PROGRESSION IN WORKING SCIENTIFICALLY SKILLS

This document is based on documents produced by the PSTT, Primary Science Education Consultancy and PLAN.
It shows how the working scientifically statements from the science NC are linked and built on across the three phases in Key Stage 1 and 2.

To highlight the links, the statements are grouped under the following broader skills definitions:

Asking questions
Asking questions that can be answered using a scientific enquiry.

Making predictions
Using prior knowledge to suggest what will happen in an enquiry.

Setting up tests
Deciding on the method and equipment to use to carry out an enquiry.

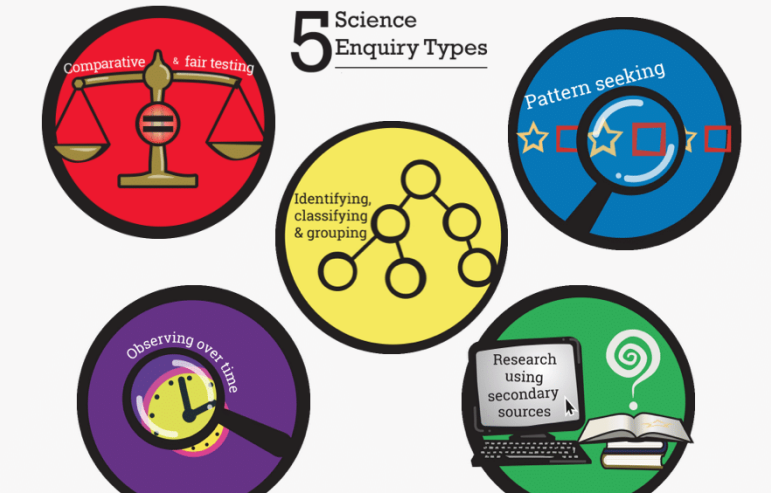
Observing and measuring
Using senses and measuring equipment to make observations about the enquiry.

Recording data
Using tables, drawings and other means to note observations and measurements.

Interpreting and communicating results
Using information from the data to say what you found out.

Evaluating
Reflecting on the success of the enquiry approach and identifying further questions for enquiry.

In addition, the 5 scientific enquiry types are highlighted in different colours so progression can easily be viewed. The 5 enquiry types are:



NOTE: The science NC statements are in bold.

Extra detail has been added in some cases to clarify the NC expectations.

		KS1	LKS2	UKS2
	**To ask scientific questions**	**Asking <u>simple</u> questions and recognising that they can be answered in different ways** The children explore the world around them and <u>raise their own questions</u>. They answer questions <u>developed with the teacher</u>. They are <u>involved in planning</u> 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. Be able to ask Yes/No questions to aid sorting Ask one or two simple questions linked to a topic Identify the question to investigate from a scenario or choose a question from a range provided Ask a question about what might happen in the future based on an observation Ask a question that is looking for a pattern based on observations	**Asking <u>relevant</u> questions and using different types of scientific enquiries to answer them** The children consider their prior knowledge when asking questions (using sentence stems for support). They <u>ask their own questions</u> about what they observe. The <u>children make some decisions</u> about which types of scientific enquiry are likely to be the best ways of answering them. They also answer questions posed by the teacher. Be able to ask a range of Yes/No questions to aid sorting Ask a range of questions linked to a topic Ask a range of questions linked to a topic Ask a range of questions linked to a topic Ask a range of questions linked to a topic	**Planning different types of scientific enquiries to answer questions** The children <u>independently</u> ask scientific questions. The <u>children decide</u> which type of scientific enquiry to use. Be able to ask a range of Yes/No questions to aid sorting and decide which ways of sorting will give useful information Ask a range of questions recognising that some can be answered through research and others may not Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results Ask a range of questions and identify the type of enquiry that will help to answer the questions. Ask further questions based on results

	**To plan an enquiry**	**Performing simple tests** The children use practical resources provided by the teacher to gather evidence to answer questions generated by themselves or the teacher. **Identifying and classifying** The 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. Identify the headings for the two groups (it is …., it is not ….) Choose equipment to use and decide what to do and what to observe or measure in order to answer the question Choose equipment to use and decide what to do and what to observe or measure in order to answer the question Choose equipment to use and decide what to do and what to observe or measure in order to answer the question	**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 identify the type of enquiry that they have chosen to answer their question. They recognise when secondary sources can be used to answer questions that cannot be answered through practical work. **NOTE**: ● **A comparative test** is performed by changing a variable that is qualitative e.g. 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. thickness of material or area of canopy. This leads to establishing a causative relationship. Be able to put appropriate headings onto intersecting Venn and Carroll diagrams Choose a source from a range provided Decide what to change and what to measure or observe Decide what to measure or observe. Decide how often to take a measurement Decide what to measure or observe	**Planning different types of scientific enquiries to answer questions, including recognising and controlling variables** The children select from a wide range of practical resources to gather evidence to answer their own questions. 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. Identify specific clear questions that will help to sort without ambiguity Choose suitable sources to use Recognise and control variables where necessary Recognise and control variables where necessary Recognise and control variables where necessary

	**To observe closely**	**Observing closely** The children use appropriate senses, aided by equipment such as magnifying glasses or digital microscopes, to make their observations. Be able to compare objects based on obvious, observable features e.g. size, shape, colour, texture Make observations linked to answering the question Make observations linked to answering the question Make observations linked to answering the question	**Making systematic and careful observations** The children help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used. Be able to compare objects based on more sophisticated, observable features. Present observations in labelled diagrams Make observations linked to answering the question Make observations linked to answering the question Make observations linked to answering the question	The children decide what observations or measurements to make over time and for how long. Be able to compare not only based on physical properties but also on knowledge gained through previous enquiry Make observations linked to answering the question Make observations linked to answering the question Make observations linked to answering the question
	**To take measurements**	**Using simple equipment** The children use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data. They begin taking measurements by comparisons, then using non-standard units. When appropriate, measure using non-standard standard units When appropriate, measure using non-standard standard units When appropriate, measure using non-standard standard units	**Taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers** The children use a range of equipment for measuring length, time, temperature and capacity. They use standard units for their measurements. When appropriate, measure using standard units where all the numbers are marked on the scale When appropriate, measure using standard units where all the numbers are marked on the scale When appropriate, measure using standard units where all the numbers are marked on the scale	**Taking measurements, using a 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, in order to get accurate data, they make decisions, such as whether to: ● take repeat readings (fair testing) ● increase the sample size (pattern seeking) ● adjust the observation period / frequency (observing over time) ● check further secondary sources (researching) Measure using standard units where not all the numbers are marked on the scale, and take repeat readings where necessary Measure using standard units where not all the numbers are marked on the scale. Use dataloggers to measure over time Measure using standard units where not all the numbers are marked on the scale

	**To gather/record results**	**Gathering and recording data to help in answering questions** The children record their measurements using prepared resources, e.g. tables, pictograms, tally charts, block graphs and sorting rings. Record data in simple prepared tables, pictorially or by taking photographs Record data in simple prepared tables, pictorially or by taking photographs Record data in simple, prepared tables and tally charts	**Gathering and recording 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 their evidence. They are given templates, if required, to which they can add headings. Prepare own tables to record data Prepare own tables to record data Prepare own tables to record data	**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. Prepare own tables to record data, including columns for taking repeat readings Prepare own tables to record data Prepare own tables to record data
	**To present results**	With help, the children record and communicate their findings in a range of ways and begin to use simple scientific language. Sort objects and living things into two group using a basic Venn diagram or simple table Present what they have learnt verbally or using pictures Present what they learnt verbally, using pictures or block diagrams Present what they learnt verbally or using pictures Present what they learnt verbally	**Presenting data in a variety of ways to help in answering questions** The children sometimes decide how to record and present their evidence. Sort objects and living things into groups using intersecting Venn and Carroll diagrams Present what they learnt verbally or using labelled diagrams Present data in bar charts Present data in time graphs Use ICT package to present data as a scattergram	**Reporting and presenting findings from enquiries, including conclusions and causal relationships, in oral and written forms such as displays and other presentations** The children decide how to record and present evidence. Create branching databases (tree diagrams) and keys to enable others to name livings things and objects Present what they learnt in a range of ways e.g. different graphic organisers Choose an appropriate form of presentation, including line graphs Choose an appropriate form of presentation, including line graphs Choose an appropriate form of presentation, including scatter graphs

	**To interpret results**	Talk about the number of objects in each group i.e. which has more or less Be able to answer their questions using simple sentences Answer their question in simple sentences using their observations or measurements Answer their question in simple sentences using their observations or measurements Answer their question in simple sentences using their observations or measurements	Spot patterns in the data particularly two criteria with no examples e.g. there are no living things with wings and no legs Be able to answer their questions using simple scientific language Refer directly to their evidence when answering their question Refer directly to their evidence when answering their question Refer directly to their evidence when answering their question	Be able to talk about the features that objects and living things share and do not share based on the information in the key etc Be able to answer their questions using scientific evidence gained from a range of sources Be able to answer their question, describing causal relationships Be able to answer their questions, describing the change over time Be able to answer their questions identifying pattern
	**To draw conclusions**	**Using their observations and ideas to suggest answers to questions** **Children in KS1 are not expected to draw conclusions. They do not have the subject knowledge to give reasons for what they observe so they cannot draw scientific conclusions.** **They are expected to make observations which will help them to answer questions.** The children are supported to relate their answers to questions to their evidence e.g. observations they have made, measurements they have taken or information they have gained from secondary sources. They recognise 'biggest and smallest', 'best and worst' etc. from their data.	**Using straightforward scientific evidence to answer questions or to support their findings** **Identifying differences, similarities or changes related to simple scientific ideas and processes** **Using results to draw simple conclusions** The children interpret their data to generate simple comparative statements based on their evidence. They begin to identify naturally occurring patterns and causal relationships. They draw conclusions based on their evidence and current subject knowledge Draw simple conclusions, when appropriate, for patterns e.g. a flying insect with no legs might always crash land Where appropriate provide oral or written explanations for their findings Where appropriate provide oral or written explanations for their findings Where appropriate provide oral or written explanations for their findings	**Identifying scientific evidence that has been used to support or refute ideas or arguments** When answering questions, the children discuss whether other evidence (e.g. from other groups, secondary sources and their scientific understanding) supports or refutes their answer. **Reporting and presenting findings from enquiries, including conclusions and causal relationships, in oral and written forms such as displays and other presentations** In their conclusions, the children: • identify causal relationships and patterns in the natural world from their evidence • identify results that do not fit the overall pattern • explain their findings using their subject knowledge Be able to use data to show that livings things and materials that are grouped together have more things in common than with things in other groups Provide oral or written explanations for their findings Provide oral or written explanations for their findings Provide oral or written explanations for their findings

	**To make a prediction**	**Children in KS1 are not expected to make scientific predictions as they do not have the subject knowledge to do this.** **That does not mean that you should not ask children what they think may happen, but this will be based on experience or may simply be a guess.**	**Using results to make predictions for new values** The 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 Use results from an investigation to make a prediction about a further result Use results from an investigation to make a prediction about a further result Use results from an investigation to make a prediction about a further result	**Using test results to make predictions to set up further comparative and fair tests** The children use the scientific knowledge gained from enquiry work to make predictions they can investigate using comparative and fair tests. Use test results to make predictions for further investigations Use test results to make predictions for further investigations Use test results to make predictions for further investigations
	**To evaluate an enquiry**	**Children in KS1 are not expected to evaluate.** **However, children should be encouraged to consider their method and adapt this where necessary.**	**Using results to suggest improvements and raise further questions** The children identify ways in which they adapted their method as they progressed or how they would do it differently if they repeated the enquiry. . Following a scientific experience, the children ask further questions which can be answered by extending the same enquiry. Suggest improvement e.g. a wider range of objects – only looked at British trees. Suggest new questions arising from the investigation Suggest limitations e.g. only had one book. Suggest new questions arising from the investigation Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation Suggest improvements e.g. to method of taking measurements. Suggest new questions arising from the investigation	**Reporting and presenting findings from enquiries, including explanations of and degree of trust in results** The children evaluate the: ● choice of method used, the control of variables ● precision and accuracy of measurements ● credibility of secondary sources used. They identify any limitations that reduce the trust they have in their data. Be able to explain using evidence that the branching database or classification key will only work for the living things or materials it was created for Be able to talk about their degree of trust in the sources they used Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results Explain their degree of trust in their results e.g. precision in taking measurements, variables that may not have been controlled, and accuracy of results