Coleridge Primary School

SCIENCE

CREATIVE, CARING, RESILIENT

Whole School Progression Map – The Nature, Process and Methods of Science (*Working Scientifically*)

Children are naturally curious. '*Why is the sky blue?', 'How do birds fly?', 'What is water made of?'* are just some of the of *wide-eyed* questions that young children might ask as they begin to make sense of the world around them.

Through *The Nature, Processes and Methods of science*, (often referred to simply as '*Working Scientifically'*), children learn the skills of scientific enquiry. These skills allow them to think and behave like scientists; to refine their questions; and to understand the possible ways in which they might find answers to these themselves - either through conducting their own investigations, or through drawing on data and secondary research sources.

In order for children to be able to *Work Scientifically* however, they must first have a deep substantive knowledge: a child who does not yet know what a plant needs to survive, for example, cannot be expected to identify variables that could be changed in order to affect their rate of growth. Similarly, a child who does not have the adequate vocabulary to describe materials, cannot be expected to classify or group them based on their properties.

For this reason, it is vitally important that *Scientific Knowledge and Conceptual Understanding* (the facts of science), are taught in very careful sequence with *The Nature, Processes and Methods of Science* (the skills of science enquiry).

The progression map shown below aims to make clear how The Nature, Processes and Methods of science are taught across the age range, so as to develop and strengthen these skills in children as they move through the school.

For ease of navigation, this progression map groups the many skills that children are expected to master, into 7 board headings:

- **Asking and Answering Questions**
- **Observing and Measuring**
- **Engaging in Practical Enquiry**
- **Recording and Presenting Data**
- **Answering Questions and Drawing Conclusions**
- **Evaluating and Raising Further Conclusions and Predictions**
- **Communicating Findings**

	EYFS (Nursery and Reception)	Key Stage 1 (Years 1 &2)	Lower Key Stage 2 (Years 3 & 4)	Upper Key Stage 2 (Years 5 & 6)
Asking Questions	Explore the natural world around them (Understanding the World: reception) Notice and ask questions about differences (Personal, Social & Emotional Dev: birth-3) Understand simple questions about 'who', 'what' and 'where' (Communication & Language: 2 years) / understand 'why' questions (3-4 years) / ask questions to find out more (reception	**Asking Simple Questions and recognising that they can be answered in different ways** • 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. • The children answer questions developed with the teacher often through a scenario. • 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.** • The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions. • The children answer questions posed by the teacher. • 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 enquiry to answer questions, including recognising and controlling variables where necessary** • 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. • 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.

Observing and Measuring	Use all their senses in hands-on exploration of natural materials (Understanding the World: 3-4 years) Explore the natural world around them, making observations and drawing pictures of animals and plants (ELG: The Natural World) Talk about what they see, using a wide vocabulary (Understanding The World: 3-4 years Make comparisons between objects relating to size, length, weight and capacity (Mathematics: 3-4 years) / compare length, weight and capacity (reception)	**Observing closely, using simple equipment** • 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. • They begin to take measurements, initially by comparisons, then using non-standard units.	**Making systematic and careful observation and, where appropriate, taking accurate measurements using standard units on a range of equipment (thermometers, beakers, weighing scales, data loggers etc.)** • The children make systematic and careful observations. • They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.	**Taking measurements, using a wider range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate** • 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. • 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	Make choices and explore different resources and materials (Playing & Exploring) Choose the right resources to carry out their own plan (Physical Dev 3-4 years) / Be confident to try new activities and show independence, resilience and perseverance in the face of challenge (ELG: Managing Self)	**Performing simple tests** • 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. **Identifying and classifying** • 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. • 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** • The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher. • They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary** • 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.
Recording and Presenting Data	Use drawing to represent ideas (Expressive Arts & Design: 3-4 years) / return to and build on their previous learning, refining ideas and developing their ability to represent them (reception)	**Gathering and recording data to help in answering questions** • The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. • They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs. • 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** • 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. • 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** • 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. • Children present the same data in different ways in order to help with answering the question.

Answering Questions and Concluding	Know more, so feel confident about coming up with their own ideas (Creating & Thinking Critically) Offer explanations for why things might happen, making use of recently introduced vocabulary (ELG: Speaking) Offer their own ideas, using recently introduced vocabulary (ELG: Speaking)	**Using their observations and ideas to suggest answers to questions** • 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 their observations and ideas to suggest answers to questions** • The children recognise 'biggest and smallest', 'best and worst' etc. from their data.	**Using straightforward scientific evidence to answer questions or to support their findings** • 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 differences, similarities or changes related to simple scientific ideas and processes** • Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. **Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions** • They draw conclusions based on their evidence and current subject knowledge.	**Identifying scientific evidence that has been used to support or refute ideas or arguments** • 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. • They talk about how their scientific ideas change due to new evidence that they have gathered. • They talk about how new discoveries change scientific understanding. **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** • In their conclusions, children: identify causal relationships and patterns in the natural world from their evidence; identify results that do not fit the overall pattern; and explain their findings using their subject knowledge.
Evaluating and Raising Further Conclusions and Predictions			**Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions** • They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. **Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions** • 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. • 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** • 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. • They identify any limitations that reduce the trust they have in their data. **Using test results to make predictions to set up further comparative and fair tests** • Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.

Communicating Findings			**Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions** • 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** • They communicate their findings to an audience using relevant scientific language and illustrations