HFL progression in working scientifically skills

This document shows how the working scientifically statements from the science national curriculum for England build through the primary curriculum. The **bold** statements reflect the working scientifically skills outlined under the statutory requirements. The other bullet points provide additional guidance to support with understanding of progression. For EYFS, relevant Development Matters statements have been used to consider how the foundations for working scientifically can be encouraged and modelled through interactions with children while they are playing and exploring.

In a full enquiry, children will be using and developing a range of the skills listed below. However, to explicitly teach, model and assess each skill it is recommended that teaching narrows the focus so that a fundamental skill or skill area can be focused on in an enquiry. The focus of the learning should also be the focus of any recording children complete e.g. if the focus is on forming a conclusion, this might be the only part of the enquiry recorded by the child in their book. Over the course of an academic year, teachers and science subject leaders should ensure that a range of skills are focused on, so that children are learning the full range of working scientifically skills.

Skill		EYFS	Key stage 1	Lower key stage 2	Upper key stage 2
Planning-exploring and planning	Ideas and questions 	• shows curiosity and starts to ask questions	• **asks simple questions and recognises that they can be answered in different ways**	• **asks relevant questions and uses different types of scientific enquiries to answer them**	• uses their scientific experiences to explore ideas and raise different types of questions. • chooses the type of enquiry to answer a question and justifies their choice.
	Planning or following an approach 	• performs simple tests using some simple equipment	• **performs simple tests** or follows teachers' instructions, including tests to classify, comparative tests, pattern seeking and observations over time. • with guidance, suggests what they will do • with guidance, identifies things to measure or observe that are relevant to the question	• **sets up simple practical enquiries, comparative and fair tests** • begins to make decisions about what observations to make and how long to make them for • begins to choose the type of simple equipment that might be used from a reasonable range	• **plans different types of scientific enquiries to answer questions** • makes decisions about what observations or measurements to make, how long to make them for and whether to repeat them • chooses the most appropriate equipment to make measurements (accuracy and precision)
	Variables		• suggests why a comparative test is unfair	• with help, decides how to set up a fair test and identifies some things that need to be kept the same.	• recognises when and how to set up comparative and fair tests • **recognises and controls variables where necessary** • explains which variables need to be controlled and why

– collecting and presenting evidence Doing	Observing and measuring 	• uses senses to observe and look closely • notice changes	• **observes closely using simple equipment** • makes measurements through comparisons and using non standard units.	• **makes systematic and careful observations where appropriate taking accurate measurements using standard units using a range of equipment, e.g. data loggers and thermometers**	• **takes measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate** • calculates mean value where appropriate (after taught in maths see footnote)
	Secondary sources 		• uses simple secondary sources to find answers, e.g. books, videos, photographs, people, identification sheets	• recognises when and how secondary source might help answer questions that cannot be answered through practical investigations	• recognises which secondary sources will be most useful to research their ideas • begins to separate opinion from fact • **identifies scientific evidence that has been used to support or refute ideas or arguments**
	Identify and classify 	• finds things that are similar or different • sorts and matches things	• **identifying and classifying** • uses observations and testing to identify similarities and differences in materials and living things • sorts and groups based on own criteria and criteria given into tables and sorting rings	• **identifies differences, similarities related to simple scientific ideas and processes** • **records findings using keys** • uses classification branching keys • records classification using Venn and Carroll diagrams	• **records and presents findings using classification keys** • uses and develops keys to identify, classify and describe living things and materials

	Recording information and data	• makes simple records (drawings, photographs etc.) to show observations including simple tick sheets (reception)	• **gathers and records data to help in answering questions** • records observations e.g. using photos, video, labelled diagrams and in writing • records measurements in prepared tally charts, tables, block graphs or pictograms	• **gathers and records data in a variety of ways to help in answering questions** • starts to decide how to record data in simple contexts. • uses given templates and adds own headings to tables	• **records data and results of increasing complexity** • decides how to record data and prepares own format.
	Presenting evidence 		• with help, records their findings in a range of ways, e.g. simple tables, diagrams, pictograms, block graphs and sorting circles	• **recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**	• **records and presents findings using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs**

–an alys ing resu lts con clud ing	Answering questions and concluding 	• talks about what they have done and what they have noticed	• talks about what they have found out and, with support, how they found it out • **use their observations and ideas to suggest answers to questions**	• **uses results to draw simple conclusions** • **uses straightforward scientific evidence to answer questions or to support their findings** • **identifying differences, similarities or changes related to simple scientific ideas and processes**	• **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** • draws valid conclusions, explains and interprets the results (**including the degree of trust)** using scientific knowledge and understanding (e.g. recognises limitations of data)

and evaluating Reviewing	Sharing findings 		• talks about what they, their group or class have found out	• **reports on findings from enquiries, in simple scientific language, using oral and written explanations, displays or presentations of results and conclusions** • communicates findings to an audience	• communicates findings to an audience in oral and written forms using relevant scientific language, graphs and diagrams to communicate and justify scientific ideas
	Evaluating		• with support, suggests whether what happened was what they expected • with support, suggests different ways they could have done things	• **uses results to suggest improvements, make predictions for new values and raise further questions** • with support, suggests simple improvements to a method • use evidence to suggest value for different items e.g. distance travelled by car on other surfaces. • with support, ask questions related to the enquiry or arising from the data	• makes practical suggestions about how their working method could be improved (e.g. surveying more people, repeat to check accuracy of results, better control of variables etc.) • identify limitations that reduce the trust they have in data. • uses results to identify when further tests and observations might be needed • **uses test results to make predictions and to set up further comparative and fair tests**

Vocabulary

Term	Definition and examples
Types of enquiry	The national curriculum lists five types of enquiry: fair and comparative testing, looking for a pattern, observing over time, identifying and classifying, research
Fair or comparative testing	Changing one variable to observe its effect while controlling all of the other variables. In a comparative test the variable being changed is qualitative e.g. type of material. In a fair test it is quantitative e.g. size of the parachute.
Observing over time	Observing and measuring how something changes over time.

Looking for a pattern	Observing and recording patterns in nature or carrying out a survey where all of the variables cannot be controlled, e.g. where do daisies grow? Do children with the longest arms throw the furthest?
Research	Using secondary sources such as: books, the internet, pictures, visitors and experts as sources of evidence to answer questions.
Identifying and classifying	Arranging and sorting objects, materials and living things into particular sets according to certain characteristics. These can be characteristics and groups designed by the children or recognised groups such as carnivores, omnivores and herbivores.
Accurate	To be accurate, a measurement is close to its true value.
Precise equipment	More precise equipment measures to a smaller increment e.g. a ruler with mm is more precise than a ruler with only cm.
Variable	Variables are the things in an enquiry that can be changed. To establish a causal relationship in a fair test only one variable can be changed. Any others that may affect the results need to be kept the same (controlled). *(Not mentioned in the national curriculum until UKS2)*
Conclusion	A simple summary of what has been found out based on observations and/or measurements.

Footnote: Alternatives to calculating a mean

It may be appropriate for pupils to take repeat readings in comparative and fair tests before they have learnt about calculating the mean average in maths. Rather than asking them to calculate a mean in science before learning how to do this in maths, pupils can instead be encouraged to look closely at their data and identify any readings that do not fit with the others. Once identified, these readings can be crossed out and ignored, or if there is time pupils can repeat the reading again. Pupils can then look at the remaining readings and use these to estimate a 'most likely' answer.