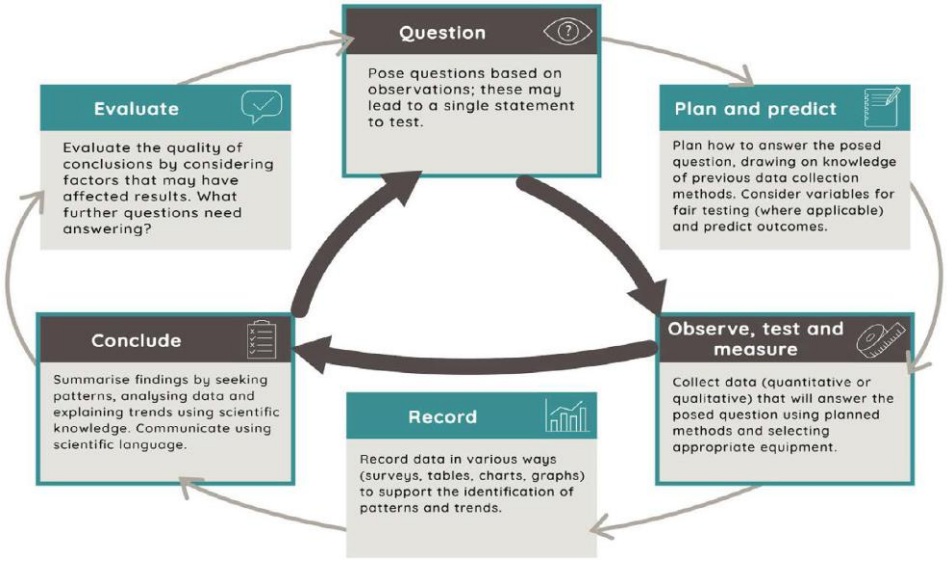
Science Disciplinary Knowledge Progression

Disciplinary knowledge is taught and embedded within the teaching of each unit of substantive knowledge. Within every teaching unit, children are encouraged to show curiosity and pose questions to allow them to explore the world around them. As part of working scientifically, which is embedded throughout all units, pupils will also learn to use a variety of enquiry strategies to answer scientific questions. Different questions lead to different types of enquiry and are not limited to fair testing. By the end of primary school, children will be able to use these enquiry strategies confidently and know that different strategies may be needed at different times.

- **Observing over time:** (observing or measuring how one variable changes over time)
- **Identifying and classifying:** (identifying and naming materials/living things and making observations or carrying out tests to organise them into groups)
- **Looking for patterns:** (making observations or carrying out surveys of variables that cannot be easily controlled and looking for relationships between two sets of data)
- **Comparative and fair testing:** (observing or measuring the effect of changing one variable when controlling others)
- **Answering questions using secondary sources of evidence:** (answering questions using data or information that they have not collected first hand)



Nursery/FS1	Reception/FS2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Planning Conduct a guided investigation with supervision	**Planning** Follow a modelled investigation	**Planning** Perform simple investigations to find the answer to a given question. When posed with a question 'why are we keeping ____ the same?' begin to understand that it's to keep the test fair.	**Planning** Begin to design their own investigation to find the answer to a given question. With support, decide if suggested observations are suitable.	**Planning** Ask relevant questions and with support use different types of scientific enquiries to answer them (fair tests, comparative tests, observation over time, research, pattern seeking) Begin to select their own methods to find the answer to a scientific question With support, set up simple practical enquiries, comparative and fair tests Begin to design their own investigations and manage variables	**Planning** Ask relevant questions and use different types of scientific enquiries to answer them (fair tests, comparative tests, observation over time, research, pattern seeking) Select their own methods to find the answer to a scientific question Set up simple practical enquiries, comparative and fair tests Design their own tests & identify and manage variables.	**Planning** Select the most appropriate type of scientific enquiry to use to answer scientific questions; and with support and plan the enquiry, recognising when and how to set up comparative and fair tests and explain which variables need to be controlled and why. With support, Plan and execute appropriate investigations based on a given or student-led question	**Planning** Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. Plan and execute appropriate investigations based on a given or student-led question
Predicting Through adult modelling, children begin to learn that we can make guesses as to what might happen and explain these orally.	**Predicting** Suggest what might happen and make some good guesses.	**Predicting** Suggest what might happen, often justifying with personal experience and/or prior knowledge.	**Predicting** Suggest what might happen, and begin to use scientific understanding, justifying with personal experience and/or prior knowledge.	**Predicting** Make predictions about what they think will happen considering: • scientific knowledge and/or personal experience • cause and effect • what might	**Predicting** Make predictions about what they think will happen considering: • scientific knowledge and/or personal experience justification • cause and effect	**Predicting** Making increasingly scientific predictions considering: • previous scientific knowledge and evidence • scientific language to explain why	**Predicting** Making increasingly scientific predictions considering: • Previous scientific knowledge and evidence to inform their predictions.

				happen when the variable is changed.	• how the changing variable will affect the measured variable.	• links between topics to evidence a prediction.	• scientific language to describe a potential outcome or explanation • links between topics to evidence a prediction.
Observing (qualitative data) Ask questions about the things they observe	**Observing (qualitative data)** Make observations about the things they see around them,	**Observing (qualitative data)** Observe closely using simple equipment (hand lenses)	**Observing (qualitative data)** Observe closely using simple equipment and describe using scientific vocabulary.	**Observing (qualitative data)** Make systematic and careful observations and begin to use some scientific vocabulary to describe what they notice or what has changed.	**Observing (qualitative data)** Make systematic and careful observations and use scientific vocabulary to describe what they notice or what has changed.	**Observing (qualitative data)** Make systematic and careful observations to describe, in detail and with a range of scientific vocabulary, what they notice or what has changed.	**Observing (qualitative data)** Make systematic and careful observations to describe, in detail and with a broader range of scientific vocabulary, what they notice or what has changed.
Measuring (quantitative data) With adult guidance begin to use non-standard units to measure and compare. Explore simple measuring equipment.	**Measuring (quantitative data)** With adult guidance begin to use non-standard units to measure and compare. With adult guidance, begin to use simple measuring equipment to make approximate measurements.	**Measuring (quantitative data)** Use non-standard units to measure and compare. Begin to use simple measuring equipment to make approximate measurements.	**Measuring (quantitative data)** Use non-standard units to measure and compare confidently Use simple standard unit measuring equipment to make approximate measurements.	**Measuring (quantitative data)** Use standard units to measure and compare with increasing accuracy.	**Measuring (quantitative data)** Use standard units to measure and compare accurately	**Measuring (quantitative data)** Use standard units to measure and compare precision. Through discussion, decide whether to repeat readings and learn about reliability	**Measuring (quantitative data)** Use standard units to measure and compare with precision (decimals). Make their own decisions whether to repeat readings
Recording (diagrams) Record observations through pictures.	**Recording (diagrams)** Draw simple diagrams.	**Recording (diagrams)**	**Recording (diagrams)** Draw and label simple diagrams.	**Recording (diagrams)** Begin to draw scientific diagrams	**Recording (diagrams)** Draw scientific diagrams labelling	**Recording (diagrams)** Drawing scientific diagrams:	**Recording (diagrams)** Drawing scientific diagrams :

		Draw simple diagrams and with support label these		labelling with simple scientific vocabulary.	with scientific vocabulary.	• Labelling with a range of scientific vocabulary. • Annotated to explain concepts and convey opinions.	• Labelling with a broader range of scientific vocabulary. • Annotated in detail to explain concepts and convey opinions.
Recording (tables)	**Recording (tables)** Verbally articulate results to enquiries and adult to scribe.	**Recording (tables)** With support use a prepared table to record results including: • Numbers. • Simple observations. • Tally frequency.	**Recording (tables)** Use a prepared table to record results including: • Numbers. • Simple observations. • Tally frequency.	**Recording (tables)** Use a prepared table to record results including observations. Begin to use tables with more than two columns. Suggest how results could be recorded and identify table headings.	**Recording (tables)** Use a prepared table to record results including detailed observations. Use tables with more than two columns. Begin to design simple results tables.	**Recording (tables)** Use pre-prepared tables with columns that allow for repeat readings. Begin to suggest design ideas for tables considering variables when doing so. With support, calculate the mean average.	**Recording (tables)** Use tables with columns that allow for repeat readings. Design results tables with increasing independence with consideration of variables where applicable. Calculate the mean average.
Identifying, grouping and classifying With adult support start to group objects based their observations	**Identifying, grouping and classifying** With adult support group based on basic observations and given characteristics. Make choices when performing simple identifying and classifying.	**Identifying, grouping and classifying** Perform simple identifying and classifying and grouping tasks using basic observation. Follow yes/no questions to use a classification key.	**Identifying, grouping and classifying** Perform simple identifying and classifying and grouping tasks using observation and prior knowledge. Organise questions to create a simple classification key.	**Identifying, grouping and classifying** With support group based on visible characteristics and measurable properties. Begin to populate a pre-prepared branching and number key. Use simple keys for classification	**Identifying, grouping and classifying** Group based on visible characteristics and measurable properties. Populate a pre-prepared branching and number key. Identify criteria for classification and use and create simple keys.	**Identifying, grouping and classifying** Begin to group in a broader range of contexts. With some support, organise the layout of number and branching keys. With some support, formulate appropriate	**Identifying, grouping and classifying** Group in a broader range of contexts. Independently organise the layout of number and branching keys. Formulate appropriate questions for classification keys.

						questions for classification keys.	
Graphing	**Graphing** With adult support, begin to represent data using pictograms.	**Graphing** Begin to represent data using pictograms and block charts.	**Graphing** Represent data using pictograms and block charts.	**Graphing** Begin to represent data using bar charts. Begin to draw bars with accuracy. Begin to read the value of bars with accuracy.	**Graphing** Accurately represent data using bar charts. Draw bars with accuracy. Read the value of bars with accuracy.	**Graphing** Begin to represent data by using line graphs and scatter graphs. Plot points with greater accuracy. Begin to read the value of plotted points with accuracy.	**Graphing** Represent data by using line graphs and scatter graphs. Plot points with accuracy. Read the value of plotted points with accuracy.
Analysing and drawing conclusions Make suggestions based on their observations	**Analysing and drawing conclusions** With support, use basic observations to answer questions verbally.	**Analysing and drawing conclusions** With support, use their observations and/or results to answer simple questions. Say whether their findings match their predictions	**Analysing and drawing conclusions** Use their observations and/or results to answer simple questions. Give conclusions with simple reasoning Begin to recognise when results or observations do not match their predictions	**Analysing and drawing conclusions** Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. Through discussion comment on the degree of trust by reflecting on: • Results that do not fit a pattern (anomalies). • The quality of results (accurate measurements and maintaining	**Analysing and drawing conclusions** Comment on the findings of other investigations compared to their own and how they support or contradict. Use own results and findings of others to draw simple conclusions, make predictions for new values, suggest improvements	**Analysing and drawing conclusions** Begin to compare individual, class and/or model data to the prediction and recognize when they do not match. Report and present findings from enquiries, including conclusions, explanations of and degree of trust in results. Through discussion, comment on the degree of trust by reflecting on: • Accuracy (human error with equipment).	**Analysing and drawing conclusions** Compare individual, class and/or model data to the prediction and recognize when they do not match. Report and presenting findings from enquiries, including conclusions, causal relationships and explanations of and results and giving an explanation of trust in results, with reason. Comment on the degree of trust by reflecting on:

				control variables).	and raise further questions Comment on the degree of trust by reflecting on: • Results that do not fit a pattern (anomalies). • The quality of results (accurate measurements and maintaining control variables).	• Reliability (repeating results). • Sources of information (e.g. websites, books).	• Accuracy (human error with equipment). • Reliability (repeating results). • Sources of information (e.g. websites, books).
Evaluating	**Evaluating**	**Evaluating**	**Evaluating**	**Evaluating**	**Evaluating**	**Evaluating**	**Evaluating**
		Say what went well and what did not go well with their enquiry.	Begin to recognise whether a test is fair or not.	Through discussion, suggest steps in the method that need changing and variables which were difficult to control to suggest improvement	Identify steps in the method that need changing and variables which were difficult to control to suggest improvement control them.	Suggest what data to collect to further test direct relationships.	Decide what data to collect to further test direct relationships.