




Subject Disciplinary Knowledge – An overview

Subject specific disciplinary knowledge is needed to develop substantive knowledge and understanding within the subject. Through developing an understanding of the disciplinary knowledge, pupils are supported to understand what makes learning in a particular subject distinctive.






In Science, there is a range of Disciplinary Knowledge areas outlined in the planning documents. In Key Stages 1 and 2, each unit of work identifies which areas of the disciplinary knowledge is explicitly taught. We have identified the disciplinary knowledge that is developed during the Early Years, leading into those defined for Key Stage 1. As the pupils progress into Key Stage 2, the Key Stage 1 areas of disciplinary knowledge continue to be developed and two additional areas are introduced.




The National Curriculum for England identifies 'Working Scientifically' as part of the Programme of Study. We recognise that Working Scientifically is part of the disciplinary knowledge. We use the acronym IPROF for the Scientific Enquiry types and these Enquiries develop through the different key stages.

EYFS – Key Stage 1 Readiness Disciplinary Knowledge






	Confidence in answering simple questions about observable properties of objects, people, animals and plants around them.
	Comparing objects in their environment and talking about their similarities and differences.
	Asking questions about the world around them, seeking to find their own answers.

Disciplinary Knowledge – Working Scientifically

	Key Stage 1	Lower Key Stage 2	Upper Key Stage 2
	Asking simple questions and recognising that they can be answered in different ways.	asking relevant questions and using different types of scientific enquiries to answer them	Plan enquiries, including recognising and controlling variables where necessary.
	Observing closely, using simple equipment	making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers	Take measurements using a range of scientific equipment, with increasing accuracy and precision.
	Performing simple tests	setting up simple practical enquiries, comparative and fair tests	Use appropriate techniques, apparatus and materials to set up and carry out a range of scientific enquiries.
	Identifying and classifying		Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs and models.
	Using their observations and ideas to suggest answers to questions	Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusion	Present findings in written form, displays and other presentations

	Gathering and recording data to help in answering questions	Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests	Use test results to make predictions to set up further comparative and fair tests.
		Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables	Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships and conclusions.
		Identifying differences, similarities or changes related to simple scientific ideas and processes.	Use simple models to describe scientific ideas identifying scientific evidence that has been used to support or refute ideas or arguments.

Key Stage 1 & 2 – Scientific Enquiries

I		Identifying and classifying
P		Pattern seeking
R		Research
O		Observing over time
F		Fair and comparative testing

Strategic Overview

Substantive Knowledge




Our Science Curriculum develops **substantive knowledge** using the disciplinary knowledge. Substantive knowledge is the body of knowledge and concepts that form the basis of scientific understanding. Substantive knowledge develops progressively throughout our curriculum, and is organised into three distinct bodies of knowledge: Biology; Chemistry; and Physics. Each of the three main bodies of knowledge are further broken down in our curriculum (in line with the National Curriculum Programmes of Study).

This section outlines how the curriculum is organised in each of our Key Stages. It includes some specific details about the development of the disciplinary knowledge, and an outline of how the substantive knowledge is organised.

Early Years Foundation Stage

Key Stage 1 Readiness Skills developed throughout the EYFS

These are skills that are developed throughout the Early Years provision, and enable the pupils to be ready to learn when they enter Key Stage 1.

	Confidence in answering simple questions about observable properties of objects, people, animals and plants around them.
	Comparing objects in their environment and talking about their similarities and differences.
	Asking questions about the world around them, seeking to find their own answers.

Early Learning Goals relating to the KS1 readiness skills

ELG: Listening, Attention and Understanding

Make comments about what they have heard and ask questions to clarify their understanding.

ELG: Fine motor skills

Use a range of small tools, including scissors, paintbrushes and cutlery.

ELG: Building Relationships

Work and play cooperatively and take turns with others.

Substantive Knowledge in EYFS – being ready for Key Stage 1

KS1 readiness knowledge			
Seasonal changes	Animals and humans	Plants	Everyday materials
<ul style="list-style-type: none"> To know about different types of weather To observe changes in trees and plants as the seasons progress 	<ul style="list-style-type: none"> To know what an animal is To recognise and name a variety of different animals To know the names of different body parts of humans and animals they have experience of 	<ul style="list-style-type: none"> To know what a plant is To know what a flower is To know where you see plants To describe different plants and flowers 	<ul style="list-style-type: none"> To recognise that different everyday objects are made from different materials To describe how different objects look and feel

Early Learning Goals relating to the substantive knowledge in EYFS

ELG: The Natural World

Explore the natural world around them, making observations and drawing pictures of plants and animals.

Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.







Understand some important processes and changes in the natural world, including the seasons and changing states of matter.

ELG: Speaking

Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary.

Key Stage 1

Disciplinary Knowledge - Working Scientifically

 Asking simple questions and recognising they can be answered in different ways What am I trying to find out about? Why do I want to know? What questions could I ask about this new information?	 Observing closely using simple equipment What equipment am I using? How do I use this equipment properly?	 Performing simple tests How am I going to complete my enquiry?
 Identifying and classifying How can I sort and classify the things I have been looking at and comparing?	 Using their observations and ideas to answer questions What observations have I made? What am I comparing in this enquiry? How will I check my observations and results?	 Gathering and recording data to help in answering questions How am I recording my data and information? What patterns have I spotted in my data and information?

Scientific Enquiry

I Identifying, grouping and classifying	P Pattern seeking	R Research	O Observing over time	F Fair and comparative testing
Organising data and observations into defined groups	Identifying patterns in the world around them Identifying patterns in the way materials act	Seeking information that will answer enquiry questions from books and the internet	Collecting repeated observations and measurements in an organised way.	Identifying how to set up fair and comparative tests to explore enquiry questions and/or hypotheses

Substantive Knowledge

This is the subject specific knowledge that is developed across Key Stage 1. It is organised into the following areas of learning, in line with the National Curriculum Programmes of Study for Key Stage 1. Our learning units also deal explicitly with common misconceptions, ensuring that these do not develop in the pupil's developing knowledge.









Biology				Chemistry	
Seasonal Changes	Animals including Humans	Plants	Living things and their habitats.	Everyday materials	Uses of everyday materials.

Structural organisation:

	Biology				Chemistry
Year 1 and 2 Cycle A	Seasonal changes	Animals including humans	Plants		Everyday Materials
Year 1 and 2 Cycle B				Living things and their habitats	Uses of everyday materials

Key Stage 2

Disciplinary Knowledge – Working Scientifically Lower Key Stage 2

 <p>Asking simple questions and recognising they can be answered in different ways</p> <p>How does this new knowledge link to what I already know? Based on what I know already, what is my hypothesis? Why do I think that? If I am doing a practical enquiry, what variables do I need to think about? Can I recognise the independent, dependent and controlled variables in the enquiry I am carrying out?</p>	 <p>Observing closely using simple equipment</p> <p>What do I need to observe? What equipment do I need to make my observations? What am I expecting to see?</p>	 <p>Performing simple tests</p> <p>What type of enquiry would it be best to follow? Why? What equipment am I using? Why is this the best equipment? How do I use this equipment precisely and safely? If I am problem solving or researching, where will I look for information that will help me?</p>	 <p>Identifying and classifying</p> <p>How can I sort and classify the things I have been looking at and comparing? Why have I grouped or classified my observations and measurements in the way that I have? Are there any formal methods for sorting and classifying that I should use to help me?</p>
 <p>Recording findings using simple scientific language, drawings, labelled diagrams, bar charts and tables</p> <p>How will I check that any results are accurate? How will I record my information and data? Which chart or graph is the best way to display the information I have recorded?</p>	 <p>Using their observations and ideas to answer questions</p> <p>What patterns have I spotted in my data and information? What conclusions can I draw from my investigation?</p>	 <p>Gathering and recording data to help in answering questions</p> <p>Will I need to gather multiple results and find a mean in order to be accurate? How does my data and information relate to my hypothesis? What conclusions can I draw from my investigation?</p>	 <p>Identify differences, similarities or changes related to simple scientific ideas and processes</p> <p>How does what I have observed match theories and ideas I have been learning about?</p>

Scientific Enquiry

I Identifying, grouping and classifying	P Pattern seeking	R Research	O Observing over time	F Fair and comparative testing
Organising data and observations into defined groups	Identifying patterns in the world around them Identifying patterns in the way materials act Identifying patterns in data sets	Seeking information that will answer enquiry questions from books and the internet Knowing how to check the quality of the information they gather Upper key stage 2 using information to refute or back up an argument.	Collecting repeated observations and measurements in an organised way Deciding on accurate methods for collecting the data in line with the investigation	Identifying how to set up fair and comparative tests to explore enquiry questions and/or hypotheses Demonstrating an understanding of the difference between fair and comparative tests, particularly in upper key stage 2

Substantive Knowledge

This is the subject specific knowledge that is developed across Key Stage 2. It is organised into the following areas of learning, in line with the National Curriculum Programmes of Study for Key Stage 2. Our learning units also deal explicitly with common misconceptions, ensuring that these do not develop in the pupil's developing knowledge.

Biology				
Animals including humans	Plants	Living things and their habitats	Evolution and inheritance	
Chemistry				
Rocks	States of Matter		Properties and changes of materials	
Physics				
Light	Sound	Forces including magnets	Electricity	Earth and Space

Structural organisation:

	Biology			Chemistry	Physics			
Year 3-4 Cycle A	Animals including humans	Living things and their habitats		States of matter	Light	Electricity		
Year 3-4 Cycle B		Plants		Rocks	Sound		Forces and magnets	
Year 5-6 Cycle A		Living things and their habitats.		Properties and changes of materials	Light	Electricity		
Year 5-6 Cycle B			Evolution and inheritance				Forces	Earth and Space