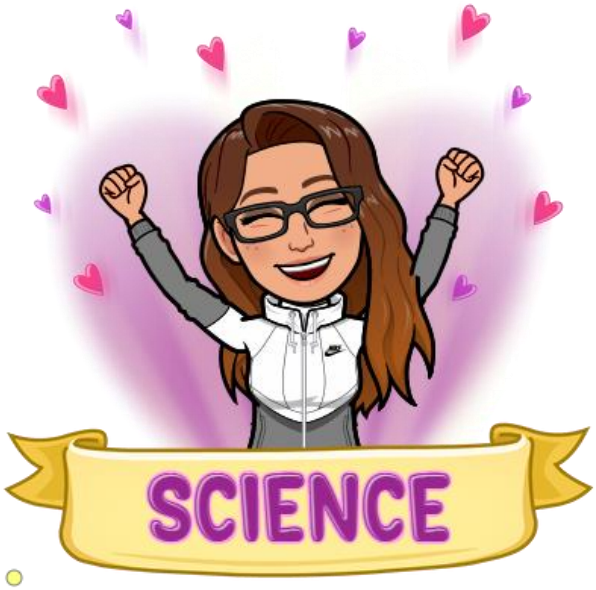
MORLEY VICTORIA

Encouragement ★ Enjoyment ★ Success ★ Effort ★

Working Scientifically

What does this mean?

A parent's guide



What is it?

This is the core area to science teaching. We can fill children's head with facts they can parrot when asked but that will not produce the next generation of scientists. Getting this right is what will inspire our future physicists, botanists and astronomers. We need to instil a love of science from an early age. The truth is that we are all born scientists - anyone teaching EYFS will tell you how many questions a child can ask in one hour let alone a day! We are programmed to be curious and to wonder why. We must equip children with the skills and knowledge to go on the scientific pursuit of answering the why, how and what if questions they pose. We must nurture their natural curiosity and ensure it is not lost as they progress through school and grow older. (Plan Bee Science)

These skills are taken from the National Curriculum for years 1-6 and are progressive all the way from Early Years to Year 6. Although science as a subject is not taught in early years, we ensure that children are exposed to these skills through their EYFS curriculum and early learning goals. At Morley Victoria, we refer to these as 7 key skills that are displayed within classrooms and in children's books. Every lesson of science aims to contain at least one of these skills for the children to develop.

This booklet explains the 7 working scientifically skills along with the symbols that your children will become used to seeing in their lessons.

Asking questions

Asking questions that can be answered using a scientific enquiry.

- In Early Years, children may ask simple questions to understand the world around them.
- During years 1 and 2 (age 5-7), pupils should be taught to ask simple questions and recognise that they can be answered in different ways
- During years 3 and 4 (ages 7-9), pupils should be taught to ask relevant questions and use different types of scientific enquiries to answer them
- During years 5 and 6 (ages 9-11), pupils should be taught to plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary

Questions children may ask:

- **What features do animals living at the North Pole have?** Children might use books, websites or watch videos to find out (research).
- **Do all flowers have five petals?** Children may suggest carrying out a survey of flowers in the school grounds (pattern seeking).
- **Which shoes have most grip?** Children could investigate the forces needed to pull shoes across different surfaces (a comparative test).
- **When is the bulb brightest?** Children could investigate the effect of changing the number of batteries or the thickness / length of the wire in their circuit (fair tests).

Making predictions

Using prior knowledge to suggest what will happen in an enquiry.

- During Early Years, pupils are encouraged to share their thoughts about what might happen when carrying out a shared enquiry.
- During years 1 and 2 (age 5 – 7), pupils should be taught to make predictions about what may happen before carrying out an enquiry.
- During years 3 and 4 (age 7-9), pupils should be taught to use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.
- During years 5 and 6 (age 9-11), pupils should be taught to use test results to make predictions to set up further comparative and fair tests.

Predictions that children may make:

- **I think that the biggest egg will hatch first.** You could have an egg hatching kit in the classroom for chicks (observation over time).
- **I think that some objects can be hard and soft.** Children could identify classroom objects as hard and/or soft and place into labelled hoops (Identifying, grouping and classifying). Will the hoops need to overlap because some objects are hard and soft?
- **I think this is the strongest magnet.** Children could measure the greatest distance that different types of magnet attract a paperclip (fair test).
- **I think the puddle on the in the sun will evaporate sooner than the puddle in the shade.** Children may investigate by measuring the perimeter of the puddle or taking photographs during the day (observation over time and a comparative test).

Setting up tests

Deciding on the method and equipment to use to carry out an enquiry.

- During Early Years, pupils will carry out simple tests with adults.
- During years 1 and 2 (age 5-7), pupils should be taught to perform simple tests.
- During years 3 and 4 (age 7-9), pupils should be taught to set up simple practical enquiries, comparative and fair tests.
- During years 5 and 6 (age 9-11), pupils should be taught to plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary using test results to make predictions to set up further comparative and fair tests

Planning an investigation with children often starts with a question and then discussion about the method and equipment needed. Sometimes it is appropriate to provide the equipment and let the children decide their method independently. Sometimes you might have a class discussion to plan how the children will carry out the investigation but leave the children to select the equipment they need.

- **What changes do you notice across the four seasons?** Children may decide to observe one tree across the year and ask to photograph it using a camera or tablet (observation over time).
- **How do rocks vary?** Children may use hand lenses or microscopes to help them identify whether they have grains, crystals or fossils in them (identifying, grouping and classifying).
- **How will you separate this mixture of sand, stones and salt?** You may provide a range of sieves, spoons, filter paper and funnels so that the children can explore how to do this most effectively (problem solving.)

Observing and measuring

Using senses and measuring equipment to make observations about the enquiry.

- During Early Years, pupils should be taught to observe the world around them and make close observations of enquiries they participate in.
- During years 1 and 2 (age 5-7), pupils should be taught to observe closely, using simple equipment.
- During years 3 and 4 (age 7-9), pupils should be taught to make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.
- During years 5 and 6 (age 9-11), pupils should be taught to take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.

Children will use a variety of equipment for observing and measuring:

- Using different senses - you may use ‚feely‘ bags or smelling pots to encourage young children to use their sense of touch and smell to identify different objects (identifying, grouping and classifying).
- Measuring with rulers - children might investigate what happens to a seed or bulb as they grow into mature plants and measure the length of the stem (observation over time).
- Using a thermometer - children might investigate the effect of temperature on the time it takes sugar to dissolve (fair test).
- Using data loggers - children could record sound made by a ticking clock as the distance from the source increases (pattern seeking).

Recording data

Using tables, drawings and other means to note observations and measurements.

- During Early Years, pupils should record their enquiries with the support of an adult using tally charts and cutting and sticking.
- During years 1 and 2 (age 5-7), pupils should be taught to gather and record data to help in answering questions.
- During years 3 and 4 (age 7-9), pupils should be taught to gather, record, classify and present 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.
- During years 5 and 6 (age 9-11), pupils should be taught to record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

Children may record data is several ways:

- Using drawings or annotated diagrams - children investigating the effect of light, water and temperature on plant growth might draw diagrams of the plants every few days (observation over time).
- Using tables - children investigating materials that conduct electricity might record their findings in a table (comparative test).
- Using graphs - children investigating whether people with the longest legs run fastest could plot a scatter graph and draw a ‚line of best fit, to see whether there is a direct relationship (pattern seeking).

Interpreting and communicating results

Using information from the data to say what you found out.

During Early Years, pupils should communicate their findings using mainly oral methods.

During year 1 and 2 (age 5-7), pupils should be supported to record and communicate their findings in a range of ways and begin to use simple scientific language.

During years 3 and 4 (age 7-9),pupils should be taught to use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusions.

During years 5 and 6 (age 9-11), pupils should be taught to use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas. Use oral and written forms such as displays and other presentations to report conclusions, causal relationships and explanations of degree of trust in results

Pupils may record their findings in oral or written forms.

Children may communicate their results in many ways:

- Orally - young children could explain to the class which items sink and float after they have each tested some objects (identifying, grouping and classifying).
- Drama - children describe pollination of flowers by insects after watching some film clips (research)
- Power point - older children could present a power point to their peers after finding out about the life cycle of a chosen animal (research).
- Diagrams - children could create a classification key to identify mini beasts or plants after carrying out a survey in their local environment (identifying, grouping and classifying)
- Poster/leaflet - children could suggest which drinks would be best for your teeth after investigating the effect of different liquids on eggshells (observation over time & fair test).
- Sticky note/paragraph - children could write a short paragraph to explain how to make the best string telephone after testing various pots and threads (pattern seeking).

Evaluating

Reflecting on the success of the enquiry approach and identifying further questions for enquiry.

During Early Years, pupils should be asked to say if they think their prediction was correct.

During year 1 and 2 (age 5-7), pupils should be taught to identify if the results of their experiment matched their prediction and if they thought it was done fairly.

During years 3 and 4 (age 7-9),pupils should be taught to use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.

During years 5 and 6 (age 9-11), pupils should be taught to report and present findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations.

Pupils may evaluate their practical investigations orally or in written forms:

- Informal discussion between pupil and teacher - a pupil may explain that the rocket mouse did not travel far because the bottle was small (comparative test).
- Class discussion - pupils may agree that they did not find many mini beasts when they went out to survey the school grounds because it was a cold/wet day (identifying, grouping and classifying).
- Written paragraph - a child may explain an anomalous result on a graph. For example, when investigating the effect of different shapes on water resistance (fair test), .We found it difficult to start the stop watch exactly at the time the shape touched the surface of the liquid so the times are not very accurate..