



Sc1: Working Scientifically

Scientific Enquiry describes the processes and skills pupils should be taught and use, to find out more about the world and how it works. ... - Turner et al, takes the view that: '**Science enquiry** is what children do in order to answer **scientific** questions about the world around them'

Scientific enquiry increases children's capacity to:

- Problem solve and answer questions. Rich opportunities are provided where children explore their own ideas, develop and deepen conceptual understanding.
- Work with independence. Thinking and reasoning is nurtured alongside a host of qualities, including resilience, determination and confidence.
- 'Be a scientist'. A necessary toolkit of practical skills is developed and added to over time.
- Communicate effectively. Technical and scientific vocabulary is learned, practised and used, as children communicate evidence in a variety of ways, often with different audiences in mind.

Observing changes over time – observations or measurements are made at regular intervals

Making **careful** observations of objects or events and how they change over time.

- Long term studies of how plants and habitats change through the year (Pre School, Early Years, KS 1)
- Taking observations of ice melting (Early Years)
- Measuring pulse rate after exercise (Year 5 a& 6)
- Noticing how shadows change throughout the day (Years 3 & 4 and 5 & 6)
- Noticing how the moon changes shape during the month (Years 5 & 6)
- Observing how mould grows on different foods (Years 5 & 6)

	<ul style="list-style-type: none"> • Taking observations of a puddle on a hot day (Years 3 & 4)
<p><u>Comparative and fair test – exploring cause and effect</u></p> <p>Observing or measuring the effect of changing one variable whilst keeping other potential variables the same.</p>	<ul style="list-style-type: none"> • Investigating how shadows change size (Years 3 & 4 and 5 & 6) • Investigating air resistance using parachutes (Years 5 & 6) • Investigating dissolving rates (Years 5 & 6) • Investigating properties of materials (All Years)
<p><u>Classifying – sorting and grouping according to similarities and differences</u></p> <p>Identify features that allow things to be organised into distinct groups.</p> <p>Recognise things as part of a specific group and name them.</p>	<ul style="list-style-type: none"> • Classifying rocks, plants and animals (All years) • Classifying living, not living, never been alive (Years 1 & 2) • Classifying materials including those that can be recycled (All years) • Using keys to identify plants and animals (Years 1 & 2, Years 3 & 4 and Years 5 & 6)
<p><u>Researching – using secondary sources to find answers to questions</u></p> <p>Gathering and analysing scientific finding to answer a question or to provide background information to help explain observed events.</p>	<ul style="list-style-type: none"> • Using keys to identify plants and animals • Learning what animals eat • Learning about the digestive system, circulatory system (KS 2) • Learning about phases of the moon, Planets (Years 5 & 6)

Research can also show how scientists' ideas have changed over time as new evidence has been found.	
<u>Modelling</u>	<ul style="list-style-type: none"> • Concrete models e.g. of the digestive system, movement of earth and Moon, circulatory system (KS 2)
<u>Pattern Seeking</u>	<ul style="list-style-type: none"> • Do the pupils with the longest legs jump further or run faster?
To be able to work independently, pupils need to develop a set of skills that they can then use whilst carrying out different types of enquiry.	<p>Pupils need to be able to:</p> <ul style="list-style-type: none"> • Ask questions • Make predictions • Decide how to carry out an enquiry • Take measurements • Present data • Answer questions using data • Draw conclusions • Evaluate their enquiry

Key skills	Pre-School	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Asking Questions	To begin to answer questions about	To begin to ask questions to find out	To ask simple questions and recognise that	To suggest some ideas and questions based	In a variety of contexts, to suggest	To suggest relevant questions based	With support begin to ask questions and	To ask questions and develop a line of enquiry



things around them, familiar places, objects and people. (Who , What, Where)	information on topics that interest them To answer questions about aspects of the natural world (Who, What, Where, Why and How)	they can be answered in different ways To test ideas suggested to them and say what they think will happen	on simple knowledge	questions and ideas and how to test them.	on scientific knowledge that can be tested and suggest how to test those using different types of scientific enquiry	develop a line of enquiry based on observations of the real world	based on observations of the real world To know how to turn a question or idea into a form that can be tested
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Pre-School

Reception

Year 1

Year 2

Year 3

Year 4

Year 5

Year 6

Making Predictions



With support say what they think might happen	To say what they think might happen with support.	To say what they think might happen.	To make predictions about what will happen	To make predictions about what will happen, some of which are based on scientific knowledge	To make predictions of what will happen based on scientific knowledge and understanding	To make predictions using scientific knowledge and understanding
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Pre-School

Reception

Year 1

Year 2

Year 3

Year 4

Year 5

Year 6

Deciding how to carry out an enquiry or investigation

		To say how they might find out about ideas and questions that they suggest with support	To say how they might find out about ideas and questions that they suggest	To consider what makes a fair test unfair or evidence sufficient and	To design a fair test. To plan how to collect sufficient evidence	To plan a fair test using previous knowledge and understanding	To decide how to turn ideas into a form that can be tested
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			To think about and discuss whether comparisons and tests are fair or unfair with support	To think about and discuss whether comparisons and tests are fair or unfair	with help, plan a fair test To think about how to collect sufficient evidence	To think about why observations and measurements should be repeated To choose what apparatus to use and what to measure (in some contexts)	To identify factors that need to be taken into consideration in different contexts To collect sufficient evidence to test an idea	To identify factors that are relevant to a particular situation To choose what evidence to collect to investigate a question, ensuring the evidence is sufficient To choose what equipment to use
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	Pre-School	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
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Making Measurements



To make simple observations	With support perform simple tests. To observe closely, using appropriate senses and simple equipment	To perform simple tests. To observe closely, using appropriate senses and simple equipment	To perform simple tests. To collect evidence to try to answer a question To observe closely, using appropriate	To gather and record evidence in a variety of context to answer a question or test an idea To make systematic and	To gather and record evidence in a variety of contexts to test an idea or prediction based on their scientific knowledge and understanding	To take measurements using a range of scientific equipment, with increasing accuracy and precision	To make a variety of relevant observations and measurements using a range of scientific equipment, with increasing accuracy and
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		e.g. magnifying glasses	To collect evidence to try to answer a question	senses and simple equipment.	careful observations and comparisons	To make systematic observations and comparisons of relevant features in a variety of contexts	To make relevant observations	precision, taking repeat readings where appropriate
		To make some measurements of length using standard and non-standard measures.	To make measurements of length and height in standard and non-standard measure.	To take accurate measurements of length, volume of liquid and time using standard units of measure and measuring equipment, effectively	To take accurate measurements of temperature, time and force, as well as measurements of length using standard units of measure and measuring equipment, effectively	To consolidate measurement of volume, temperature, time, length and force (using Newton meters)	To decide when observations and measurements need to be checked, by repeating, to give more reliable data.	

To measure pulse
To solve
problems
involving the
calculation and
conversion of
units of measure,
using decimal
notation up to
three decimal
places where
appropriate
(Maths)

						thermometers and data loggers	three decimal places where appropriate (Maths) To consider how scientists have combined evidence from observation and measurement with creative thinking to suggest new ideas and explanations for phenomena	To consider how scientists have combined evidence from observation and measurement with creative thinking to suggest new ideas and explanations for phenomena
	Pre-School	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Recording & Presenting Data  	To present some findings in simple drawings (mark making) using ICT where relevant with support	To present some findings in simple tables and drawings (mark making) using ICT where relevant with support	To present some findings in drawings, simple tables and block graphs using ICT where relevant	To make records of observations To present results in tables, drawings and block graphs using	To gather, record, classify and present data in a variety of ways to help in answering questions To record findings using	To gather, record, classify and present data in a variety of ways to help in answering questions To record findings using	To record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables and bar charts and	To record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables and bar charts and

				ICT where relevant	simple scientific language, drawings, labelled diagrams, bar charts and tables using ICT where relevant To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions	simple scientific language, drawings, labelled diagrams, classification keys, bar charts and tables using ICT where relevant To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions	line graphs using ICT where relevant To report and present findings from enquiries, including conclusions, casual relationships and explanations of and a degree of trust in results, in oral and written forms with some guidance	line graphs using ICT where relevant To report and present findings from enquiries, including conclusions, casual relationships and explanations of and a degree of trust in results, in oral and written forms
	Pre-School	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Answering Questions using Data	To begin to notice similarities and differences in	To recognise similarities and differences between living	To make simple comparisons and groupings that relate to differences and	To make simple comparisons, identifying similarities and differences	To make generalisations and begin to identify simple patterns in	To identify simple trends and patterns in results presented in	To decide whether results support any prediction	To make comparisons To evaluate repeated results



<p>photos and real life experiences</p>	<p>things and objects</p>	<p>similarities between living things and objects</p> <p>To say what their observations show, and whether it was what they expected</p>	<p>between living things, objects and events</p> <p>To say what results will show</p> <p>To say whether their predictions were supported</p>	<p>results presented in tables</p> <p>To identify differences, similarities or changes related to simple scientific ideas and processes</p>	<p>tables, charts and graphs and to suggest explanations for some of these</p> <p>To identify differences, similarities or changes related to simple scientific ideas and processes</p>	<p>To begin to evaluate repeated results</p> <p>To recognise and make predictions from patterns in data and suggest explanations for these using scientific knowledge and understanding.</p> <p>To interpret data and think about whether it is sufficient to draw conclusions</p> <p>To identify scientific evidence that has been used to support or refute ideas or arguments</p>	<p>To identify patterns in results that do not appear to fit the pattern</p> <p>To identify scientific evidence that has been used to support or refute ideas or arguments</p>
<p>Pre-School</p>	<p>Reception</p>	<p>Year 1</p>	<p>Year 2</p>	<p>Year 3</p>	<p>Year 4</p>	<p>Year 5</p>	<p>Year 6</p>

**Drawing
Conclusions**



To draw simple conclusions and explain what they did	To use knowledge to explain what was found out and to draw conclusions	To draw simple conclusions from results and begin to use scientific knowledge and evidence to answer questions or to suggest explanations for them and to support their findings To make predictions for new values	To explain what the evidence shows by drawing simple conclusions and begin to use scientific knowledge and evidence to say whether it supports any prediction made To link the evidence to scientific knowledge and understanding in some contexts To make predictions for new values	To draw conclusions indicating whether these match any prediction made	To use results to draw conclusions and to make further predictions To say whether the evidence supports any prediction made
Pre-School	Reception	Year 1	Year 2	Year 3	Year 4
Year 5	Year 6				

**Evaluating the
Enquiry or
Investigation**



To explain what they did with support

To explain what they did

To explain and reflect on the investigation and say how to improve, with support

To explain and reflect on the investigation and say how to improve

To suggest and evaluate explanations for these predictions using scientific knowledge and understanding, with support

To suggest and evaluate explanations for these predictions using scientific knowledge and understanding