific language and illustrations. |