HCAT

Working Scientifically

Purpose of study

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Aims

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them.
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

'Working and thinking scientifically' is described separately at the beginning of the programme of study but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content

Key Stage 1

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.

Lower Key Stage 2

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.

Upper Key Stage 2

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

<table>
<tr><th rowspan="3">HCAT Science Curriculum Coverage</th><th colspan="4">KS1</th><th colspan="2">LKS2</th><th colspan="2">KS2</th></tr>
<tr><th colspan="2" rowspan="2">Cycle A</th><th colspan="2" rowspan="2">Cycle B</th><th>Cycle A</th><th>Cycle B</th><th>Cycle A</th><th>Cycle B</th></tr>
<tr><th colspan="4">Working Scientifically to be integrated across</th></tr>
<tr><td>Autumn 1</td><td colspan="2">Animals including humans</td><td colspan="2">Animals including humans</td><td>Animals Including Humans</td><td>Animals Including Humans</td><td>Animals Including Humans</td><td>Animals including humans</td></tr>
<tr><td>Autumn 2</td><td>Materials: Properties and changes</td><td>Seasonal Changes (incl. Working Scientifically)</td><td colspan="2">Use of everyday materials – Working Scientifically</td><td>Light</td><td>Electricity (Linked to Santa’s Hot Rod DT)</td><td>Materials</td><td>Electricity</td></tr>
<tr><td>Spring 1</td><td colspan="2">Animals including humans</td><td colspan="2">Living Things & Their Habitats</td><td>Forces</td><td>Living Things & Their Habitats</td><td>Earth and Space</td><td>Living Things</td></tr>
<tr><td>Spring 2</td><td colspan="2">Plants-Working Scientifically</td><td>Living Things & Their Habitats</td><td>Seasonal Changes (incl. Working Scientifically)</td><td>Magnets</td><td>States of Matter</td><td>Earth and Space</td><td>Plants</td></tr>
<tr><td>Summer 1</td><td colspan="2">Plants</td><td colspan="2">Plants</td><td>Plants</td><td>Sound</td><td>Plants</td><td>Light</td></tr>
<tr><td>Summer 2</td><td>Materials: Properties and changes- Working Scientifically</td><td>Seasonal Changes (incl. Working Scientifically)</td><td colspan="2">Plants</td><td>Rocks & Fossils</td><td>Materials: Properties and changes</td><td>Forces</td><td>Evolution</td></tr>
</table>

Working Scientifically		KS1	LKS2	UKS2
	Framing Questions	I ask questions about what I see. I contribute to class discussion in science. I ask a range of simple questions about what they notice. I find information from books or other printed and screen sources.	I ask relevant questions about what they notice I use a range of texts to investigate science topics. I know how to generate further questions to test results. I begin to use relevant information from text and sources.	I select the most appropriate ways to answer science questions using different types of scientific enquiry I select appropriate sources from a range of information
	Planning Enquiries	I recognise that my questions about what I notice can be answered I know how to suggest ways to answer my question. I know why I am trying to find things out. I recognise that my questions about what I notice can be answered in different ways I begin to give reasons to support my ideas I act on suggestions about how to find things out	I use different types of scientific enquires to answer my questions about what I notice I predict what might happen before I carry out any tests. I act on suggestions and put forward my own ideas about how to improve my enquiry methods	I plan different types of scientific enquiries to answer questions. I find and discuss the controlling variables to be considered I use the key factors to decide on the variables for my experiment I make predictions based on my scientific knowledge and understanding I know how to give scientific reasons, using my past knowledge, to give reasons for predictions I plan to use appropriate apparatus effectively in my scientific enquiries I make practical suggestions about how my enquiry methods can be improved

	Observing	I observe things closely I give some reasons why some things might happen. I use all my senses to observe so that I know how to try to answer questions. I describe my observations using scientific vocabulary.	I make systematic and careful observations using a range of equipment I give reasons for my observations. I use scientific vocabulary to describe my observations.	I record observations systematically I make a series of precise observations and comparisons when completing scientific tasks I repeat observations and offer explanations for any differences I encounter
	Classifying	I know how to identify things in the natural and man-made world. I know how to identify differences, similarities or changes relating to natural and man-made things.	I know how to sort animals and objects accurately according to a given criteria. I know how to use a variety of ways to classify information.	I know how to identify differences, similarities or changes that may impact upon simple scientific ideas and processes
	Measuring	I make measurements using simple equipment.	I measure length, mass and time using suitable equipment and standard units I know how to use thermometers to record standard units of temperature.	I take and record measurements with increasing accuracy and precision I repeat measurements and offer explanations for any differences I encounter
	Testing	I know how to use simple equipment to investigate. I know how to use simple equipment to carry out a range of tests.	I know how to use a variety of ways to gather information. I know how to use a variety of ways to record my findings. With help, I know how to carry out simple practical enquires, comparative and fair tests.	I select appropriate apparatus to set up further enquiries, comparative and fair tests. I experiment with a range of methods to ensure I have the correct approach to a given task. I use test results to ask further questions within a scientific enquiry.

	Gathering Observations	I know how to put information on a chart. I record my observations on screen and paper using text, tables, drawings, and labelled diagrams. I compare observations using scientific vocabulary.	I record my observations, comparisons and measurements using tables, charts, text, and labelled diagrams. I know how to present data in different ways. I know how to report my findings to others in a variety of ways.	I use appropriate scientific language and conventions to communicate both quantitative and qualitative data. I know how to select appropriate charts and tables to present my findings.
	Scientific Evidence		I use straightforward scientific evidence to answer questions or to support my findings. I know some of the work of key scientists to support my enquiry.	I know how to identify opinions and facts that have been used to support or refute scientific ideas or arguments. I identify scientific evidence that has been used to support or refute scientific ideas or arguments. I describe how experimental evidence and creative thinking have been combined to provide a scientific explanation (Jenner's work on vaccination).
	Presenting Conclusions	I know how to use a simple chart to record my findings. I know how to tell others what I have found out. I say whether what happened was what I expected.	I know how to use my findings to draw simple conclusions. I know how to make predictions from my conclusions. I refer to my observations and measurements when giving explanations. I look for patterns in my data and try to explain them.	I draw conclusions which are consistent with the evidence and relate these to scientific knowledge. I use my comparisons to inform my conclusions. I give reasons and explanations to support my conclusions. I explain casual relationships and the degree of trust in my results.