## **Progression in working scientifically skills**

NB - The National Curriculum statements in italics in these tables indicate that they feature more than once.

EVES	Vear 1 & 2	Vear 3 & 4	Year 5 & 6
Asking ques	stions and recognising that	it they can be answered in	different ways
<ul> <li>Asking questions about what they have observed</li> <li>While exploring the world, the children develop their ability to ask questions (such as: what something is, how things are similar and different, why things happen and how things work). Where appropriate, they will suggest possible answers to these questions.</li> <li>The children answer questions developed with the teacher often through modelling.</li> </ul>	<ul> <li>Asking simple questions and recognising that they can be answered in different ways</li> <li>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.</li> <li>The children answer questions developed with the teacher often through a scenario.</li> <li>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.</li> </ul>	<ul> <li>Asking relevant questions and using different types of scientific enquiries to answer them</li> <li>The children consider their prior knowledge when asking questions. They independently use a range of question stems. Where appropriate, they answer these questions.</li> <li>The children answer questions posed by the teacher.</li> <li>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.</li> </ul>	<ul> <li>Planning different types of scientific enquiries to answer questions, including recognising and controlling variables, where necessary</li> <li>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.</li> <li>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.</li> </ul>

Application in related substantive context			
<ul> <li>What is this? Encourage description, e.g., green, living, part of a plant.</li> <li>How does the water reach the petals of the daffodil?</li> <li>How do potatoes grow? (Draw a lifecycle)</li> <li>How does the apple core change over time?</li> <li>How does the tree change over time?</li> <li>Which is the strongest material to build a house with? (Three Little Pigs)</li> <li>What animals live in woodland?</li> <li>How do caterpillars turn into butterflies?</li> <li>Why is it day in England country but night in Australia? (Understanding the solar system)</li> </ul>	How are these animals the same and how are they different? (sorting into classification groups) What are the similarities and differences between different animals? (Identifying through images) What do plants need to grow? (set up simple enquiries where not all requirements for growth are provided) What are different materials used for and why? (link to testing properties of materials) How can we work out if something is alive or not alive? (link to things that have never been alive) Ask questions of a parent about how they look after their baby; Ask questions of a pet owner about how they look after their pet.	Use choosing variables sheet. Ask questions about how plants disperse their seeds, Ask questions about the nutritional content of a range of food items (including fast food); Ask questions how is water transported around a plant? Ask questions What is renewable and non-renewable energy? Ask questions how can I identify characteristics of invertebrates in the local environment? Ask questions and understand how can we keep our bodies healthy? Ask questions and identify how we can investigate the effects of different drinks on teeth? Investigate patterns by asking questions such as: (i) can people with longer legs run faster? (ii) can people with bigger hands catch a ball better? How do we use forces to make an object move? Ask questions about the size of shadows and how they change;	<ul> <li>Plan to investigate properties of different materials in order to recommend materials for particular functions depending on these properties e.g. which materials would make the best thermal insulators?</li> <li>Plan to investigate forces (friction, water resistance, air resistance) in a range of contexts, e.g. how does the shape of an object impact on water resistance and upthrust?</li> <li>Plan to investigate how bacteria forms on bread.</li> <li>Plan a pulse rate investigation, e.g. which exercise produces the fastest pulse rate?</li> <li>Explore different ways to demonstrate that light travels in straight lines, e.g. what happens to light when the angle of a mirror changes?</li> <li>Investigate effects on changes in components. E.g. How does voltage affect the brightness of a bulb?</li> </ul>

	Ask questions about how objects move on different surfaces; Ask questions about evaporation rates for different liquids, e.g. puddles, washing, handprints on paper towels Ask questions about how we hear sound over distance/ through different materials	

EYFS	Year 1 & 2	Year 3 & 4	Year 5 & 6
	Making observations	and taking measurements	
<ul> <li>Explore and make observations of the natural world around them</li> <li>Children explore the world around them and are encouraged to talk about what they see/notice. They make observations to support identification, comparison and noticing change.</li> <li>Teachers model observational and investigational skills – for example, asking aloud: "I wonder what will happen if"</li> </ul>	<ul> <li>Observing closely, using simple equipment</li> <li>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.</li> <li>They begin to take measurements, initially by comparisons, then using nonstandard units.</li> </ul>	<ul> <li>Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</li> <li>The children make systematic and careful observations.</li> <li>They use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements.</li> </ul>	<ul> <li>Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>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.</li> <li>During an enquiry, they make decisions <ul> <li>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).</li> </ul> </li> </ul>

Application in related substantive context				
Observe changes in plants and living things (potatoes) Observe seasonal change Observe changes in materials (melting butter, making play	Careful observation of plants (identification), observation of a plant growing over several days – what changes can be seen. Take measurements of plant growth	Observe the movement of water up the stem of a flower and observe seed dispersal, noticing differences; Observe how rocks change over time, e.g. gravestones or old	Observe asexual plant growth, e.g. spider plants; Use a thermometer to record temperatures as it changes from a solid,	
dough) Observe what animals are found where (Polar animals, woodland animals) in different conditions; Observe habitats of mini-beasts (use of magnifying glass); Observe the change in weather over a week, measure the temperature and rain fall using a thermometer and a rain gauge (teacher led). Observe materials used for various objects around school/home; Measure/observe how animals, including humans, grow (measure feet size in relation to age) Use non-standard units to measure	buildings; Measure size of shadows and how they change (mm/cm/m); Observe own teeth and those of different animals (herbivore, carnivore, omnivore); Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate (use thermometer – Celsius); Measure volume of sounds (data logger – dB); Use standard units of time, length, capacity and temperature to measure	liquid and gas; Observing separation processes. E.g. what happens to salt water when the water is evaporated? Measure lengths of shadows, angles on		
		incidence and reflection. When making a sundial, measure angles to 53 degrees from N because of East Leake's location; Measuring heights and arm span;		
			Select measuring equipment to suit purpose and use standard units of measure (g/kg, N, Celsius, milliseconds/seconds/minutes, ml/l, mm, cm, m)	

EYFS	Year 1 & 2	Year 3 & 4	Year 5 & 6		
	Engaging in practical enguiry to answer guestions				
<ul> <li>Exploring and enquiring</li> <li>The children use practical resources provided to explore and enquire (sand/water, construction, cooking, outdoor play, garden, small world).</li> <li>Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function.</li> <li>Children use observations to group together similar objects and consider differences, patterns and change.</li> </ul>	<ul> <li>Performing simple tests</li> <li>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.</li> <li>Identifying and classifying</li> <li>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.</li> <li>They use simple secondary sources (such as identification sheets) to name living things. They describe the characteristics they used to identify a living thing.</li> </ul>	<ul> <li>Setting up simple practical enquiries, comparative and fair tests</li> <li>The children select from a range of practical resources to gather evidence to answer questions generated by themselves or the teacher.</li> <li>They follow their plan to carry out: observations and tests to classify; comparative and simple fair tests; observations over time; and pattern seeking.</li> <li>Explanatory note 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.</li> <li>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.</li> </ul>	<ul> <li>Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>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.</li> </ul>		

Application in related substantive context				
Regular consideration of seasonal changes (weather, taking photos of the tree through the seasons) Mix play dough ingredients to see what happens Drop food colouring into daffodil water and observe what happens Observe heating/cooling, melting, dissolving, and mixing through cooking (pancakes, stir-fry, soup, biscuits) Explore discovery resources in continuous provision (push and pull vehicles and objects, mirrors, magnets) Explore the natural environment.	Use variables sheet to help aid scientific enquiry. Test properties of objects e.g. absorbency of materials for the purpose of a shelter and for a boat. Test different materials to see if they can bend, twist, stretch and pull. Explore the effect of exercise on the human body – observe changes in peers; Sort items into living, dead, non-living; Regular consideration of seasonal changes. Use of classification sheets to identify different animals and their features. Classification sheets to identify different plants – garden flowers and leaves.	Use choosing variables sheet. Use food labels to explore the nutritional content of a range of food items; Devise a test to investigate the hardness of a range of rocks; Devise a test to investigate how much water different rocks/ soils absorb; Explore how shadows vary as the distance between a light source and an object or surface is changed; Explore how objects move on different surfaces. Devise an investigation to test the strength of magnets; Explore human impact on the local environment e.g. looking after animals. Explore eating different types of food to identify which teeth are being used for cutting, tearing and grinding (chewing); Investigate how to melt chocolate more quickly; Explore altering the pitch or volume of objects; Explore which materials can be used instead of wires to make a circuit.	Give reasons for choice of equipment and methods to separate a given solution or mixture such as salt and sand in water; Look for patterns between heights and arm span length; Carry out comparative and fair tests involving non-reversible changes e.g. How oxidisation makes a new material and is non-reversible? Make first-hand observations of how objects appear to bend when placed in water (refraction); Explore how levers, pulleys and gears work to understand what purpose each has in a machine; Explore the uses of the behaviour of light, through reflection and shadows, such as in shadow puppets.	

EYFS	Year 1 & 2	Year 3 & 4	Year 5 & 6		
Recording and presenting evidence					
<ul> <li>Sorting and recording data to help in answering questions</li> <li>The children record their observations and learning e.g. draw pictures of animals and plants. They group together similar objects (for example, sorting rings)</li> </ul>	<ul> <li>Gathering and recording data to help in answering questions</li> <li>The children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing.</li> <li>They record their measurements e.g. using prepared tables, pictograms, tally charts and block graphs.</li> <li>They classify using simple prepared tables and sorting rings.</li> </ul>	<ul> <li>Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</li> <li>Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</li> <li>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.</li> <li>Children are supported to present the same data in different ways in order to help with answering the question.</li> </ul>	<ul> <li>Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>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.</li> <li>Children present the same data in different ways in order to help with answering the question.</li> </ul>		

Application in related substantive context			
Draw pictures of the changing daffodil Sort and group materials Take photos of seasonal change (tree) Ordering life cycles of animals and plants Making homes for woodland animals and photographing them	Collect information regularly over the year for aspects that change, e.g. weather, plants, clothing, animals – present this information in different ways to compare the seasons (take photographs and compare them) Whole class tables of man-made and natural materials. Draw labelled diagrams of the key parts of a plant following a practical diagram; Create simple food chains, draw and label what's happening. Focus on tally charts and pictograms. Whole class bar charts and tally charts. Children to have blank tables and to fill in the headings to them. Children to use venn diagrams to compare different animals and whether they are a herbivore, carnivore and omnivore.	Compare, contrast and classify skeletons of different animals; Classify rocks in a range of ways, based on their appearance (Venn or Carroll diagram); Describe patterns in visibility of different objects in different lighting conditions; Show the change in shadow size over distance as a drawn diagram. Table of how far objects move on different surfaces; Use diagrams or a model to describe the journey of food through the body; Record freezing points of liquids and melting points of solids. Identify good electrical conductors versus insulators.	Present understanding of puberty between boys and girls using a Venn diagram and graphing changes in our bodies in late adulthood; Create a chart or table grouping/comparing everyday materials by different properties; Use secondary sources to help create a model e.g. role play or using balls to show the movement of the Earth around the Sun and the Moon around the Earth; Line graphs to show the relationship between arm span and heights; Classify plants and animals, presenting this in a range of ways e.g. Venn diagrams, Carroll diagrams and dichotomous keys; Present information e.g. in a health leaflet describing impact of drugs and lifestyle on the body; Labelled diagram of a plant/animal suited to a particular habitat; Use light ray diagrams to show the reflection of light (in a straight line); Communicate structures of circuits using circuit diagrams with recognised symbols.

EYFS	Year 1 & 2	Year 3 & 4	Year 5 & 6		
	Answering questions and concluding				
Using their experiences to suggest answers to questions	Using their observations and ideas to suggest answers to questions	Using straightforward scientific evidence to answer questions or to support their findings.	Identifying scientific evidence that has been used to support or refute ideas or arguments		
<ul> <li>Children draw upon their experiences of the natural world around them, along with what has been read in class, to suggest possible answers to questions.</li> </ul>	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.	<ul> <li>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.</li> </ul>	<ul> <li>Children answer their own &amp; 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.</li> <li>They talk about how their scientific ideas change due to new evidence that they have gathered.</li> <li>They talk about how new discoveries change scientific understanding</li> </ul>		

	Using their observations and ideas to suggest answers to questions • The children recognise 'biggest and smallest', 'best and worst' etc. from their data.	<ul> <li>Identifying differences, similarities or changes related to simple scientific ideas and processes</li> <li>Children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships.</li> <li>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>They draw conclusions based on their evidence and current subject knowledge</li> </ul>	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.
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	Application in related substantive context			
Explain which animals live in the polar regions/woodland through class discussion	Explain in simple terms why an animal or plant is suited to a habitat	Use choosing variables sheet. Explain how plants disperse their	Explain the results from their investigations;	
Explain that materials have different properties (magnetic, transparent etc.) Understand that trees are plants	the soil like a worm as it needs fresh leaves to eat; the seaweed we found on the beach cannot live in our pond because it is not salty;	Explain the nutritional content of a range of food items (including fast food); Explain how water is transported	Use secondary sources and, where possible, first-hand observations to find out stages of human development;	
and that these are living things Explain how liquids and solids behave under different conditions (e.g., melting butter when	Explain what plants need to grow based on evidence gathered; Explain what materials are suited to different purposes;	around a plant? Explain renewable and non-renewable energy?	Use test evidence gathered about different properties to suggest an appropriate material for a particular purpose;	
when making play dough)	animals/humans to survive (food, water and air); Explain what we can do to keep our bodies healthy	characteristics of invertebrates in the local environment?	Consider the views of scientists in the past and evidence used to deduce shapes and movements of the Earth,	
	Explain what the changes of seasons are and why this occurs.	different drinks have on teeth?	Research how the work of scientists such as Isaac Newton helped to	
		an object move?	Use information about the	
		Explain the size of shadows and how they change;	or plant to assign it to a group;	
		Explain objects move on different surfaces;	on evolution;	
		Explain about how we hear sound over distance/ through different materials	Explain how evidence from enquiries shows that light travels in straight lines.	

EYFS	Year 1 & 2	Year 3 & 4	Year 5 & 6		
Evaluating and raising further questions and predictions					
Using experiences of natural change to make predictions. • Children understand the predictability of seasonal change (weather, clothing, trees etc.)	Using experiences of natural change and processes to make predictions. • Children describe the predictability of seasonal change (weather, clothing, trees etc.)	<ul> <li>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>They identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry.</li> </ul>	<ul> <li>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</li> <li>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.</li> <li>They identify any limitations that reduce the trust they have in their data.</li> </ul>		
		<ul> <li>Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>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.</li> <li>Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry.</li> </ul>	<ul> <li>Using test results to make predictions to set up further comparative and fair tests</li> <li>Children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests.</li> </ul>		

Application in related substantive context					
Predict clothing/weather/ what the trees will look like for different seasons.	Use property-testing evidence to select appropriate material for a purpose e.g. Which material is the best for a shelter or a boat? Use learning about what plants need to grow to predict how well they will grow in, e.g., lemon juice? Ask further question after investigation e.g. what would happen if we used? Predict clothing/temperatures/ weather for different seasons. Predict who will have the biggest show size based on their age. Predict what will happen to the body after exercise.	Use a classification key to classify unknown plants and animals, based upon their features; Give similarities and differences between a range of skeletons; Make predictions about patterns in how shadows vary over distance; Rank magnets: Make predictions for further tests regarding object movement on new surfaces. Create food chains based on research; Present their learning about the water cycle. Choose switches to add to circuits to solve particular problems, Every topic represented on a double page evaluation at the end of topic.	Predict results and answer questions by drawing on evidence gathered; Compare two or more gestation period between human and other animals; Evaluate both the positive and negative effects of diet, exercise, drugs and lifestyle on the body; Identify characteristics that will make a plant or animal suited or not suited to a particular habitat; Predict and explain, with diagrams or models as appropriate, how the shape of shadows can be varied; Make circuits that can be controlled as part of a DT project (Fairgrounds)		