



SCIENCE CURRICULUM

Page	Content
2 - 4	Intent, Implementation and Impact statements
5 - 6	National Curriculum Coverage
7 - 14	Science- long term plan
15 - 18	Progression of Knowledge
19 - 20	Progression of Skills
21 - 22	SEND in Science
23	Vocabulary progression
24 – 26	Key knowledge
27	Resources and Websites

1. INTENT, IMPLEMENTATION AND IMPACT

Intent

Science has changed our lives and is vital to the world's future prosperity and survival. All pupils at Croft are taught essential aspects of the knowledge, methods, processes and uses of science. They are taught to understand our world by carefully thinking about it and testing their predictions with observations and experiments. Through building up a body of key foundational knowledge and concepts, pupils are encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena.

Our Science topics are informed by the National Curriculum. We use the progression of skills table to ensure that children are taught scientific knowledge (substantive knowledge) and scientific skills (disciplinary knowledge) and that those skills progress as they move up through school.

High quality lessons help children to aspire to be the best they can be. Following on from EYFS and Key Stage 1, teachers instill, extend and enhance a love of learning in children where they can explore science with a continued confidence. Where possible, we link Science learning to other subjects to allow children to be fully immersed in their learning.

Through our teaching of Science at Croft, we intend to:

- give children the opportunities to see how skills and knowledge can be applied in the real world.
- Show children how to use skills in future endeavours and become well-rounded members of society.
- broaden and develop scientific learning in order to deepen understanding.

Through science lessons, we can also:

- improve pupils' skills in literacy (correct spelling of key vocabulary), numeracy (data handling) and ICT (collecting data e.g data loggers).
- develop pupils' scientific thinking skills e.g making predictions and altering thought processes when repeating tests.
- promote pupils' awareness and understanding of gender, cultural, spiritual and moral issues e.g looking after animal habitats in the local environment.

We want children to leave Croft with a natural curiosity of the world around them and the role that Science has in understanding themselves and their world. They should be enthused by Science and the essential role it has to play in the world's prosperity and survival.

Implementation

The Science lead, in conjunction with senior leaders and class teachers for each year group, checks the long-term plans to ensure coverage of the National Curriculum content. Science is taught as a discrete subject, weekly. Every year group teaches Science every half term.

To create interesting and engaging lessons, we use a variety of resources. A standard planning template is used for all Science lessons. These planning templates identify the series of lessons with each lesson having a learning question to be addressed. Throughout the year, investigations

are undertaken so that children can independently discover an answer to a given challenge or as they progress through the school create their own investigations to answer questions.

The following information shows the focus of learning for each phase of learning.

Early Years Foundation Stage

The main focus within EYFS is to harness children's natural curiosity with the world and everything around them. More specifically, as part of the EYFS framework and specified within the 'Understanding the world' educational programme there is an Early Learning Goal (ELG) for the natural world. Within this it states children at the expected level of attainment will:

- Explore the natural world around them, making observations and drawing pictures of animals and plants;
- Know some similarities and differences between the natural world around them and contrasting environments; drawing on their experiences and what has been read to them in class;
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

Key stage 1 - Ruby

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They are encouraged to be curious and ask questions about what they notice and helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways.

Lower key stage 2 – Diamond and Topaz

The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions.

They start to ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

Upper key stage 2 – Amethyst

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions,

relationships and interactions more systematically. At upper key stage 2, they encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

Retaining Key knowledge

In order to help children retain key information, we use retrieval questions at the start of most lessons. These questions revisit key facts and important information from within that year group and previous year groups. Regular recall of such facts helps children commit them to their long-term memory, ensuring they will retain the 'key knowledge' for the end of Key Stage 2. In addition, at the start of each new Science topic a Knowledge Organiser is sent home which contains the key points of learning and vocabulary so that the children have an opportunity to discuss this with the parents or guardians. For KS1 the Science knowledge may be contained in a topic Knowledge organiser rather than a discrete Science Knowledge Organiser. These Knowledge Organisers are regularly referred to in lessons and are often a source of retrieval questions. Furthermore, a Graphic organiser is used for each Science topic where children have an opportunity to recall key information at a time after their learning to see what they can remember. This also provides an assessment opportunity for teachers to identify misconceptions or where some learning may need to be revisited.

Impact

Each child's individual science book shows that science is taught regularly and learning recorded in a variety of ways. Outcomes of work are monitored to ensure that children have a clear understanding of key knowledge. Teachers can then clarify misconceptions where appropriate and revisit areas of learning if necessary.

Emphasis is placed on children being able to demonstrate curiosity, enquiry and scientific vocabulary. They build on prior learning in order to further their knowledge and understanding. This helps them to see how science influences all lifestyles and how it shapes our world today.

The outcomes of pupils will be monitored by the class teacher, subject lead and SLT through marking, lesson observations and book scrutiny.

Assessment

Assessment is ongoing throughout each science topic. Children start new topics by discussing or mind-mapping what they already know. AfL is used regularly in lessons through verbal discussions, questioning, observations and retrieval questions. These are then used to identify next steps and misconceptions are quickly clarified. These are recorded in the whole class feedback booklets after each lesson.

2. NATIONAL CURRICULUM COVERAGE

a) EYFS statutory framework and links to Science

The EYFS statutory framework defines the learning and development requirements (Section 1). Within this the framework details the requirements for:

- Areas of learning and development
- Educational Programmes
- Early Learning Goals

There are seven areas of learning and development that must shape the educational programmes in early years settings. The area that links well with Science is 'understanding the world'. Within this, children should be guided to make sense of their physical world and community. Within the framework it refers to listening to a broad selection of stories, non-fiction, rhymes and poems that foster their understanding of our culturally, socially, technologically and ecologically diverse world...enriching and widening children's vocabulary that will support later reading comprehension.

The level of development children should be expected to have attained by the end of the EYFS is defined in the early learning goals (ELGs). They should not be used as a curriculum or in any way to limit the wide variety of rich experiences. Within the 'Understanding the world' educational programme there is an ELG for the natural world. Within this it states children at the expected level of attainment will:

- Explore the natural world around them, making observations and drawing pictures of animals and plants;
- Know some similarities and differences between the natural world around them and contrasting environments; drawing on their experiences and what has been read to them in class;
- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.

It is this context that has been used to develop the Foundation Stage 'Science curriculum' using a variety of resources including the PSST and PLAN resources.

- To know that there are different seasons throughout the year.
- To identify some similarities and differences between the seasons.
- To understand that animals live in different climates and habitats.
- To be able to name and locate different body parts.
- To recall some ways in which we can look after the world.
- To recall some ways to keep our body healthy (exercise, dental hygiene, healthy eating, limiting screen time, positive mental health).
- To identify how to melt ice and turn it into water.

-To know what a plant needs to grow and make observational drawings with the correct parts.

b) **KS1 and KS2 curriculum**

The KS1 and KS2 science curriculum is based on the National Science Programmes of Study as this is seen as best practise in term of the progression of substantive knowledge and disciplinary knowledge. A review was held in early 2022 between the Science curriculum lead, SLT and teachers to ensure each year group covered the statutory requirements articulated in the programmes of study. The output from this review was recorded in the LTP captured in the following pages. This captures the sequence of topics, the learning questions as a series of lessons and the enquiry types and associated activities covered.

3. SCIENCE LONG TERM PLAN

Ruby

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
Unit	<p>Materials</p> <p>Seasonal Changes</p>	<p>Seasonal changes</p> <p>Night, day, sun, stars, moon</p>	<p>Humans</p>	<p>Humans</p> <p>Seasonal changes</p>	<p>Plants/Animals</p>	<p>Plants/Animals</p>
Questions	<ul style="list-style-type: none"> • What house would Mrs Pig like to live in and what material shall I choose? • What material would be best to make a house? • Which of these materials are waterproof? • How can we sort materials and their properties? • Is it man made or naturally occurring? • Is it translucent or transparent? • Is it flexible or rigid? <p>-----</p> <ul style="list-style-type: none"> • How does dissecting the wolf faeces help us in deciding which pig the wolf has eaten? • What changes happen in Autumn? 	<ul style="list-style-type: none"> • What happens to the days and nights in Autumn? • When do we see the sun, moon and stars? • What happens in the four seasons? • What's the weather like today? • What animals hibernate? • When do we see Diurnal animals? • What activities do Humans do during the day/night? 	<ul style="list-style-type: none"> • Can you name the parts of a face? • What are parts of the body called? • What are the main bones in the body? • Can I tell you the body parts that provide the 5 senses? • What are the five senses? • 	<ul style="list-style-type: none"> • How can I keep my body healthy? • Which of these foods are healthy? • What are the different teeth called? • How do I keep my teeth healthy? • How do scientists keep us safe? <hr/> <ul style="list-style-type: none"> • What are the differences between autumn and winter? • What are the differences between Spring and Summer? 	<ul style="list-style-type: none"> • What parts does a plant have? • What are these trees and flowering plants called? • Can I find some of these trees and flowering plants? • • What trees do these leaves/fruit grow on? • 	<ul style="list-style-type: none"> • What is the life cycle of a frog? • Which category do these animals belong in? • What are these animals called? • What are the key features of the dinosaurs? • Which dinosaurs are carnivores, herbivores and omnivores? • What are the key features of a plant? • What are these plants called? • What are these trees called? • What conditions does a plant need to grow? • What has happened to my planted seed? • What is the life cycle of a butterfly?

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
	Every Day Materials Seasonal changes	Seasonal changes Night, day, sun, moon, stars	Humans	Humans Seasonal changes	Plants/Animals	Plants/Animals
Enquiry type	<u>Comparative & Fair testing</u> What house would Mrs Pig like to live in and what material shall I choose? <u>Observing changes over time</u> What changes happen in Autumn? - check progression EYFS <u>Identifying & classifying things</u> How can we sort these materials?	<u>Identifying & Classifying</u> Which activities do we do in the day or night? <u>Observing changes over time</u> What happens as the season changes to Autumn?	<u>Identifying and classifying things</u> Can you name the parts of a face? What are parts of the body called? What are the main bones in the body?	<u>Observing changes over time</u> What are the differences between Spring and Summer? What are the differences between autumn and winter? Covid vaccination scientists	<u>Identifying and classifying things</u> What trees do these leaves/fruit grow on? <u>Research using secondary sources</u> Dinosaur facts and names	<u>Observing changes over time</u> What has happened to my planted seed? <u>Identifying and classifying things</u> Amphibians, reptile's, mammals, birds, <u>Looking for naturally occurring patterns and relationships</u> Do beans grow clockwise or anti-clock wise as they grow? - Moved to Year 2 Do taller plants grow from bigger seeds?

Diamond

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
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	Light	Forces and Magnets	Animal Inc Humans	Plants	Rocks	Scientists
Questions	<ul style="list-style-type: none"> • What is dark and light? • What are light sources? • What is reflection? • How can we be safe in the sun? • How are shadows formed? • How do shadows change during the day? 	<ul style="list-style-type: none"> • What is a push and a pull? • What force makes an object go faster or slower? • What makes a metal magnetic? • Do all magnets have the same strength? • What are magnetic poles? • How can magnets be used in games? 	<ul style="list-style-type: none"> • What is nutrition? • Why are food labels important? • Why are skeletons important? • What jobs does the human skeleton do? • How do bones and muscles work together? • How can I investigate the human skeleton? 	<ul style="list-style-type: none"> • What are the functions of the different parts of a plant? • What does a plant need to grow? • How does water move around a plant? • Why are flowers important? • What is the life cycle of a flowering plant? 	<ul style="list-style-type: none"> • What are the different types of rock and how are they formed? • What do the different rocks look like? • How are fossils formed? • Who was Mary Annings? • How is soil formed? • What are the different layers of soil? 	<ul style="list-style-type: none"> • Who bought new plants to the UK? • Why is Marie Curie so important? • Who is George Washington Carver? • How can you find out the age of a rock? • What are the layers of the Earth? • Where in the world do these scientists come from?

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
	Light	Forces and Magnets	Animals Inc Humans	Plants	Rocks	Research Scientist
Enquiry	<u>Comparative and fair testing</u>	<u>Looking for naturally occurring patterns and relationships</u>	<u>Identifying and classifying things</u>	<u>Observing changes over time</u>	<u>Research using secondary sources</u>	<u>Research using secondary sources</u>

<p>ty pe</p>	<p><u>Looking for naturally occurring patterns and relationships</u></p> <p>What is the best material to use in a book bag?</p>	<p>Which magnet has the strongest magnetic field?</p>	<p>What are the different types of skeleton and what is their purpose?</p>	<p>How is water transported within plants?</p>	<p><u>Identifying and classifying things</u></p> <p>How are fossils formed?</p>	
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Topaz

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
	Sound	Electricity	States of Matter	Living Things and Their Habitats	Animals inc. Humans	Scientists and Inventors

Questions

- How is sound made?
- How do vibrations become the sound we hear?
- How do you change the pitch of a sound?
- How does sound change over distance?
- Do different materials absorb sound?
- How do you make an instrument play different sounds?

- How is electricity generated?
- What type of electricity do different appliances use?
- What is the difference between a complete and incomplete circuit?
- Which materials are electrical conductors or insulators?
- How does a switch work?
- How do you draw circuits using scientific symbols?

- How are particles different in a solid, liquid and gas?
- Do gases weigh anything?
- How does a gas change state?
- What makes materials change state?
- How does a gas change state?
- What is the water cycle?

- How can living things be group?
- How can vertebrates be classified?
- How can invertebrates be classified?
- How do you use and create a classification key?
- How are our local habitats changing?
- How does environmental changes affect different species?

- What are parts of the human digestive system?
- What are the functions of each organ in the digestive system?
- What are the names and functions of our teeth?
- How do different drinks affect our teeth?
- What is a food web?

- How should you look after your teeth?
- What is absolute Zero?
- How Thomas Edison's inventions changed people's lives?
- How to prevent deforestation?

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
	<u>Sound</u>	<u>Electricity</u>	<u>States of matter</u>	<u>Living things and their habitats</u>	<u>Animals including humans</u>	<u>Scientists and inventors</u>
<u>Enquiry type</u>	<u>Carrying out a fair test and Comparative tests</u> Do different materials absorb sound?	<u>Identify, classify, recording and presenting data</u> Which materials are electrical insulators and conductors?	<u>Observing and measuring changes over time</u> What makes materials change state? <u>Asking questions and carrying out a fair test and Comparative tests</u> Does gas weigh anything? <u>Naturally occurring patterns and relationships</u> How does the size of a piece of ice affect its rate of melting?	<u>Research using secondary resources</u> What are the human impacts on an environment?	<u>Observing and measuring changes</u> <u>Drawing conclusions, noticing patterns and presenting findings</u> <u>Asking questions and carrying out a fair test and Comparative tests</u> How do different drinks affect our teeth?	

Amethyst

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
	Animals including Humans	Living things and their habitats.	Earth and Space	Properties and changes of Materials	Forces	Rocks and soils - new unit, not yet planned
<u>Questions</u>	<ul style="list-style-type: none"> • What are the different stages of human development? • How do babies grow and develop from birth to 12 months? • What are the main changes that happen during puberty? • What changes take place in old age? • What are the gestation periods for different animals? • What is the life expectancy of different animals? 	<ul style="list-style-type: none"> • What are the different habitats of animals? • How do animals adapt to their habitats? • What are food chains and food webs? • What are the similarities and differences of animal life cycles? • What impact do humans have on other animal's habitats? 	<ul style="list-style-type: none"> • Who is Mae Jemison? • How do I know that the Sun, Earth and Moon are roughly spherical bodies? • What are the order of the planets in relation to the Sun? • How has our understanding of the solar system changed over time? • How is the movement of the Moon relative to Earth and the Earth relative to the sun? • How can the Earth's rotation explain why we have day and night? • How does the Earth's orbit and tilt explain the seasons? 	<ul style="list-style-type: none"> • What similar properties do different materials have? • What materials were the best/worst insulators? • How can I compare and group electrical conductors? • How can I compare and group materials that dissolve? • What are reversible and irreversible changes? • How can I use my knowledge of solids, liquids and gases to decide how to separate materials? 	<ul style="list-style-type: none"> • How do forces act on objects? • How does gravity affect unsupported objects? • How does air resistance work? • What is water resistance? • How can different surfaces affect friction? • What are levers, pulleys and gears and how can a smaller force to have a greater effect? • Will move this to Autumn term 2022-2023 	<ul style="list-style-type: none"> • What are the different types of rock? • How can we identify different types of rock? • How do rocks on Earth's surface change? • What are the steps in the rock cycle?

	<u>Autumn 1</u>	<u>Autumn 2</u>	<u>Spring 1</u>	<u>Spring 2</u>	<u>Summer 1</u>	<u>Summer 2</u>
	Animals including Humans	Living things and their habitats.	Earth and Space	Properties and changes of Materials	Forces	Rocks and soils - new unit, not yet planned
<u>Enquiry type</u>	<u>Research using secondary sources</u> What is the human life cycle? <u>Naturally occurring patterns and relationships</u> Do bigger animals have longer life spans?	<u>Identifying and classifying things</u> What is a producer, consumer and predator and what are the differences? How can we use and develop keys and other information records to identify, classify and describe living things? How can food chains and webs be used to show the relationship between different living things? <u>Research using secondary sources</u> What are the life cycles of different animals? Frog, butterfly, rabbit	<u>Looking at naturally occurring patterns and relationships</u> How does the Earth and other planets move relative to the sun and the solar system? How does the Earth's rotation and orbiting explain day/night/seasons of the year?	<u>Comparative and fair testing</u> What materials make the best insulators? <u>Observing changes over time</u> How does a sugar cube change in water over time?	<u>Comparative and fair testing</u> What is the best shaped boat to move at speed? Are bigger parachutes better? What would be the best material for brakes on a bike?	

4. PROGRESSION OF KNOWLEDGE

EYFS – Understanding the world

- To know that there are different seasons throughout the year.
- To identify some similarities and differences between the seasons.
- To understand that animals live in different climates and habitats.
- To be able to name and locate different body parts.
- To recall some ways in which we can look after the world.
- To recall some ways to keep our body healthy (exercise, dental hygiene, healthy eating, limiting screen time, positive mental health).
- To identify how to melt ice and turn it into water.
- To know what a plant needs to grow and make observational drawings with the correct parts.

Animals Including Humans

RUBY

DIAMOND

TOPAZ

AMETHYST

- identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals;
- identify and name a variety of common animals that are carnivores, herbivores and omnivores;
- describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets);
- identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.

- identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat;
- identify that humans and some other animals have skeletons and muscles for support, protection and movement.

- describe the simple functions of the basic parts of the digestive system in humans;
- identify the different types of teeth in humans and their simple functions;
- construct and interpret a variety of food chains, identifying producers, predators and prey.

- describe the changes as humans develop to old age.

Plants

Electricity

Forces

- identify and name a variety of common wild and garden plants, including deciduous and evergreen trees;
- identify and describe the basic structure of a variety of common flowering plants, including trees.

- identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers;
- explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant;
- investigate the way in which water is transported within plants;
- explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

- identify common appliances that run on electricity;
- construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers;
- identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery;
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit;
- recognise some common conductors and insulators, and associate metals with being good conductors.

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object;
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces;
- recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.

Seasonal Changes

Light

Living Things and Their Habitats

- observe changes across the 4 seasons;
- observe and describe weather associated with the seasons and how day length varies.

- recognise that they need light in order to see things and that dark is the absence of light;
- notice that light is reflected from surfaces;
- recognise that light from the sun can be dangerous and that there are ways to protect their eyes;
- recognise that shadows are formed when the light from a light source is blocked by an opaque object;
- find patterns in the way that the size of shadows change.

- recognise that living things can be grouped in a variety of ways;
- explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment;
- recognise that environments can change and that this can sometimes pose dangers to living things.

- describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird;
- describe the life process of reproduction in some plants and animals.

Materials

<p>Everyday Materials</p> <ul style="list-style-type: none"> • distinguish between an object and the material from which it is made; • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock; • describe the simple physical properties of a variety of everyday materials; • compare and group together a variety of everyday materials on the basis of their simple physical properties. 	<p>Rocks</p> <ul style="list-style-type: none"> • compare and group together different kinds of rocks on the basis of their appearance and simple physical properties; • describe in simple terms how fossils are formed when things that have lived are trapped within rock; • recognise that soils are made from rocks and organic matter. 	<p>States of Matter</p> <ul style="list-style-type: none"> • compare and group materials together, according to whether they are solids, liquids or gases; • observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius ($^{\circ}\text{C}$); • identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. 	<p>Properties and Changes of Materials</p> <ul style="list-style-type: none"> • compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets; • know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution; • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating; • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic; • demonstrate that dissolving, mixing and changes of state are reversible changes; • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.
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	Forces and Magnets	Sound	Earth and Space
	<p>Forces and Magnets</p> <ul style="list-style-type: none"> • compare how things move on different surfaces; • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance; • observe how magnets attract or repel each other and attract some materials and not others; • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials; • describe magnets as having 2 poles; • predict whether 2 magnets will attract or repel each other, 	<ul style="list-style-type: none"> • identify how sounds are made, associating some of them with something vibrating; • recognise that vibrations from sounds travel through a medium to the ear; • find patterns between the pitch of a sound and features of the object that produced it; • find patterns between the volume of a sound and the strength of the vibrations that produced it; • recognise that sounds get fainter as the distance from the sound source increases. 	<ul style="list-style-type: none"> • describe the movement of the Earth and other planets relative to the sun in the solar system; • describe the movement of the moon relative to the Earth; • describe the sun, Earth and moon as approximately spherical bodies; • use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

Scientists and Inventors = Non statutory

	<p>Pupils might find out about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam.</p>		<p>Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.</p> <p>They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for key notes or Ruth Benerito, who invented wrinkle-free cotton.</p>
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5. PROGRESSION OF SKILLS

Science

Reception

Communication and Language	<ul style="list-style-type: none"> • Learn new vocabulary. • Ask questions to find out more and to check what has been said to them. • Articulate their ideas and thoughts in well-formed sentences. • Describe events in some detail. • Use talk to work out problems and organise thinking and activities. Explain how things work and why they might happen. • Use new vocabulary in different contexts.
Physical Development	<ul style="list-style-type: none"> • Know and talk about the different factors that support their overall health and wellbeing: <ul style="list-style-type: none"> - regular physical activity - healthy eating - toothbrushing - sensible amounts of 'screen time' - having a good sleep routine - being a safe pedestrian
Understanding the World	<ul style="list-style-type: none"> • Explore the natural world around them. • Describe what they see, hear and feel while they are outside. • Recognise some environments that are different to the one in which they live. • Understand the effect of changing seasons on the natural world around them.

ELG

Communication and Language	Listening, Attention and Understanding	<ul style="list-style-type: none"> • Make comments about what they have heard and ask questions to clarify their understanding.
Personal, Social and Emotional Development	Managing Self	<ul style="list-style-type: none"> • Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.
Understanding the World	The Natural World	<ul style="list-style-type: none"> • Explore the natural world around them, making observations and drawing pictures of animals and plants. • 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 around them, including the seasons and changing states of matter.

KS1

LKS2

UKS2

Asking Questions and Carrying Out Fair and Comparative Tests

<p>Children can:</p> <ul style="list-style-type: none"> a explore the world around them, leading them to ask some simple scientific questions about how and why things happen; b begin to recognise ways in which they might answer scientific questions; c ask people questions and use simple secondary sources to find answers; d carry out simple practical tests, using simple equipment; e experience different types of scientific enquiries, including practical activities; f talk about the aim of scientific tests they are working on. 	<p>Children can:</p> <ul style="list-style-type: none"> a start to raise their own relevant questions about the world around them in response to a range of scientific experiences; b start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; c recognise when a fair test is necessary; d help decide how to set up a fair test, making decisions about what observations to make, how long to make them for and the type of simple equipment that might be used; e set up and carry out simple comparative and fair tests. 	<p>Children can:</p> <ul style="list-style-type: none"> a with growing independence, raise their own relevant questions about the world around them in response to a range of scientific experiences; b with increasing independence, make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; c explore and talk about their ideas, raising different kinds of scientific questions; d ask their own questions about scientific phenomena; e select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; f make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; g plan, set up and carry out comparative and fair tests to answer questions, including recognising and controlling variables where necessary; h use their test results to identify when further tests and observations may be needed; i use test results to make predictions for further tests.
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Observing and Measuring Changes

<p>Children can:</p> <ul style="list-style-type: none"> a observe the natural and humanly constructed world around them; b observe changes over time; c use simple measurements and equipment; d make careful observations, sometimes using equipment to help them observe carefully. 	<p>Children can:</p> <ul style="list-style-type: none"> a make systematic and careful observations; b observe changes over time; c use a range of equipment, including thermometers and data loggers; d ask their own questions about what they observe; e where appropriate, take accurate measurements using standard units using a range of equipment. 	<p>Children can:</p> <ul style="list-style-type: none"> a choose the most appropriate equipment to make measurements and explain how to use it accurately; b take measurements using a range of scientific equipment with increasing accuracy and precision; c make careful and focused observations; d know the importance of taking repeat readings and take repeat readings where appropriate.
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Identifying, Classifying, Recording and Presenting Data

<p>Children can:</p> <ul style="list-style-type: none"> a use simple features to compare objects, materials and living things; b decide how to sort and classify objects into simple groups with some help; c record and communicate findings in a range of ways with support; d sort, group, gather and record data in a variety of ways to help in answering questions such as in simple sorting diagrams, pictograms, tally charts, block diagrams and simple tables. 	<p>Children can:</p> <ul style="list-style-type: none"> a talk about criteria for grouping, sorting and classifying; b group and classify things; c collect data from their own observations and measurements; d present data in a variety of ways to help in answering questions; e use, read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge; f record findings using scientific language, drawings, labelled diagrams, keys, bar charts and tables. 	<p>Children can:</p> <ul style="list-style-type: none"> a independently group, classify and describe living things and materials; b use and develop keys and other information records to identify, classify and describe living things and materials; c decide how to record data from a choice of familiar approaches; d record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar graphs and line graphs.
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Drawing Conclusions, Noticing Patterns and Presenting Findings

<p>Children can:</p> <ul style="list-style-type: none"> a notice links between cause and effect with support; b begin to notice patterns and relationships with support; c begin to draw simple conclusions; d identify and discuss differences between their results; e use simple and scientific language; f read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1; g talk about their findings to a variety of audiences in a variety of ways. 	<p>Children can:</p> <ul style="list-style-type: none"> a draw simple conclusions from their results; b make predictions; c suggest improvements to investigations; d raise further questions which could be investigated; e first talk about, and then go on to write about, what they have found out; f report and present their results and conclusions to others in written and oral forms with increasing confidence. 	<p>Children can:</p> <ul style="list-style-type: none"> a notice patterns; b draw conclusions based in their data and observations; c use their scientific knowledge and understanding to explain their findings; d read, spell and pronounce scientific vocabulary correctly; e identify patterns that might be found in the natural environment; f look for different causal relationships in their data; g discuss the degree of trust they can have in a set of results; h independently report and present their conclusions to others in oral and written forms.
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Using Scientific Evidence and Secondary Sources of Information

<p>a</p>	<p>Children can:</p> <ul style="list-style-type: none"> a make links between their own science results and other scientific evidence; b use straightforward scientific evidence to answer questions or support their findings; c identify similarities, differences, patterns and changes relating to simple scientific ideas and processes; d recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations. 	<p>Children can:</p> <ul style="list-style-type: none"> a use primary and secondary sources evidence to justify ideas; b identify evidence that refutes or supports their ideas; c recognise where secondary sources will be most useful to research ideas and begin to separate opinion from fact; d use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas; e talk about how scientific ideas have developed over time.
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6. SEND IN SCIENCE

Planning Inclusive Lessons Learning in science involves children and young people building their knowledge of important concepts and procedures. When learning new content, learners must connect this to what they already know. This means that it is important that learners develop secure understanding of previously taught concepts and procedures.

When planning lessons, it is important to consider learners with SEND. Carefully consider the objective of each individual lesson; **what specifically do you want pupils to learn? How can you present new information in a way that all learners can access? How can complex ideas be broken down into simpler parts for pupils to learn and practice? How can you focus learner's attention on the new content?** For example, learners could observe and explore a stimulus to hook them into the new learning. This could be an object, a model, or an image. You should encourage learners to ask questions about their learning and build in opportunities for small group and whole-class discussions. Oracy-led sessions, with visuals to support the access of all learners, can enable you to build on and extend your learners' scientific thinking. If you have an additional adult in the lesson, plan their role and share their responsibilities with them in advance.

Strategies to Scaffold Learning

How can I support learners who struggle to access lessons because of literacy difficulties?

- Provide topical word banks and picture cards that the learner can point or refer to when explaining scientific processes.
- Ask teaching assistants to collate word/picture banks on a mini whiteboard/paper with the learner during the teaching input to support their independent learning activity.
- Scaffold learning to make it accessible for all, e.g., if writing up the method for their experiment, a learner with writing difficulties could verbally explain for you or a teaching assistant to scribe, note-take or film explaining their answers.

How can I support learners who struggle to access lessons because of numeracy difficulties?

- Scaffold learning to make it accessible for all, e.g., when creating data tables for an experiment, learners with numeracy difficulties could create a pictogram.
- Employ manipulatives and resources used in maths lessons to support learning in science.
- Bring abstract concepts to life through concrete resources and comparisons.

How can I support learners who struggle to retain vocabulary?

- Begin each lesson with a review of the vocabulary learnt in the previous lesson.
- Provide word banks that are accessible throughout the science topic. Encourage learners to tick the words they feel confident with to help target language that still needs support, e.g., when learners can independently use a word in a sentence. This could also encourage and motivate the learner to use language they have yet to use.
- Refer to language regularly during lessons and, where applicable, throughout the school day, as this will embed the vocabulary and build stronger links and associations.

How can I support learners who need additional time to develop conceptual understanding?

- Provide pre-teaching opportunities for learners to hear vocabulary prior to the lesson, to support their access and engagement in whole-class teaching.
- Plan small group teaching opportunities, for example whilst learners who have already met an objective are doing enrichment activities independently, dedicate time to conference with and/or provide additional learning opportunities for learners working towards the learning objective.
- Provide learners with worked examples to use as a model whilst completing independent work.

How can I support learners who struggle with attention?

- Create a working classroom environment that is calming and simple, e.g., clear routines, organised workspaces.
- Use preferential seating and proximity to engage all learners – have learners who struggle to concentrate at the front of the class, or plan for a teaching assistant to encourage the learner to participate and maintain focus.
- Pre-expose learners to the equipment and nature of the lesson (especially for experiments and practical lessons) to spark engagement and interest in the upcoming lesson.
- Plan movement breaks and classroom jobs (e.g., handing out materials) for individual learners.

How can I support learners who struggle with change and transition?

- Science doesn't always follow the same lesson format and structure, so prepare learners in advance by explaining how the lesson will run.
- Use visuals (e.g., now, next, then boards or visual timetables) to segment the lesson into manageable chunks that are achievable for the learner.
- Think about the individual learner – some learners may be highly motivated if they know something in advance of a lesson. Show them an object, or picture about the lesson.

7. VOCABULARY PROGRESSION

RUBY	DIAMOND	TOPAZ	AMETHYST
<p>Animal including humans</p> <p>Fish, reptiles, mammals, birds, amphibians, herbivore, omnivore, carnivore, leg, arm, elbow, head, ear, nose, beak, wings, back, senses, taste, sight, feel, smell, hear</p>	<p>Animal including humans</p> <p>Movement, muscles, bones, skull, nutrition, skeletons, endo skeletons, exoskeleton</p>	<p>Animal including humans</p> <p>Mouth, tongue, teeth, oesophagus, stomach, small intestine, large intestine, herbivore, carnivore, canine, incisor, molar, digestive system</p>	<p>Animal including humans</p> <p>Foetus, embryo, gestation, baby, child, adolescence, teenager, early adulthood, middle adulthood, old age, growth, development</p>
<p>Plants</p> <p>Deciduous, evergreen trees, leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem</p>	<p>Plants</p> <p>Air, light, water, nutrients, soil, reproduction, transportation, dispersal, pollination, photosynthesis</p>	<p>Living things and their habitats</p> <p>Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, snails, slugs, worms, spiders, insects, environment, habitat, classification, venn diagrams, food chain, food web</p>	<p>Living things and their habitats</p> <p>Habitat, adaption, mammal, reproduction, sexual reproduction, asexual reproduction, insect, metamorphosis, amphibian, bird, offspring, clone, habitat, food web, energy, producer, consumer, predator, prey</p>
<p>Everyday materials</p> <p>Wood, plastic, paper, water, glass, metal, rock, hard, soft, bendy, rough, smooth, flexible, rigid, waterproof</p>	<p>Rocks</p> <p>Fossils, soils, sandstone, granite, marble, pumice, crystals, absorbent, sedimentary, metamorphic, igneous, rock cycle</p>	<p>States of Matter</p> <p>Solid, liquid, gas, evaporation, condensation, particles, temperature, freezing, heating, water cycle, precipitation,</p>	<p>Properties and changes of materials</p> <p>Hardness, soluble, solution, insoluble, transparent, opaque, thermal conductor, electrical conductor, insulator, dissolve, mix, rigid, flexible</p>
<p>Seasonal Changes</p> <p>Summer, Spring, Winter, Autumn, Night, Day, Sun, Moon, Light, Dark</p>	<p>Light</p> <p>Light, shadows, Mirror, Reflective, Dark, reflection, opaque, translucent, transparent</p>	<p>Sound</p> <p>Volume, vibration, wave, pitch, amplitude, hertz, decibel, tone, speaker, cochlea, anvil, hammer, ear drum, auditory nerve,</p>	<p>Earth and Space</p> <p>Earth, Sun, moon, axis, rotate, orbit, day, night, seasons, hemisphere, star, solar system</p>
	<p>Forces and Magnets</p> <p>Magnetic, force, contact, attract, repel, friction, poles, push, pull, start, stop, magnetic field</p>	<p>Electricity</p> <p>Cell, wire, bulb, switch, buzzer, battery, circuit, series, conductor, insulator, parallel circuit, break, circuit</p>	<p>Forces and Magnets</p> <p>Force, push, pull, gravity, air resistance, water resistance, friction, gears, pulleys, levers, newton, weight, mass</p>

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6. KEY KNOWLEDGE

In order to help children remember key facts, the 'Key Knowledge' identified for Science will be revisited throughout school. Key knowledge is effectively knowledge that forms part of our long-term memory. The aim is that by the end of KS2, children can recall the key facts and use them to make links when faced with new scientific concepts, resulting in deeper understanding of science.

RUBY				
Biology			Chemistry	Physics
Animals, including Humans	Animals, including Humans	Plants	Everyday Materials	Seasonal Change
<p>Know how to classify a range of animals by amphibian, reptile, mammal, fish and birds</p> <p>Know and classify animals by what they eat (carnivore, herbivore and omnivore)</p> <p>Know how to sort by living and non living things</p>	<p>Know the name of parts of the human body that can be seen</p>	<p>Know and name a variety of common wild and garden plants Know and name the petals, stem, leaves and root of a plant Know and name the roots, trunk, branches and leaves of a tree</p>	<p>Know the name of the materials an object is made from</p> <p>Know about the properties of everyday materials</p>	<p>Name the seasons and know about the type of weather in each season</p>
Diamond				
Biology		Chemistry	Physics	

Animals, including humans	Plants	Plants	Rocks	Forces	Light
<ul style="list-style-type: none"> • Know about the importance of a nutritious, balanced diet • Know how nutrients, water and oxygen are transported within animals and humans • Know about the skeletal and muscular system of a human 	<ul style="list-style-type: none"> • Know the function of different parts of flowering plants and trees 	<ul style="list-style-type: none"> • Know how water is transported within plants Know the plant life cycle, especially the importance of flowers 	<ul style="list-style-type: none"> • Compare and group rocks based on their appearance and physical properties, giving reasons • Know how soil is made and how fossils are formed • Know about and explain the difference between sedimentary, metamorphic and igneous rock 	<ul style="list-style-type: none"> • Know about and describe how objects move on different surfaces Know how a simple pulley works and use to on to lift an object • Know how some forces require contact and some do not, giving examples • Know about and explain how magnets attract and repel Predict whether magnets will attract or repel and give a reason 	<ul style="list-style-type: none"> • Know that dark is the absence of light • Know that light is needed in order to see and is reflected from a surface • Know and demonstrate how a shadow is formed and explain how a shadow changes shape • Know about the danger of direct sunlight and describe how to keep protected

TOPAZ

Biology		Chemistry	Physics	
Animals, including humans	All living things and their habitats	States of Matter	Electricity	Sound

<ul style="list-style-type: none"> Identify and name the parts of the human digestive system <p>Know the functions of the organs in the human digestive system</p> <p>Identify and know the different types of human teeth</p> <ul style="list-style-type: none"> teeth Know the functions of different human teeth <ul style="list-style-type: none"> Use and construct food chains to identify producers, predators and prey 	<ul style="list-style-type: none"> Use classification keys to group, identify and name living things Know how changes to an environment could endanger living things Group materials based on their state of matter (solid, liquid or gas) 	<ul style="list-style-type: none"> Know the temperature at which materials change state Know about and explore how some materials can change state Know the part played by evaporation and condensation in the water cycle 	<ul style="list-style-type: none"> Identify and name appliances that require electricity to function construct a series circuit Identify and name the components in a series circuit (including cells, wires, bulbs, switches and buzzers) <p>Predict and test whether a lamp will light within a circuit Know the function of a switch Know the difference between a conductor and an insulator; giving examples of each</p>	<ul style="list-style-type: none"> Know how sound is made, associating some of them with vibrating Know how sound travels from a source to our ears Know the correlation between pitch and the object producing a sound Know the correlation between the volume of a sound and the strength of the vibrations that produced it Know what happens to a sound as it travels away from its source
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AMETHYST

AMETHYST				
Biology		Chemistry	Physics	
All living things and their habitats	Animals, including humans	Properties and changes in materials	Forces	Earth and Space

<ul style="list-style-type: none"> • Know the life cycle of different living things e.g. mammal, amphibian, insect and bird • Know the differences between different life cycles • Know the process of reproduction in plants • Know the process of reproduction in animals 	<ul style="list-style-type: none"> • Create a timeline to indicate stages of growth in humans 	<ul style="list-style-type: none"> • Compare and group materials based on their properties (e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets • Know and explain how a material dissolves to form a solution Know and show how to recover a substance from a solution <p>Know and demonstrate how some materials can be separated (e.g. through filtering, sieving and evaporating)</p> <p>Know and demonstrate that some changes are reversible and some are not Know how some changes result in the formation of a new material and that this is usually irreversible</p>	<ul style="list-style-type: none"> • Know what gravity is and its impact on our lives • Identify and know the effect of air and water resistance Identify and know the effect of friction <p>Explain how levers, pulleys and gears allow a smaller force to have a greater effect</p>	<ul style="list-style-type: none"> • Know about and explain the movement of the Earth and other planets relative to the Sun • Know about and explain the movement of the Moon relative to the Earth • Know and demonstrate how night and day are created • Describe the Sun, Earth and Moon (using the term spherical)
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7. RESOURCES AND WEBSITES

PRIMARY SCIENCE TEACHING TRUST (PSTT)

A wealth of resources for teachers on how to plan and teach science. It includes resources for EYFS [Play Observe Ask \(EYFS\) | Primary Science Teaching Trust \(pstt.org.uk\)](https://www.pstt.org.uk/)

And PLAN

PLAN [PLAN primary science resources \(planassessment.com\)](https://www.planassessment.com/)

Plan Knowledge Matrices show progression of knowledge as progress from EYFS to Y6. Includes misconceptions to be addressed by year group and topic.

Explorify [Explorify](https://www.explorify.com/)

Create your own log in and use the pictorial resources to help promote deeper thinking. Ranges of useful activities include 'odd one out', 'zoom in/out' and 'What's going on?'

Twinkl

Resources for teaching lessons as required. Teachers often amend or use other appropriate resources as required.