The Young Scientist's Handbook

Contents

The Laboratory Safety Rules

We should always follow these rules during experiments and activities in the science laboratory.

Listen to instructions as carefully as you can

Make sure your hair is tied back before an experiment

Never eat or drink in the laboratory

Always clean and tidy up after an experiment

Make sure the spaces between benches are clear of bags and jackets

Always wear goggles when using the Bunsen burner

Do not run in the laboratory

Report all breakages at once

Use the gas, electricity and water for experiments only

Also see page seven on starting science book 1.

Thinking about Learning (1)

The learning log

A learning log helps you think about what you have learned in class. At least two log entries should be completed after each lesson. The learning log should be completed in your jotters or any notebook you may have. Remember each log should be dated and titled.

Suggested learning log entries

I really enjoyed ...

I want to find out more about ...

I was unsure about ...

I was surprised by ...

I learned that ...

22nd Feb 1891

Lesson on Batteries

i really enjoyed the battery investigations.

i want to find out how cells are made

i was unsure about 'voltage'

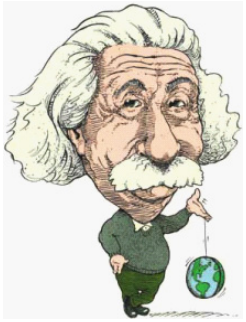
i was surprised that there are so many types cell.

i learned that cells have energy

i learned that two or more cells is called a battery.

Albert

This is a typical learning log entry from my school days. Try to keep yours up to date and as neat as you can.



Thinking about Learning (2)

The scientific report

A scientific report is a record and evaluation of your experiment. Scientific reports have all or **most** of the following headings.

Heading ... Any title that helps describe the experiment.

Aim ... What you are trying to find out.

Hypothesis ... What you think the answer to the aim is.

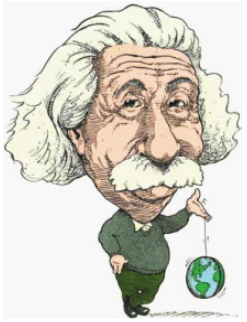
Method ... A few brief sentences describing what you did including a simple labelled line diagram.

Result ... What actually happened. Results are often put in tables and displayed in bar graphs or line graphs.

Conclusion ... The answer to the aim using the result.

Evaluation ... See young Einstein's evaluation below to get an idea of what can be written here

I wrote this report when I was 12. Notice that it is not always necessary to use all the headings.



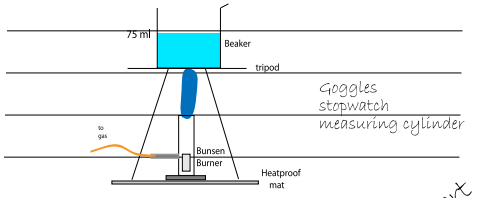
15th March 1891

Boiling water

Aim: How long will it take to boil 75 ml of water?

Method: 75 ml of water was carefully put into a measuring cylinder and then poured into a beaker.

The apparatus was set up as shown



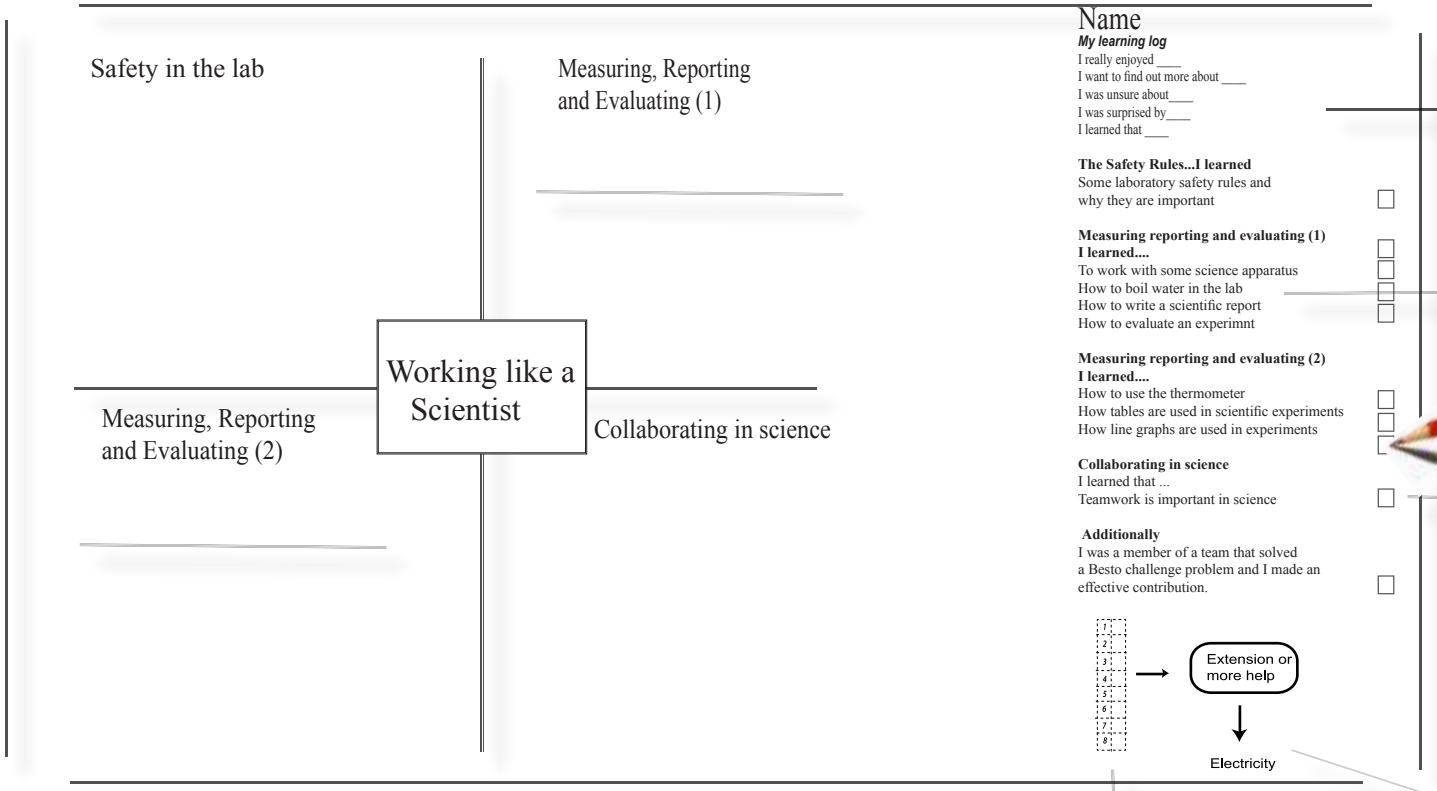
Result: The water boiled in 130 seconds

Albert

Evaluation. This result was 25 seconds longer than the class average so it is possible we used too much water. I would like to repeat the experiment with different volumes of water and look for a pattern.

Thinking about Learning (3)

The learning square



This is an example of a learning square. Each square has four smaller squares representing a lesson of the topic you are studying. Each lesson in class ends with questions for your learning square. This means the completed square is mainly your own work and is a summary of the work completed in class.

This grid is for the Quick Quiz that helps you and your teacher find out how you are progessing and if you need more help.

This is a reminder of your learning log. Continually reflecting and thinking about your learning is very important if you wish to successfully learn in school. See page 4.

These are statements telling you what you should have learned and the scientific skills you have developed.

These boxes are to be coloured either green, yellow or red.
Green means you understand
Yellow means you don't quite get it
Red means you need help.

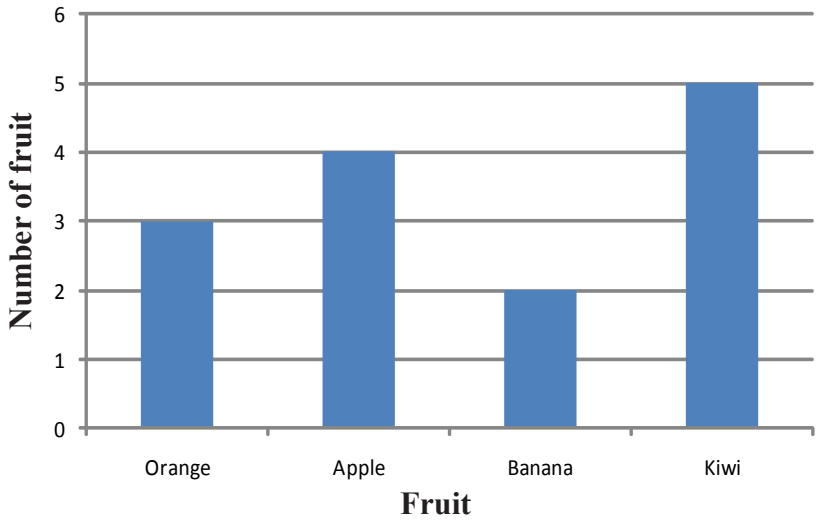
This tells you the next unit you will study.

Thinking about Learning (4)
Presenting Our Work

Scientists display data using tables, charts and graphs.

Bar graphs

A bar graph allows you to quickly compare two or more values. Suppose you have a bowl of fruit with, four apples, three oranges five kiwi fruit and two bananas. Present this information as a bar graph

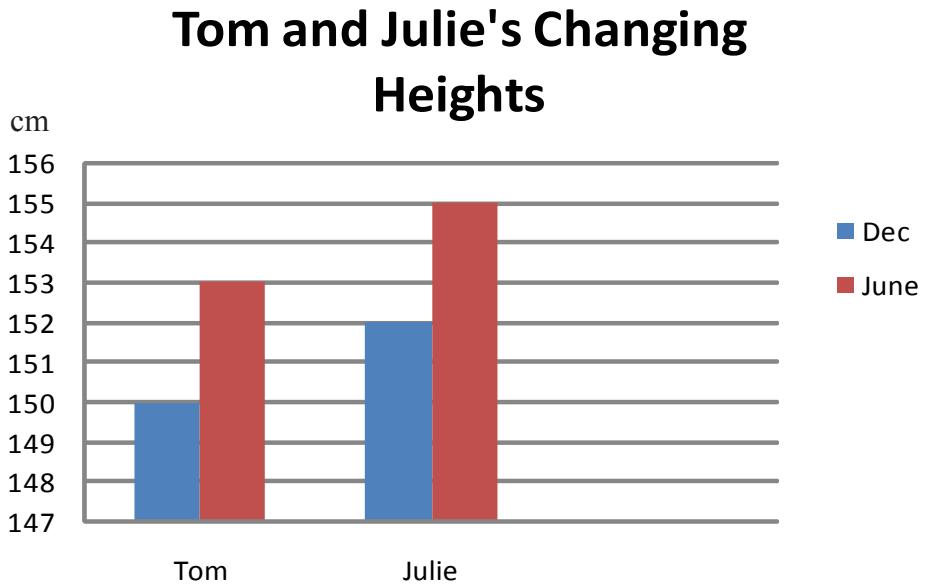


We can quickly see that the most fruit in the graph is kiwi and the least are bananas.

All bar charts should have: labelled axes and bars, correctly drawn bars the same width and the same space between them.

Exercise... Find of a set of objects or items and i) put them into a bar graph by hand and ii) use a computer programme, like Excel or find a website that draws graphs.

Bar graphs are also useful for showing how data changes over a period of time. Suppose Tom is 150cm in June and 153cm in December whereas Julie 152 cm in June and 155 cm in December. Present this information in a bar graph.



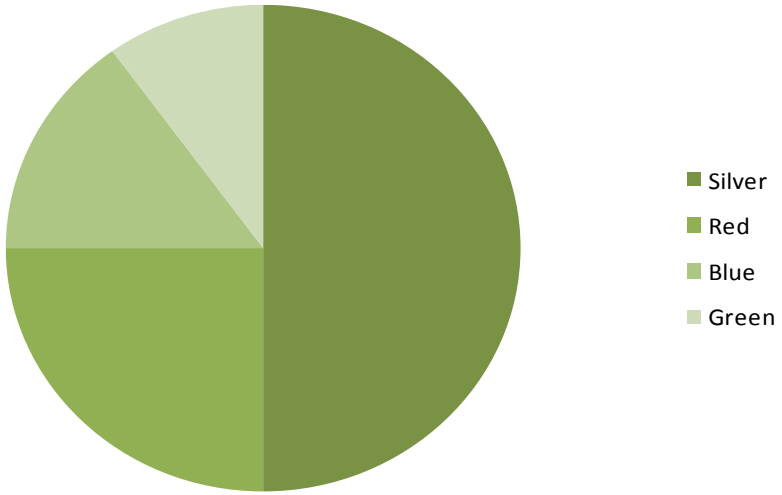
We can quickly se how Tom and Julie grew over the six month period Notice the key on the right. You can decide yourself on how you indicate what bar represents each month.

Exercise... Find a group of four or five friends and measure their heights at different times during the year. Decide yourself how often you will measure each other's height and the time period between measurements. Then complete a bar graph just like the one above. This exercise takes a little planning and organising.

At the end of the measuring period use a computer programme, like Excel or find a website that draws graphs like this.

The pie chart

Pie charts are useful for showing how much each item contributes to the total amount. For example, Suppose we have a carpark with a total of 20 cars. Five cars are red 10 are silver and three are blue and two are black. Present this infornation as a pie chart.



We can quickly see that 50% or half the car park is made up of silver cars.

Exercise: Find of a set of about 10 or 20 objects and i) draw a pie chart by hand and ii) use a computer programme, like Excel or find a website that draws pie charts.

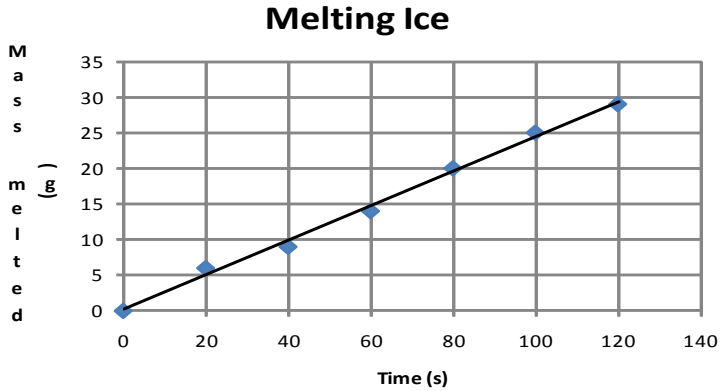
Note: The total pie represents 100% and each slice represents a percentage portion of it.

(Also see pages 10 and 11 in Starting Science Book 1)

The line graph

The line graph is used for finding a trend or pattern between the values. For example suppose a scientist measures the mass of water melting from a block of ice every ten seconds and presents her results in a table and then a graph.

Time (s)	Mass Melted (g)
20	5
40	9
60	14
80	20
100	25
120	30



Note how the graph that the best straight line goes through most of the points.

Exercise: Use this table and draw your own graph. Remember to label the axis, find the best scale and draw the best fit straight line.

Try to use Excel or a website and use the computer to draw the line.

Time (s)	Mass Melted (g)
20	9
40	17
60	28
80	40
100	49
120	60

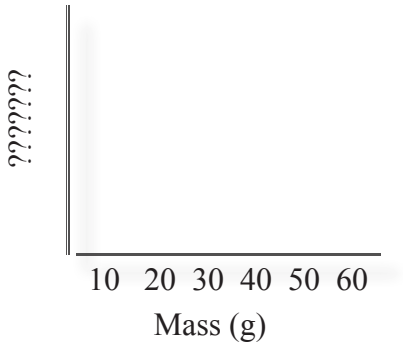
Thinking about Learning (5)
A Besto Challenge

Besto Industries have set you a task to find the volume of 1 g of water. To do this you will need electronic scales, a small beaker and a 100 ml measuring cylinder and any other apparatus in the lab.. Since this is one of your first ***Besto*** challenge some help is given.

This is the table you will need

Mass (g)	(?????)
10	
20	
30	
40	
50	
60	

This is the graph you will draw



To find the volume of 1 g of water divide the height of the graph by the total mass of water used.

This is a collaborative exercise and needs some planning and thought. Work in a group of four or five and decide together on the job you will do. One full report is needed covering all (except the hypothesis) the headings. Don't forget the evaluation. Decide how to share the work of the report and how to present your work to the class.

(This task can be completed at any time in S1)