Science and Data Handling

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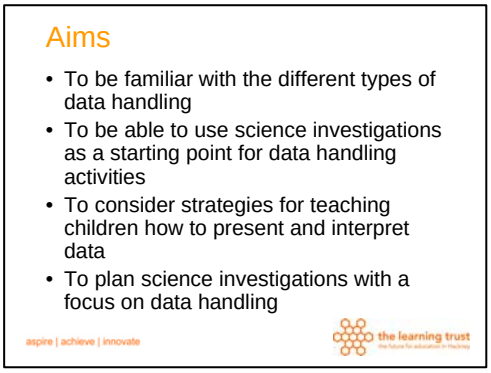
For this INSET it is recommended that participants sit in groups that contain a mix of staff from different key stages and year groups.

Introduction

Show Slide 1



Slide 1 shows the aims of the session. Allow time for the staff to read these.

"We will be looking at the different types of data handling, when they are introduced to children and progression. For many children maths, especially data handling is very abstract and has little point. Science investigations can provide an opportunity for data handling to have relevance and an outcome whilst also consolidating their science enquiry skills in presenting and interpreting their results.

Are we confident that children are able to make the links between the data handling they do in numeracy and science? Is the quality the same? (Science) Do they understand why they are doing it? (Numeracy) Are children able to tackle data handling independently? Are they able to choose, use and apply appropriate forms of data handling?"

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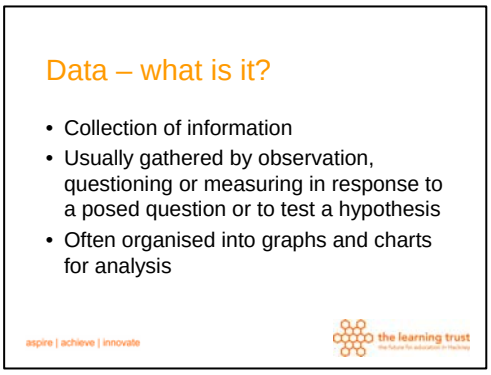
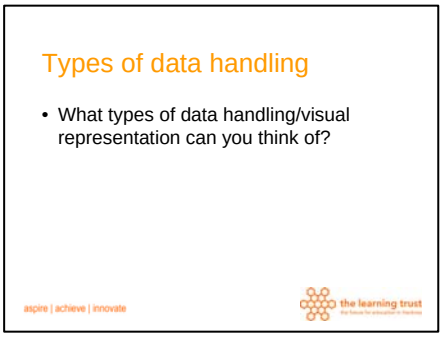


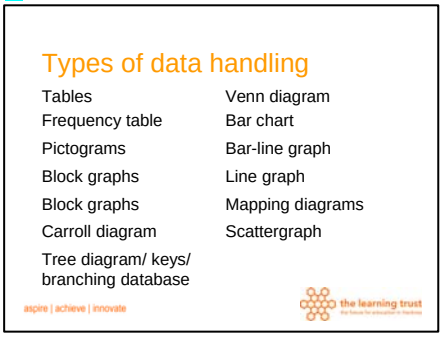
Types of data handling

Show slide 3



In groups ask the participants to write on post it notes the types of data handling that they can think of.

When participants have had time to discuss this (up to 5 minutes) show Slide 4



These are the types of data handling that children will expereince in primary school. Did they get them all? Are there any others?

Are there any with which they are not familiar? The trainer can use the accompanying notes to clarify and explain. See Data Handling Glossary.

Next ask the participants to sort these types of data handling according to when they would be taught. Use the A3 laminated sorting grid.

A little later ask - When is it first taught? How is it different in KS1 and KS2?

Refer participants to the progression in data handling from the new framework Appendix 1.

Handout cards with examples of data handling and a sorting grid. Participants sort onto the grid justifying their choices. Compare with other groups.

Gathering and presenting data

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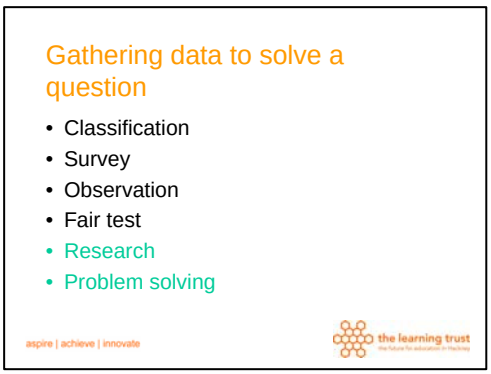

There are a range of types of science enquiry that can be used to answer a question or to test a hypothesis. These first 5 types will produce data, although today we will not be considering research. Problem solving the sixth type of science enquiry will not be addressed today as it does not usually generate data.

Classification

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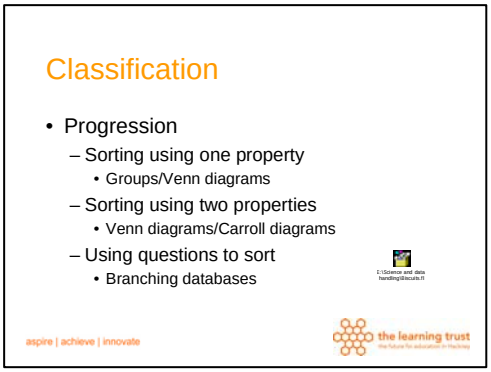

Classification is sorting and grouping and starts in the foundation stage. We need to sort things all the time even if it is simply to put things away so that we can find them again!

Hand out the plates of biscuits. Ask the participants to sort the biscuits according to their own criteria. Can other teachers guess how they have sorted them? Allow time for people to sort in several different ways as the more times you do it the more difficult it becomes. This is when discussion starts as people have to justify their decisions. Highlight how this is a good SC1 skill– justifying opinions.

Handout Carroll diagram. Teachers sort the biscuits onto the A3 diagram. When are Carroll diagrams taught? Highlight the fact that this type of data handling needs to be revisited outside of the Numeracy lessons.

Show the linked Activ primary flipchart of the Carroll diagrams.

Ask one person in each group to choose a biscuit. The other people have to guess which biscuit it is by asking yes/no questions, as in the game Guess who or 20 questions. ‘Is it round?’

Ask the participants to use strips of paper to write questions to create a tree or branching database.

This picture shows a branching database that a group of children produced during a lesson about the properties of materials.

Fair testing

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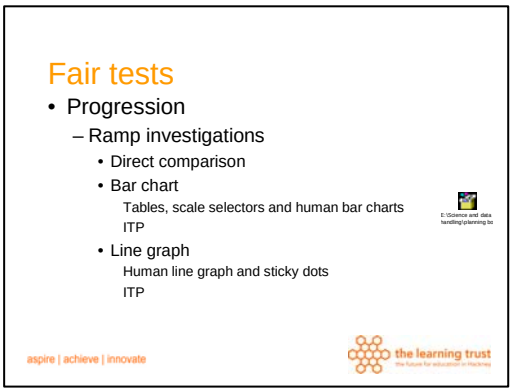
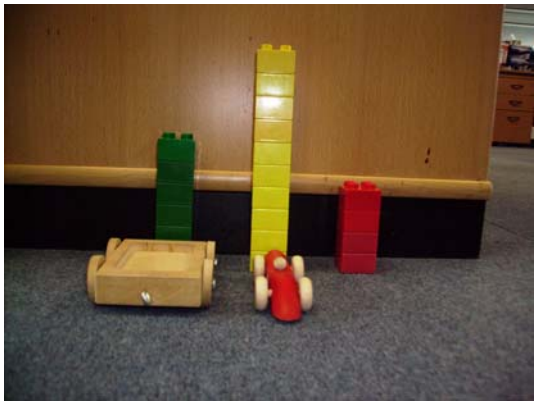


Initially children will not be able to use measuring equipment. They can create instant graphs.

Instant graphs



For example if an investigation involves measuring a length, such as sliding objects down a ramp, building bricks can be used to measure the distance travelled by the objects. Demonstrate measuring a distance using blocks. These can then be used to create an instant graph.

Tables

Older children will start to use non standard measurements which they can start to record in a table. Children, where possible, should be encouraged to create their own tables from scratch. A table is simply two lines with headings.

Type of vehicle	Distance

Demonstrate how to draw a table on the white board.

Use post it notes to transfer the data from the instant graph onto the table.

Scale selectors

Drawing a graph is again two lines with labels, but this time the axes need scales. If children are taught how to choose an appropriate scale for themselves they will be able to check their own work and that of others for errors.

Show the post it table selector.

Ask the participants which would be the most appropriate scale for the data.

Human bar charts

Ask for volunteers to help present the data as a human bar chart. Use post it note labels for each axis – x axis type of vehicle, y axis distance travelled. Choose the most appropriate scale for the y axis. Stick the post-its on asking for help to position them. Ask people to make the bars of the graph with their heads at the right height. Take a photo for the staff room!

The same skills are required for line graphs. Line graphs are not only for year 6. Children should be given experiences lower down the school. To produce a human line graph the points are shown by a fist and a skipping rope is held in the hand for the line.

Another strategy you can try before asking the children to draw line graphs independently is having a large class graph and as groups take a measurement they can mark it on the large graph with a sticky dot.

Drawing graphs independently
These skills will then need to be transferred to paper graphs. Show the participants the scale selector and graph paper and how to use it. See Appendix 2. Highlight that this is useful in any subject not just science. It can also be differentiated.

Show how the flipchart can be used to teach the skills required to draw a bar chart.

Show the ITPs for both the bar chart and line graph.

It is important to plan a fair test investigation so that that the children will be producing data that is appropriate for the type of graph that you wish them to practice drawing.

Observation

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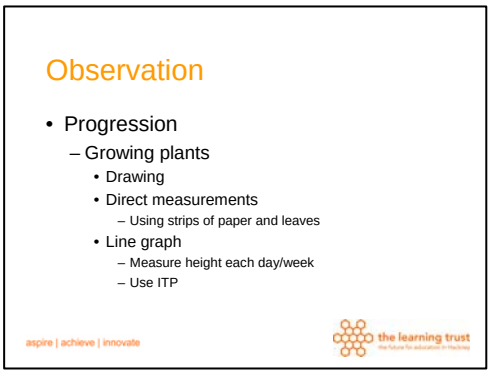


Children may start by drawing what they see over time eg number of leaves, height of stem.

Take direct measurements. Use garden string to make a replica stem and add correct number of leaves.

Measure the height of the stem regularly and plot this on a line graph.

Survey

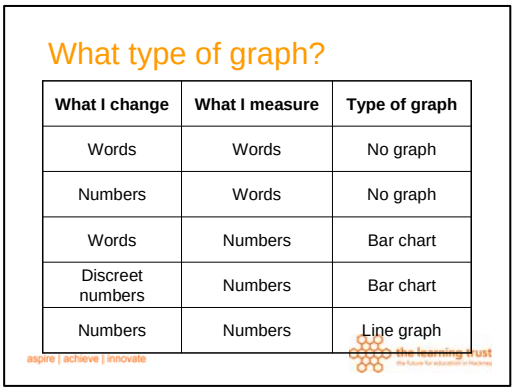
Show Slide 9.

Laminated photographs of children can be used to create pictograms from surveys. A pictogram grid can be left on the wall and each day a different question displayed. Children move their photo according to their answer. This can be discussed later in the day. Children can be encouraged to generate their own questions to investigate.

Often surveys compare two sets of data, particularly about the human body, to identify if there are links. For example do taller children have longer arms? Can children with longer legs jump further? This information would need to be presented as a scattergram which is generally difficult for younger children to do, however it is possible. Show how children can measure their height and arm reach using the coloured height chart. They then stick their photo on the correct square on the 9 square grid. This can be done in KS2 with children taking actual measurements and putting these onto a large graph and sticky dots.

For some questions such as how much do children drink in a day there are many possible amounts eg 0ml to over 1000ml. This needs to be plotted as a frequency chart. The range is split into chunks eg 1-10ml, 11-20ml and the number of children falling in each group is tallied. This is then plotted as a frequency chart.

Which graph to use?



The children need to be able to decide for themselves what is the most appropriate form of presentation – particularly whether to use a bar chart or line graph. This chart should help them to decide.

Ask the participants to look at Appendix 3 and decide what sort of graph would be used for each investigation.

Interpreting data

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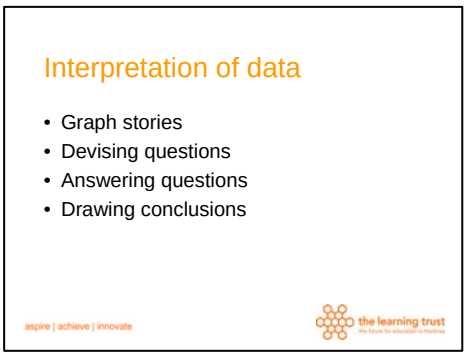

This is the area that children often find the most difficult. However if they are used to drawing graphs for themselves they should find it easier to interpret them.

Ask participants to look at the graph in Appendix 4. This shows how the temperature of the water changes when cooking frozen peas. Look at the graph. Can you tell the story?

Another way to get children familiar with graphs is to encourage them to write questions for others to answer.

Drawing conclusions

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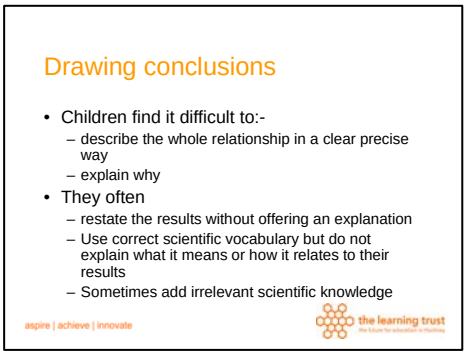

Drawing conclusions is an area of science enquiry that is often overlooked as often the lesson runs out of time at this point. It is a good idea to start at this point in the investigation sometimes so that the children are explicitly taught how to write a good conclusion.

Children need to be shown what a good conclusion looks like - they need to have conclusion writing modelled for them. A good conclusion will contain a description of the patterns and trends and also an explanation.

Look at Appendix 5 and discuss how well the children have described the relationship.

Look at Appendix 6 and discuss the explanations. Use the notes overleaf to help with the discussion.

Falling Paper

Pupil	**Good and bad points**	**Order** (1 best)
Leah	Just tells you the results. No explanation or link to science knowledge.	**4=**
Rick	Makes a connection to everyday life. Does not link to the results. Does not explain.	**4=**
Ali	Uses scientific term (air resistance). Does not say what 'it' means. Does not link to the results.	**2**
Chloe	Explains well. Links made with specific results (largest and smallest) rather than whole pattern. Scientific term 'air resistance' not used but understanding of term shown.	**1**
Shona	Attempt at an explanation. Does not say what 'it' means. Indicates that air can exert a force. Does not link explicitly to results.	**3**
Kurt	Irrelevant information. No link to results	**6**

Task
Next time you are doing a data handling unit in Numeracy identify how you can use data from your science work to support it.

Resources

Post it notes
Examples of data handling in laminated cards
Sorting grid for above
Biscuits (Tescos **variety** pack) and plates 2 per group
Laminated Carroll Diagram A3
Cars, ramps and bricks
Post it scale selector
Skipping rope
Height chart x 2 with added colours
9 square grid

Handouts

Powerpoint

Appendix 1
Progression in data handling from the new framework.

Appendix 2
Scale selector and graph

Appendix 3
Which type of graph?

Appendix 4
Pea graph

Appendix 5
Describing a relationship

Appendix 6
Writing better explanations

Appendix 7
Presenting scientific evidence poster

Appendix 8
Data handling vocabulary

Appendix 9
Data handling websites