KNOWLEDGE PROGRESSION YEAR GROUP OVERVIEW – Science (Working Scientifically)

Science: Working Scientifically

Key Stage 1 Programme of Study	Lower Key Stage 2 Programme of Study	Upper Key Stage 2 Programme of Study
During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: ▪ asking simple questions and recognising that they can be answered in different ways ▪ observing closely, using simple equipment ▪ performing simple tests ▪ identifying and classifying ▪ using their observations and ideas to suggest answers to questions gathering and recording data to help in answering questions.	During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: ▪ asking relevant questions and using different types of scientific enquiries to answer them ▪ setting up simple practical enquiries, comparative and fair tests ▪ making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers ▪ 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 ▪ reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions ▪ using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions ▪ identifying differences, similarities or changes related to simple scientific ideas and processes ▪ using straightforward scientific evidence to answer questions or to support their findings.	During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: ▪ planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary ▪ taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate ▪ recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs ▪ using test results to make predictions to set up further comparative and fair tests ▪ 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 ▪ identifying scientific evidence that has been used to support or refute ideas or arguments.

Across the key stages the National Curriculum's skills progression are included within the following (PSTT) Enquiry Skills strands:

- Asking questions and recognising they can be answered in different ways
- Engaging in practical enquiry to answer questions
- Making observations and taking measurements
- Recording and presenting evidence
- Evaluating and raising further questions and predictions
- Communicating findings

Skills are dependent on specific knowledge. A skill is the capacity to perform, and in order to perform a deep body of knowledge needs to be acquired and retained.

These knowledge statements should be what pupils retain for ever. In other words, this knowledge is within their long-term memory and will be retained.

When considering pupils' improvement in subject specific vocabulary, pupils could be provided with a knowledge organiser which contains all words used for computing for their age group.

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EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	NOTE: These opportunities for working scientifically should be provided across years 1 and 2 so that the expectations in the programme of study can be met by the end of year 2. Pupils are not expected to cover each aspect for every area of study.		**NOTE: These opportunities for working scientifically should be provided across years 3 and 4 so that the expectations in the programme of study can be met by the end of year 4. Pupils are not expected to cover each aspect for every area of study.**		**NOTE: These opportunities for working scientifically should be provided across years 5 and 6 so that the expectations in the programme of study can be met by the end of year 6. Pupils are not expected to cover each aspect for every area of study.**	
Skills	**Asking questions and recognising that they can be answered in different ways** *Plan					
	***NC:*** ***Asking simple questions and recognising that they can be answered in different ways****		***NC:*** ***Asking relevant questions and using different types of scientific enquiries to answer them****		***NC:*** ***Planning different types of scientific enquiries to answer questions****	
	• 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*		• 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 identify the type of enquiry that they have chosen to answer their question*		• 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*	
	• Ask questions such as: ○ Why are flowers different colours? ○ Why do some animals eat meat and others do not?	• Ask questions such as: ○ Why do some trees lose their leaves in Autumn and others do not? ○ How long are roots of tall trees? ○ Why do some animals have underground habitats?	• Ask questions such as: ○ Why does the moon appear as different shapes in the night sky? ○ Why do shadows change during the day? ○ Where does a fossil come from?	• Ask questions such as: ○ Why are steam and ice the same thing? ○ Why is the liver important in the digestive systems? ○ What do we mean by 'pitch' when it comes to sound? • When making predictions there are plausible reasons as to why they have done so		

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Engaging in practical enquiry to answer questions*Plan

EYFS

Choose the resources they need for their activities and say when they do or don't need help.

*PSTT

NC:
*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*

NC:
*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*

- Set up a test to see which materials keeps things warmest, know if the test has been successful and can say what has been learned
- Know how to set up a fair test and do so when finding out about how seeds grow best

NC:
*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 over time; and pattern seeking*

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.

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*

- Set up a fair test with different variables e.g. the best conditions for a plant to grow
- Explain to a partner why a test is a fair one e.g. lifting weights with right and left hand, etc.
- Test to see which type of soil is most suitable when growing two similar plants
- Test to see if their right hand is as efficient as their left hand
- Set up a fair test with more than one variable e.g. using different materials to cut out sound
- Explain to others why a test that has been set up is a fair one e.g. discover how fast ice melts in different temperatures
- Carry out tests to see, for example, which of two instruments make the highest or lowest sounds and to see if a glass of ice weighs the same as a glass of water

NC:
*Planning different types of scientific enquiries, including recognising and controlling variables where necessary**

• 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)*

- Set up an investigation when it is appropriate e.g. finding out which materials dissolve or not
- Set up a fair test when needed e.g. which surfaces create most friction?
- Set up an enquiry-based investigation e.g. find out what adults / children can do now that they couldn't when a baby
- Know what the variables are in a given enquiry and can isolate each one when investigating e.g. finding out how effective parachutes are when made with different materials
- Know which type of investigation is needed to suit particular scientific enquiry e.g. looking at the relationship between pulse and exercise
- Set up a fair test when needed e.g. does light travel in straight lines?
- Know how to set up an enquiry-based investigation e.g. what is the relationship between oxygen and blood?
- Know what the variables are in a given enquiry and can isolate each one when investigating
- Justify which variable has been isolated in scientific investigation

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	Making observations and taking measurements*Plan					
	NC: ***Observing closely, using simple equipment****		***NC:*** ***Making systematic and careful observations, and where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers****		***NC:*** ***Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings where necessary****	
EYFS ***Know about similarities and differences in relation to places, objects, materials and living things. Make observations of animals and plants. Explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. Select and use technology for particular purposes.*** *PSTT	• 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*		• 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*		• 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)*	
	• Measures (within Year 1 mathematical limits) to help find out more about the investigations undertaken	• Use microscopes to find out more about small creatures and plants • Use equipment such as thermometers and rain gauges to help observe changes to local environment as the year progresses • Use measures (within Year 2 mathematical limits) to help find out more about the investigations they are engaged with	• Observe at what time of day a shadow is likely to be at its longest and shortest • Observe which type of plants grow in different places e.g. bluebells in woodland, roses in domestic gardens, etc. • Measure carefully (taking account of mathematical knowledge up to Year 3) and add to scientific learning • Use a thermometer to measure temperature and know there are two main scales used to measure temperature	• Measure carefully (taking account of mathematical knowledge up to Year 4) and add to scientific learning • Use a data logger to check on the time it takes ice to melt to water in different temperatures • Use a thermometer to measure temperature and know there are two main scales used to measure temperature	• Use all measurements as set out in Year 5 mathematics (measurement), including capacity and mass • Use other scientific instruments as needed e.g. thermometer, rain gauge, spring scales (for measuring Newtons)	• Use all measurements as set out in Year 6 mathematics (measurement), including capacity, mass, ratio and proportion

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	Recording and presenting evidence*Plan					
	NC: Gathering and recording data to help in answering questions*		***NC: Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions**** ***NC: Recording finding using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables****		***NC: Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar charts and line graphs****	
EYFS ***Represent their own ideas, thoughts and feelings through design and technology, art, music, dance, role play and stories.*** *PSTT	• 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*		• 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*		• 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*	
		Classify or group things according to a given criteria, e.g. deciduous and coniferous trees	• Gather and record information using a chart, matrix or tally chart, depending on what is most sensible • Group information according to common factors e.g. plants that grow in woodlands or plants that grow in gardens • Use bar charts and other statistical tables (in line with Year 3 mathematics statistics) to record findings • Know how to use a key to help understand information presented on a chart • Present findings using written explanations and include diagrams when needed *Record findings using simple scientific language	• Gather and record information using a chart, matrix or tally chart, depending on what is most sensible • Group information according to common factors e.g. materials that make good conductors or insulators • Use bar charts and other statistical tables (in line with Year 4 mathematics statistics) to record findings • Present findings using written explanations and include diagrams, when needed • Write up findings using a planning, doing and evaluating process *Record findings using simple scientific language	• Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs • Able to present information related to scientific enquiries in a range of ways including using IT such as power-point and iMovie • Use diagrams, as and when necessary, to support writing	• Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs • Able to present information related to scientific enquiries in a range of ways including using IT such as power-point, animation and iMovie • Use a range of written methods to report findings, including focusing on the planning, doing and evaluating phases • Use diagrams, as and when necessary, to support writing and be confident enough to present findings orally in front of the class

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	Answering questions and concluding*Plan					
	NC: 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* • The children recognise 'biggest and smallest', 'best and worst' etc. from their data*		***NC: 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* ***NC: 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* ***NC: 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*		***NC: 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* ***NC: 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*	
	• Explain to someone what has been learned from an investigation they have been involved with and draw conclusions from the answers to the questions asked	• Draw conclusions from fair tests and explain what has been found out	• Make sense of findings and draw conclusions which help them to understand more about scientific information	• Make sense of findings and draw conclusions which helps them understand more about the scientific information that has been learned	• Is evaluative when explaining findings from scientific enquiry • Clear about what has been found out from recent enquiry and can relate this to other enquiries, where appropriate • Their explanations set out clearly why something has happened and its possible impact on other things • Able to give an example of something focused on when supporting a scientific theory	• Clear about what has been found out from their enquiry and can relate this to others in class • Explanations set out clearly why something has happened and its possible impact on other things • Aware of the need to support conclusions with evidence

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					e.g. how much easier it is to lift a heavy object using pulleys • Able to relate causal relationships when, for example, studying life cycles • Able to give an example of something they have focused on when supporting a scientific theory e.g. classifying vertebrate and invertebrate creatures or why certain creatures choose their unique habitats	
EYFS ***Talk about the features of their own immediate environment and how environments might vary from one another. Explain why some things occur and talk about changes.*** *PSTT	**Evaluating and raising further questions and predictions** *Plan					
	Using their observations to suggest answers to questions. *PSTT		***NC: 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* • 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*		***NC: 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*	
					NC: 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*	
			• Be prepared to change ideas as a result of what has been found out during a scientific enquiry Able to amend predictions according to findings	• Prepared to change ideas as a result of what has been found out during a scientific enquiry Able to amend predictions according to findings	• Create new investigations which take account of what has been learned previously Make predictions based on information gleaned from investigations	Make accurate predictions based on information gleaned from their investigations and create new investigations as a result

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	Communicating their findings*Plan					
			NC: Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions*		***NC: 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 both orally and in writing, using appropriate scientific vocabulary*		• They communicate their findings to an audience using relevant scientific language and illustrations*	
			• Be confident to stand in front of others and explain what has been found out, for example about how the moon changes shape			
	Develop Scientific Literacy by understanding and using scientific vocabulary and carrying out research for scientific inquiry					
			NC: Asking relevant questions and using different types of scientific enquiries to answer them*		***NC: Planning different types of scientific enquiries to answer questions****	
			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*		They recognise how secondary sources can be used to answer questions that cannot be answered through practical work*	
	• Use story books, songs and interactive play to encourage 'Talk for Science'	• Use story books, songs and interactive play to encourage 'Talk for Science'	• Use research to find out how reflection can help us see things that are around the corner • Use research to find out what the main differences are between sedimentary and igneous rocks • *Record findings using simple scientific language Use resources to encourage 'Talk for Science'	• Use research to find out how much time it takes to digest most of our food • Use research to find out which materials make effective conductors and insulators of electricity • *Record findings using simple scientific language Use resources to encourage 'Talk for Science'	• Frequently carry out research when investigating a scientific principle or theory • Keep an on-going record of new scientific words that they have come across for the first time Use resources to encourage 'Talk for Science'	• Frequently carry out research when investigating a scientific principle or theory • Keep an on-going record of new scientific words that they have come across for the first time and use these regularly in future scientific write ups Use resources to encourage 'Talk for Science'

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PLAN
Planning for assessment

*Working Scientifically Skills supplemented with information from PLAN resources

Key of examples:

Questioning

Predicting

Test Preparation

Testing

Observing

Measurements and use of equipment

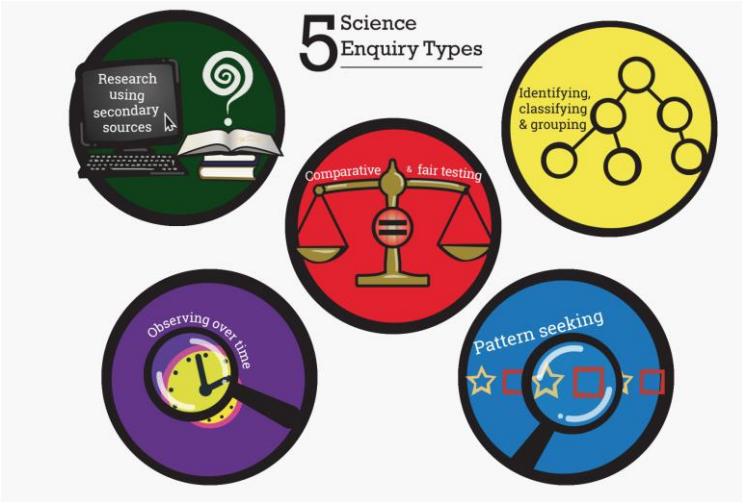
Recording data

Presenting

Researching

Scientific literacy

Explaining Findings



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