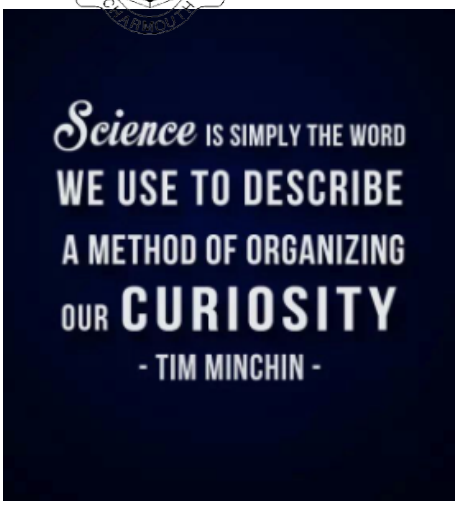
Charmouth Primary School Subject Stories:

Science



Intent

At Charmouth, we encourage children to be inquisitive throughout their time at the school and beyond. The science curriculum fosters a healthy curiosity about our universe and promotes respect for the living and non-living. Throughout the units of work, children will gain and develop the key knowledge that has been identified within each unit and across each year group. The key knowledge identified by each year group is informed by the national curriculum and builds towards identified 'end points' in accordance with NC expectations. Key skills are also mapped for each year group and are progressive throughout the school. These too ensure systematic progression to identified skills end points which are in accordance with the 'Working Scientifically' skills expectations of the national curriculum. Children are encouraged to ask questions and be curious about their surroundings and a love of science is nurtured through a whole school ethos and vision of 'learning and life in all its fullness' and a varied science curriculum. The curriculum is designed to ensure that children are able to acquire key scientific knowledge through practical experiences; using equipment, conducting experiments, building arguments and explaining concepts confidently. The school's approach to science takes account of the school's own vision, as well as its values of compassion, aspiration and resilience - ensuring that our learners aspire to achieve the best, test scientific questions without fear of failing and children support each other at every stage of their learning journey.

For pupils with additional needs, there will be every opportunity to work towards the overall objectives of the year group. Pupils may be supported with their science learning through differentiated questioning, pre-teaching of key vocabulary, adapted work or additional time. High expectations will challenge all children to meet their personal targets.

The National Curriculum Aims for Science

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.

Science within Early Years

In Reception, understanding the world is a key area of the EYFS curriculum. Some of the statements from the 2020 Development Matters are prerequisite skills for science within the national curriculum. Below we outline the most relevant statements taken from the Early Learning Goals in the EYFS statutory framework and the Development Matters age ranges for Reception to match the programme of study for science.

In Reception:

Understanding The World

- 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.

Personal, Social and Emotional Development

- Know and talk about the different factors that support their overall health and wellbeing:
  - regular physical activity
  - healthy eating
  - toothbrushing
  - sensible amounts of 'screen time'
  - having a good sleep routine
  - being a safe pedestrian

Communication and Language

- 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 help work out problems and organise thinking and activities, and to explain how things work and why they might happen.
- Use new vocabulary in different contexts.
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The endpoint for EYFS is the Early Learning Goal for Understanding the World – The Natural World

- 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.

Other related Early Learning Goals include:

- Make comments about what they have heard and ask questions to clarify their understanding. (C&L – Listening and Understanding)
- Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices. (PSED – Managing Self)

Examples of opportunities provided for scientific thinking through both continuous provision and direct teach.

Autumn 1	• **Nature scavenger hunt.** • **Focus on autumn – Autumn themed tuff tray with leaves, conkers etc.** • **Weather station – rain – paper cups with holes.** • **Listen to animal noises – guess the animals.**
Autumn 2	• **Life cycle of a hen** • **Talk about the cold weather / winter – what keeps us warm?** • **Grow cress heads / sow broad beans: how can we make them grow?** • **What's the weather today? The children to share the current weather and make predictions of later in the day / tomorrow.** • **Investigating waterproof materials to create a bridge.**
Spring 1	• **Wild animal or Pet? sorting game** • **Sort seashells or other natural materials by variety, size, colour, or shape.** • **What is wrong here? A polar bear in the desert? A hippo in a fish tank? Match animals to their habitats.** • **Night or day? Are these animals nocturnal?** • **Go for a walk in the outside area and find lots of bugs / creatures – record on detective clipboard – Describe each creature.**

	• Watch some snails in a Tuff tray – Look at the trails and describe.
Spring 2	• Grow some runner beans in jar / radishes / strawberries / carrots. Grow herbs and use in cooking activities.
	• Look at plant roots! Discuss root vegetables - Talk about frozen, tinned and dried peas and importing peas from hot countries. Discuss how things that grow above the ground grow best in summer but other vegetables like swede grow under the ground where it is warm so they will grow in winter.
	• Put the plant stages in order – can you explain each stage of the cycle.
	• Sort out things into man-made and natural. Learn about recycling and sort objects for recycling based on materials.
Summer 1	• Observe and record the weather on our calendar daily. Make weather forecast videos.
	• Watching ice left in the sun melt. How can this be monitored or measured? Freeze some toy dinosaurs in individual containers, and get the children to 'rescue' them from the ice.
	• Compare and describe seasonal colours. Maximise on windy days by installing windsocks, wind chimes or pinwheels.
	• Shadow fun – put transport toys on the edge of a long piece of white paper at midday – can you see the shadows / draw the pictures?
Summer 2	• Learn about animals that live in the sea (rock pools, the coral reef) and on land in coastal areas.
	• The bulb in the lighthouse is a source of light. Can you think of any more?
	• Investigating the impact of rubbish in the oceans – how could this be dangerous for sea life? Add single-use plastics, such as straws, to your water tray. Talk about plastic in the seas and how to care of the environment.
	• What happens in the summer? Focus on seasonal changes.

Curriculum Map (Years 1 to 6)

	Autumn		Spring		Summer	
	1st half	2nd half	1st half	2nd half	1st half	2nd half
Y1/2A	Animals including humans	Seasonal Changes	Everyday Materials	Seasonal Changes	Plants	
Y1/2B	Animals including humans	Living things and their habitats	Uses of everyday materials	Biodiversity/minibeasts	Plants	
Yr 3/4 A	Forces	Animals including humans	Electricity	Sound	States of Matter	
Yr 3/4B	Living things and their habitats	Animals including humans	Rocks	Light	Plants	
Yr 5/6 A	Animals including humans	Living things and their habitats	Forces	Earth and Space	Properties and changes of materials	
Yr 5/6 B	Animals including humans	Living things and their habitats	Light	Electricity	Evolution and inheritance	

Knowledge and Skills: Year 1 / 2 A

Animals, including Humans (Autumn 1)	Seasonal Changes (Autumn 2)	Everyday Materials (Spring 1)	Seasonal Changes (Spring 2)	Plants (Summer)
SUBSTANTIVE KNOWLEDGE: **I KNOW** and can name a variety of common animals (including fish, amphibians, reptiles, birds and mammals). **I KNOW** examples of animals which are carnivores, herbivores and omnivores. **I CAN** describe and compare the structure of common animals. **I CAN** label the basic parts of the human body. **I KNOW** which part of the body is associated with each sense.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** what changes happen when summer turns to autumn. **I KNOW** what changes happen when autumn turns to winter. **I CAN** describe the weather that is typical of each season. **I KNOW** how the length of the day changes in different seasons.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** the difference between an object and the material from which it is made. **I KNOW** and can name a variety of everyday materials (including wood, plastic, glass, metal, water, rock). **I CAN** describe the simple physical properties of a variety of everyday materials. **I CAN** compare and group together materials based on their properties.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** what changes happen when winter turns to spring. **I KNOW** what changes happen when spring turns to summer. **I CAN** describe the weather that is typical of each season. **I KNOW** how the length of the day changes in different seasons. **I CAN** compare changes across all 4 seasons	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** and can name a variety of common wild and garden plants. **I KNOW** the difference between evergreen and deciduous trees. **I KNOW** the basic structure of common flowering plants, including trees.
DISCIPLINARY KNOWLEDGE: (Working Scientifically) **Recording: I CAN** use sorting rings to classify in more than two groups, answering yes or no questions. **I CAN** sort using a simple 2 criteria Venn diagram.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Interpreting and Conclusion: I CAN** begin to notice patterns and relationships. **Planning Enquiries: I CAN** recognise different ways I could answer scientific questions.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Evaluating: I CAN** suggest simple improvements to my enquiries. **Making Predictions: I CAN** make basic predictions over things I can see.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Interpreting and Conclusion: I CAN** notice patterns and relationships over time. **Planning Enquiries: I CAN** recognise different ways I could answer scientific questions.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Asking Questions: I CAN** explore the world around me and ask my own questions. **Observation and Measurement: I CAN** use equipment such as magnifying glasses and viewers to make observations.
SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:**	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:**	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:**	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:**

Identifying, grouping and classifying. TAPS task: 'Animal Classification'	Observation over time TAPS task: 'Seasonal Change'	Identifying, grouping and classifying TAPS task: 'Ways to test transparency'	Observation over time TAPS task: 'Seasonal Change' (variation)	Observe closely. TAPS task: 'Leaf Look'
VOCABULARY: **Amphibian, bird, fish, mammal, reptile, carnivore, herbivore, omnivore, sight, hearing, touch, taste, smell**	**VOCABULARY:** **Seasons, Autumn, Winter, daylight, weather**	**VOCABULARY:** **Object, material, hard, soft, stretchy, shiny, dull, rough, smooth, not/bendy, not/waterproof, not/absorbant, transparent, opaque**	**VOCABULARY:** **Seasons, Autumn, Winter, Spring, Summer, daylight, weather**	**VOCABULARY:** **Plant, wild plant, garden plant, weed, deciduous, evergreen**

Knowledge and Skills: Year 1 / 2 B

Animals including Humans (Autumn 1)	Living Things and Their Habitats (Autumn 2)	Uses of Everyday Materials (Spring 1)	Biodiversity / minibeasts (Spring 2)	Plants (Summer)
SUBSTANTIVE KNOWLEDGE: **I KNOW** that animals, including humans, have offspring which grow into adults. **I KNOW** and can describe the basic needs of animals, including humans, for survival. **I KNOW** the importance for humans of exercise. **I KNOW** why humans need to eat the right amounts of different types of food. **I UNDERSTAND** the importance of hygiene for humans.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** explore and compare the differences between things are living, dead, and things that have never been alive. **I CAN** identify that most living things live in habitats they are suited to. **I CAN** describe how different habitats provide for the needs of animals and plants, and how they depend on each other. **I CAN** identify and name a variety of plants and animals in their habitats, including microhabitats. **I CAN** describe how animals obtain their food using the idea of a food chain. **I CAN** name different sources of food.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** Classify the uses of different everyday materials **I CAN** Compare and explain the suitability of everyday materials in different circumstances. **I KNOW** how to use my observations, ideas and experiences to ask and answer questions. **I CAN** Suggest reasons for specific outcomes **I KNOW** how recycling impacts positively on the environment. **I KNOW** how the inventions and discoveries of others have impacted on our lives today.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** identify and name a variety of minibeasts and their habitats. **I CAN** research minibeasts and explain their importance (including bees) **I KNOW** how a microhabitat is suitable for a minibeast **I KNOW** the importance and needs of minibeasts and microhabitats	**SUBSTANTIVE KNOWLEDGE:** **I CAN** observe and describe how seeds and bulbs grow into mature plants. **I KNOW** that plants need water, light and a suitable temperature to grow and stay healthy.
DISCIPLINARY KNOWLEDGE: **Asking Questions: I CAN** use a range of question stems to ask simple questions relevant to the topic. **Recording: I CAN** record my observations using photographs and/or labelled diagrams.	**DISCIPLINARY KNOWLEDGE:** **Interpreting and Conclusion:** **I CAN** draw a basic conclusion using scientific knowledge and observations. **Evaluating: I CAN** suggest some things that can be changed and evaluate why things went wrong.	**DISCIPLINARY KNOWLEDGE:** **(Working Scientifically)** **Evaluating: I CAN** suggest improvements to my enquiries. **Making Predictions: I CAN** make predictions over things I can't yet see.	**DISCIPLINARY KNOWLEDGE:** **(Working Scientifically)** **Observation/Measurement:** I CAN observe the natural world around them by making careful observations, using simple equipment **Recording: I CAN** use prepared tables to record results.	**DISCIPLINARY KNOWLEDGE:** **Recording: I CAN** use tables to record results. **Observation/Measurement:** **I CAN** use standard units to estimate and measure.

			Interpreting and Conclusion: **I CAN** draw a conclusion using scientific knowledge and observations.	
SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY: Problem solving TAPS task: 'Animal Home Build'	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:** Pattern-seeking TAPS task: 'Woodlice habitat'	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:** Identifying, grouping and classifying TAPS task: 'Waterproof Materials'	**SCIENTIFIC ENQUIRY/ ASSESSMENT OPPORTUNITY:** Identifying, grouping and classifying TAPS task: 'Nature Spotters'	**SCIENTIFIC ENQUIRY/ ASST OPPORTUNITY:** Comparative/Fair Testing. TAPS task: 'Plant Growth'
VOCABULARY: **Adult, develop, life cycle, offspring, young, live young, diet, exercise, germs, hygiene, nutrition**	**VOCABULARY:** **Habitat, microhabitat, depend, survive, life processes, living, dead, never living, food chain, food source**	**VOCABULARY:** **Materials, suitability, properties (revise previous vocabulary)**	**VOCABULARY:** **Minibeast, invertebrate, decomposer, predator, pollinator, pollination, habitat, microhabitat, biodiversity, ecosystem, depend, food chain**	**VOCABULARY:** **Sunlight, water, temperature, nutrition, germination, shoot, seed dispersal**

Knowledge and Skills: Year 3 / 4 A

Forces and Magnets (Autumn 1)	Animals Including Humans (Autumn 2)	Electricity (Spring 1)	Sound (Spring 2)	States of Matter (Summer)
SUBSTANTIVE KNOWLEDGE: **I CAN** compare how things move on different surfaces. **I KNOW** that some forces need contact between two objects, but magnetic forces can act at a distance. **I KNOW** that magnets attract or repel each other. **I KNOW** that magnets attract some materials (with examples) and not others. **I KNOW** magnets have two poles. **I CAN** predict whether two magnets will attract or repel, given which poles are facing.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** talk about what animals and humans need to stay healthy **I KNOW** that different animals require a different balance of nutrients **I KNOW** that humans and animals have skeletons and muscles for support, protection and movement. **I CAN** name and briefly describe the different types of skeletons **I CAN** give a simple explanation of how muscles work.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** common appliances that run on electricity. **I CAN** construct a simple series circuit. **I CAN** name basic parts of a circuit (including cells, wires, bulbs, switches, buzzers). **I KNOW** whether or not a lamp will light (if a circuit is complete). **I KNOW** that a switch opens and closes a circuit. **I KNOW** some examples of common conductors and insulators, including metals as good conductors.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** that sounds are made by something vibrating. **I KNOW** that vibrations from sound travel through a medium to the ear. **I KNOW** how the pitch of a sound relates to features of the object that produced it. **I KNOW** how the volume of a sound is related to the strength of the vibrations that produced it. **I KNOW** that sounds get fainter as the distance from the sound source increases.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** if a material is a solid, liquid or gas, and can group materials accordingly. **I KNOW** that some materials change state when they are heated and cooled. **I CAN** measure or research the temperature at which some materials change state.
DISCIPLINARY KNOWLEDGE: (Working Scientifically) **Observation/ Measurement: I CAN** take accurate measurements using standard units, to compare.	**DISCIPLINARY KNOWLEDGE:** **Asking Questions: I CAN** use a range of question stems to ask simple questions relevant to the topic. **Recording: I CAN** record my observations using photographs and/or labelled diagrams.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Recording: I CAN** complete a table (with given template) adding heading and results.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Making Predictions: I CAN** add detail to my predictions using scientific knowledge.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Evaluating: I CAN** suggest improvements from enquiries and ask further questions.
SCI ENQUIRY/ ASST OPPORTUNITY: Comparative/ Fair testing. TAPS task: 'Cars down ramps'	**SC ENQ/ ASSMENT OPP:** Problem solving TAPS task: 'Investigating the human skeleton'	**SCI ENQ/ ASST OPP:** Pattern seeking. TAPS task: 'Does it conduct electricity?'	**SCI ENQUIRY/ ASST OPPORTUNITY:** Pattern seeking. TAPS task: 'Investigating Pitch'	**SCI ENQUIRY/ ASST OPPORTUNITY:** Observation over time TAPS task: 'Making Ice Cream'

VOCABULARY: **Forces, friction, surface, magnet, magnetic, magnetic field, poles, repel, attract**	**VOCABULARY:** **Skeleton, muscle, vertebrate, invertebrate, tendon, joint**	**VOCABULARY:** **Electricity, appliances, battery, circuit, mains electricity, conductor, insulator**	**VOCABULARY:** **Vibration, sound wave, volume, amplitude, pitch, ear, particles, distance, soundproof, absorb, vacuum, eardrum**	**VOCABULARY:** **States of matter, solids, liquids, gases, water vapour, melt, freeze, evaporate, condense, precipitation**

Knowledge and Skills: Year 3 / 4 B

Living Things, and their Habitats (Autumn 1)	Animals, including Humans (Autumn 2)	Rocks (Spring 1)	Light (Spring 2)	Plants (Summer)
SUBSTANTIVE KNOWLEDGE: **I KNOW** that living things can be grouped in a variety of ways. **I CAN** use classification keys to help group, identify and name living things in the local and wider environment. **I KNOW** that environments can change and that this can sometimes pose dangers to living things.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** the simple functions of the basic parts of the digestive system in humans. **I CAN** identify the different types of teeth in humans and their simple functions. **I CAN** construct and interpret a variety of food chains, identifying producers, predators and prey.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** three types of rock: igneous, sedimentary and metamorphic. **I CAN** compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. **I KNOW** that fossils are formed when things that have lived are trapped within rock. **I KNOW** that soils are made from rocks and organic matter.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** that I need light in order to see things. **I KNOW** that dark is the absence of light. **I KNOW** that light is reflected from surfaces. **I KNOW** that light from the sun can be dangerous, and ways to protect my eyes. **I KNOW** that shadows are formed when the light from a light source is blocked by an opaque object. **I CAN** find patterns in the way the size of shadows change.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** and can describe the functions of parts of flowering plants (roots, stem/trunk, leaves, flowers). **I KNOW** what plants needs to survive and grow (air, light, water, nutrients from soil, room to grow), and how they vary from plant to plant. **I CAN** investigate how water is transported within plants. **I KNOW** the part that flowers play in the life cycle of plants (pollination, seed formation, seed dispersal).
DISCIPLINARY KNOWLEDGE: **(Working Scientifically)** **Observation/ Measurement: I CAN** Use observations to ask questions and group objects using classification keys.	**DISCIPLINARY KNOWLEDGE:** **(Working Scientifically) Asking Questions: I CAN** carry out research using a small range of secondary sources.	**DISCIPLINARY KNOWLEDGE:** **(Working Scientifically)** **Interpreting and Conclusion: I CAN** draw conclusions based on observations.	**DISCIPLINARY KNOWLEDGE:** **(Working Scientifically)** **Asking Questions: I CAN** decide how to gather data to answer questions.	**DISCIPLINARY KNOWLEDGE:** **(Working Scientifically)** **Evaluating: I CAN** suggest improvements from enquiries and ask further questions. **Recording: I CAN** record findings using careful observational drawings.

SCI ENQ/ ASST OPP: Identifying, grouping and classifying. TAPS task: 'Local environment survey'	**SCI ENQ/ ASST OPP:** Research. TAPS task: 'Digestion Modelling	**SCI ENQ/ ASST OPP:** Comparative/Fair testing. TAPS task: 'Reporting on rocks'	**SCI ENQ/ ASST OPP:** Pattern seeking. TAPS task: 'Investigating Pitch' Pattern seeking. TAPS task: 'Can everything make a shadow?'	**SCI ENQ/ ASST OPP:** Observation over time. TAPS task: 'Function of a plant stem'
VOCABULARY: **Classification, vertebrates, invertebrates, specimen, characteristics, organisms, life processes, respiration, sensitivity, reproduction, excretion, nutrition, habitat, environment, endangered species, extinct**	**VOCABULARY:** **Digest, oesophagus, stomach, small/large intestine, rectum, teeth, herbivore, carnivore, omnivore, predator, prey**	**VOCABULARY:** **Igneous, metamorphic, sedimentary, rock, magma, lava, sediment, permeable, impermeable, fossilisation, erosion**	**VOCABULARY:** **Light, light source, dark, reflection/reflect/ reflective, ray, pupil, retina, shadow, translucent, opaque, transparent**	**VOCABULARY:** **Roots, stem, leaves, flowers, nutrients, evaporation, fertilisation, petal, stamen, carpel, sepal, pollination, pollinator, germination, seed dispersal**

Knowledge and Skills: Year 5/6 YEAR A

Animals, including Humans (Autumn 1)	Living things and their habitats (Autumn 2)	Forces (Spring 1)	Earth and Space (Spring 2)	Properties and Changes of Materials (Summer)
I KNOW the changes that happen as humans develop to old age by drawing a timeline **I CAN** describe the development of babies in their first year. **I CAN** compare the changes that take place to boys and girls during puberty. **I KNOW** the changes that take place in old age **I KNOW** about the gestation period and life expectancies for animals.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. **I CAN** describe the life process of reproduction in some plants and animals.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** explain that unsupported objects fall towards the Earth, because of the force of gravity acting between the Earth and the falling object. **I KNOW** the effects of air resistance, water resistance and friction, that act between moving surfaces. **I KNOW** that some mechanisms, including levers, pulleys, gears, allow a smaller force to have a greater effect.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** describe the movement of the Earth, and other planets, relative to the Sun in the solar system. **I CAN** describe the movement of the Moon relative to the Earth. **I CAN** describe the Sun, Earth and Moon as approximately spherical bodies. **I KNOW** how the idea of the Earth's rotation can explain day and night. **I KNOW** how the Earth's rotation explains the apparent movement of the Sun across the sky.	**SUBSTANTIVE KNOWLEDGE:** **I CAN** compare and group everyday materials on the basis of their properties (including hardness, solubility, transparency, thermal/ electrical conductivity, response to magnets). **I KNOW** some materials will dissolve in liquid to form a solution. **I CAN** describe how to recover a substance from a solution. **I KNOW** how mixtures might be separated (eg filtering, sieving and evaporating). **I KNOW** the reasons for particular uses of everyday materials, eg metals, wood, plastic. **I CAN** show that dissolving, mixing and changes of state are reversible changes. **I KNOW** that some changes result in the formation of new materials, and this is not usually reversible (eg burning, action of acid on bicarbonate of soda).
DISCIPLINARY KNOWLEDGE: (Working Scientifically) **I KNOW** how to record data and results of increasing complexity using bar and line graphs **I CAN** analyse data on gestation periods and life expectancies of animals.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Interpreting and Conclusion: I CAN** create detailed models to explain processes such as life cycles.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Recording: I CAN** present results in a variety of ways to help in answering questions.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Asking Questions: I CAN** raise questions about a range of phenomena, using secondary sources to research.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Making Predictions: I CAN** make predictions from previous learning and review these predictions to state whether I was correct. **Observation/Measurement: I CAN** take measurements with increasing accuracy.
SCI ENQ/ ASST OPP: Interpreting and Concluding.	**SCI ENQUIRY/ ASST OPPORTUNITY:** Research.	**SCI ENQUIRY/ ASST OPPORTUNITY:**	**SCI ENQUIRY/ ASST OPPORTUNITY:** Research.	**SCI ENQUIRY/ ASST OPPORTUNITY:** Comparative/Fair testing. TAPS task: 'Dissolving'

TAPS task: 'Growth Survey'	TAPS task: 'Life cycle research'	Comparative/ Fair testing. TAPS task: 'Aqua Dynamics'	TAPS task: 'Space Travel Questions'	
VOCABULARY: **Fertilisation, prenatal, gestation, reproduce, asexual reproduction, sexual reproduction, life cycle, adolescence, puberty, menstruation, adulthood, life expectancy**	**VOCABULARY:** **A/sexual reproduction, reproduction, fertilise, gestation, life cycle, metamorphosis, pollination**	**VOCABULARY:** **Forces, gravity, gravitational pull, weight, mass, friction, air/water resistance, buoyancy, streamlined, mechanism, upthrust**	**VOCABULARY:** **Sun, star, moon, planet, sphere, spherical bodies, satellite, orbit, rotate, axis, geocentric/heliocentric model, astronomer**	**VOCABULARY:** **materials, solids, liquids, gases, melting, freezing, evaporating, condensing, conductor, insulator, transparency**

Knowledge and Skills: Year 5/6 YEAR B

Animals including humans (Autumn 1)	Living Things and their Habitats (Autumn 2)	Light (Spring 1)	Electricity (Spring 2)	Evolution and Inheritance (Summer)
SUBSTANTIVE KNOWLEDGE: **I KNOW** and can identify the main parts of the human circulatory system. **I KNOW** the functions of the heart, blood vessels and blood. **I KNOW** how diet, exercise, drugs and lifestyle affect the way my body functions. **I CAN** describe the ways in which nutrients and water are transported within animals, including humans. **I CAN** describe the changes as humans develop to old age.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** that living things are classified into board groups based on similarities and differences, including microorganisms, plants and animals. **I CAN** give reasons for classifying plants and animals based on specific characteristics.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** that light appears to travel in straight lines. **I UNDERSTAND** how this explains that objects are seen because they give out or reflect light into the eye. **I CAN** explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. **I CAN** explain why shadows have the same shape as the objects that cast them.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** that the brightness of a lamp, or the volume of a buzzer, is linked to the voltage of cells in a circuit. **I CAN** compare and give reasons for why there are variations in components, eg the brightness of bulbs, the loudness of buzzers, the on/off positions of switches. **I CAN** use recognised symbols when representing a simple circuit in a diagram.	**SUBSTANTIVE KNOWLEDGE:** **I KNOW** that living things have changed over time and that fossils provide information about living things from millions of years ago. **I KNOW** that living things produce offspring of the same kind, which normally vary and are not identical to their parents. **I KNOW** how animals and plants are adapted to suit their environments in different ways. **I KNOW** that adaptation may lead to evolution.
DISCIPLINARY KNOWLEDGE: (Working Scientifically) **Planning Enquiries: I CAN** set up fair tests, explaining which variables need to be controlled and changed.	**DISCIPLINARY KNOWLEDGE:(Working Scientifically)** **Observation/ Measurement: I CAN** use observation skills to identify, group and classify.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Asking Questions: I CAN** raise questions to further prove or disprove a scientific enquiry.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Recording: I CAN** produce my own results table, indicating cause and effect.	**DISCIPLINARY KNOWLEDGE: (Working Scientifically)** **Evaluating: I CAN** use scientific language and evaluate how their enquiry has answered the question.
SCI ENQUIRY/ ASST OPPORTUNITY: Comparative/Fair testing. TAPS task: 'Heart rate poses'	**SCI ENQUIRY/ ASST:** Identifying, grouping and classifying. TAPS task: 'Outdoor Keys'	**SCI ENQUIRY/ ASST OPPORTUNITY:** Problem solving. TAPS task: 'Raising and sorting light questions'	**SCI ENQUIRY/ ASST OPPORTUNITY:** Comparative/Fair testing. TAPS task: 'Bulb brightness'	**SCI ENQUIRY/ ASST OPPORTUNITY:** Pattern seeking. TAPS task: 'Bird Beaks'
VOCABULARY:	**VOCABULARY:**	**VOCABULARY:**	**VOCABULARY:**	**VOCABULARY:**

Circulatory system, heart, blood vessels, de/oxygenated blood, drug, alcohol, nutrients	**Characteristics, classify, taxonomist, key, bacteria, microorganism, microscope, species**	**Light, light source, reflection, incident/reflected ray, the law of reflection, refraction, visible spectrum, prism, shadow, transparent, transluscent, opaque**	**Circuit, symbol, cell/battery, current, amps, voltage, resistance, electrons**	**Offspring, inheritance, variations, characteristics, adaptation, habitat, environment, evolution, natural selection, fossil, adaptive traits, inherited traits**

Progression by Area: Knowledge

	Foundation/ EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Year Group	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Plants 	**Natural world** Explore the world around them making observations and drawings of plants. **Natural world** 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. **Communication and language**- express their ideas and feelings about their experiences using full sentences.	• Name common plants and describe the basic structure of flowering plants, including deciduous and evergreen. • Identify and describe the basic structure of a variety of common flowering plants, including trees.	• Observe and describe how seeds and bulbs grow into mature plants. • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.	• 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.	Recognise that living things can be grouped in a variety of ways. (Living things and habitats)	Describe the differences in the lifecycles of a mammal, an amphibian, an insect and a bird. (Living things and habitats)	Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. Give reasons for classifying plants and animals based on specific characteristics (Living things and habitats)
Seasonal Changes 	**The Natural World** Understand some important processes and changes in the natural world around them, including seasons.	Observe changes across the four 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 our eyes. Recognise that shadows are formed when the light source is blocked by a solid object. Find patterns in the way the size of the shadows change (Light)		Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Forces)	Use the idea that light travels in straight lines to explain why shadows have the same shape as the object that casts them. (Light)
Earth and Space 						Earth and Space 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 Earth rotation to explain day and night due to the apparent movement of the sun across the sky.	

Animals including humans.

The Natural World
Explore the natural world around them, making observations and drawing pictures of animals.

Begin to make sense of their own life-story and family's history.

Begin to understand the key features of the lifecycle of a plant and animal.

People, culture and communities
Describe their immediate environment using knowledge from observation, discussion, stories and non-fiction texts and maps.

Personal, social and emotional development
Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.

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

Notice that animals, including humans, have offspring which grow into adults.
Find out about and describe the basic needs of animals, including humans, for survival (water, food and air)
Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.

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 differences in the lifecycles of a mammal, an amphibian, an insect and a bird.

Describe the life processes of reproduction in some plants and animals.

(living things and habitats)

Describe the changes as humans develop from birth to old age.

Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.

Identify and name the main parts of the human circulatory system and describe the function of the heart, blood vessels and blood.

Describe the ways in which nutrients and water are transported within animals, including humans.

Living Things

Evolution and Inheritance

People, culture and communities
Explain some similarities and differences between life in this country and life in other countries, drawing on knowledge from stories, non-fiction texts and maps.

Understanding the world
Begin to understand the need to respect and care for the natural environment and all living things.

Explore the natural world around them.

- Name common plants and describe the basic structure of flowering plants, including trees.

(Plants)

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

(Animals including Humans)

Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other
Identify and name a variety of plants and animals in their habitats, including microhabitats
Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.

Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers.

(Plants)

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 environment.
Recognise that environments can change and that this can sometimes pose dangers to living things.

Describe the differences in the lifecycles of a mammal, an amphibian, an insect and a bird.

Describe the life processes of reproduction in some plants and animals.

Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals.
Give reasons for classifying plants and animals based on specific characteristics

<u>Evolution and inheritance</u>
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

Materials

Rocks and Soils

The Natural World
Understand some important processes and changes in the natural world around them, including changing states of matter.

Speaking
Offer explanations for why things happen, making use of recently introduced vocabulary from stories, non-fiction, rhymes and poems where appropriate.

Understanding of the world
Use all their senses in hands on exploration of natural materials.
Explore collections of materials with similar and/or different properties.
Talk about what they see using a wide vocabulary.
Explore how things work.
Talk about the difference between materials and changes they notice.

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.

Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Notice that some forces need contact between two objects, but magnetic forces can act at a distance.

(Forces and magnetism)

Rocks and Soils
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 a rock.
Recognise that soils are made from rocks and organic matter

STATES OF MATTER
Compare and group materials together, according to whether they are solids, liquids or gases (states of matter)
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 (States of matter)
Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. (states of matter)

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 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 this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.

Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.

(Evolution and Inheritance)

Forces

Understanding the World.
Explore and talk about different forces they can feel.
Can talk about the differences between materials and changes they notice.

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.

(Materials)

Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

(Materials)

Compare how things move on different surfaces
Notice that some forces need contact between two 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 two poles.
Predict whether two magnets will attract or repel each other, depending on which poles are facing.

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.

To describe the movements of the Earth, and other planets, relative to the Sun in the solar system (Earth and Space)

Light and sound 	**Understanding of the world** Explore materials with different properties. Talk about what they see, using a wide vocabulary. **Expressive arts and design** Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture form and function. Explore colour and colour-mixing. Play instruments with increasing control to express their feelings and ideas.	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. (Materials) Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies. (Seasonal changes) 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 (Animals incl humans)	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (materials) • Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Plants)	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. (Plants) 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 our eyes. Recognise that shadows are formed when the light source is blocked by a solid object. Find patterns in the way the size of the shadows change	Recognise that environments can change and that this can sometimes pose dangers to living things. (living things and habitats) SOUND To 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 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 sound gets fainter as the distance from the sound source increases.	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. (materials) Use Earth rotation to explain day and night due to the apparent movement of the sun across the sky. (Earth and Space)	Recognise that light travels in straight lines. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Use the idea that light travels in straight lines to explain why shadows have the same shape as the object that casts them.
Electricity	Shows skills in making toys work by pressing parts or lifting flaps to achieve effects such as sound, movement or new images.	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. (Materials)	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Materials)		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.	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. (Materials)	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off potion of switches. Use recognised symbols when representing a simple circuit in a diagram.

Progression by Area: Working Scientifically

Asking Questions

6	Can raise questions about local animals and how they are adapted to their environment. Can raise questions about a range of phenomena e.g., rainbows, colours on soap bubbles, objects looking bent in water. Asks a range of appropriate questions to group and classify into many different categories. Can use secondary sources to research (e.g., unfamiliar animals and plants from a broad range of habitats). Use ideas from secondary sources to support their ideas. Can raise questions to further prove or disprove a scientific enquiry.
5	Can study and raise questions to answer (including about their local environment throughout the year, properties of materials, forces, space, animals or living things). Can ask relevant questions and suggest reasons for similarities and differences. Use their scientific experiences to explore ideas and raise different questions. Can create further questions from enquiries to investigate. Independently uses secondary sources to find relevant facts about a topic. Raise further questions from enquiries/research.
4	Can decide how to gather evidence to answer questions. Raise questions to help identify and group (such as how a habitat changes, animals and living things including plants, different states of matter and how sounds are made) Can write a range of questions using the world around them and their own scientific knowledge. They recognise when secondary sources can be used to answer questions and can select appropriate information from sources. Can ask a range of questions to sort and classify.
3	Raise own questions about the world around them and why this happens the way they do (e.g. the role of the roots and stem in nutrition and support, or how rocks are formed, different forces) Recognise how and when to use secondary sources to answer questions that cannot be answered in practical science. Can write a range of questions relevant to the topic. Can answer questions posed by the teacher, independently or with support. Identify new questions from data. Can raise questions and carry out tests with support to find things out. Can carry out research using a small range of secondary sources.
2	Raise questions that help them become familiar with scientific processes (e.g life processes that are common to all living things, their local environment, materials) Can ask simple questions relevant to the topic. Can use a range of question stems. (e.g. Is a flame alive? Is a deciduous tree dead in winter? What makes the best habitat for a minibeast? Where in the school can we find something that is made of wood? Which animal belongs to which offspring? Do seeds grow quicker inside or out?) Know their questions can be answered in different ways. Use more than one secondary source to gather and present information clearly.
1	Explore the world around them and raise own questions. (e.g growing, animals in their habitat, everyday materials, why seasons change.) Can answer questions supported by the teacher, often through scenarios and recognise questions can be answered in different ways. Can begin to ask simple questions and use simple secondary sources to find answers. Able to ask yes and no questions to sort and classify.
F.	Shows curiosity about objects, events, plants, people and animals. Questions why things happen. Asks questions to clarify understanding and aspects of their familiar world e.g. place they live or natural world. Ask questions to find out how things work or to clarify what is happening.

Evaluating

6	Can describe and evaluate their own and other people's scientific ideas using evidence from a range of sources. Evaluate their choice of method, the control of variables, the precision and accuracy of measurements and the credibility of secondary sources. Use scientific language and evaluate how their enquiry has answered the question.
5	Evaluate and decide when further observations, comparative and fair tests might be needed. Evaluate different aspects of their enquiries such as equipment and accuracy of measurements. State how the enquiry improves outcomes from their questions. Can relate their results to the question and state if their test has enabled them to answer it. Use a range of charts to evaluate such as ranking scales, star diagrams including those with negative numbers. Suggest next steps based on the weakest aspects and state how this will help them or the test progress or give different results.
4	Evaluate and communicate their methods and findings. Suggest ways to improve what they have already done. Begin to evaluate different aspects of their enquiries such as equipment. Begin to understand how the enquiry improves outcomes from their questions. Use different charts to evaluate such as ranking scales, star diagrams and success ladders. Suggest points for development based on the weakest aspects.
3	Suggest improvements and raises further questions Use evidence and subject knowledge to refute statements. Make suggest improvements from enquiries. Make basic statements about what worked well and what they would change. Use success ladders confidently to evaluate their tests or understanding against multiple criteria and suggest simple next steps.
2	With support can suggest improvements to their enquiries. Suggest some things that could be changed and evaluate why things went wrong. Use success ladders with multiple criteria to evaluate the test or their understanding against the learning objective.
1	With scaffolding and prompting can suggest simple improvements to their enquiries. Talk about some changes that could be made. Use simple success ladders to evaluate their tests or understanding against the learning objective.
F.	Develop own narrative and explanations by connecting ideas or events. Talk about what they have found and say what worked well. Describe how things work in simple terms and make basic alterations and suggest things that did not work (e.g. this button does not work so press this one) Question why things happen. Come up with alternative ways of doing things through exploration. They can say or indicate by smiley faces/scale if they have achieved the learning objective.

Interpreting and Conclusion

6	Look for patterns and relationships using a suitable sample. Use oral and written forms such as displays to report conclusions, casual relationships and give an explanation of the degree of trust in their results. Children can pose further questions which can be answered by extending the enquiry. Makes suggestions for ideas that can be explored using pattern seeking. Can spot anomalies and identify results that do not fit the overall pattern. Use data to refute or support ideas or arguments. Focuses on scientific reasons for overall pattern rather than a comparison. Uses labelled diagrams to support their explanation. Use ideas from secondary sources to support their ideas, choosing appropriate websites. Create detailed models to explain processes such as circulatory system and lifecycles.
5	Identify patterns and casual relationships that may be found in the natural environment. Children interpret data to generate simple comparative statements based on evidence. Use results to draw conclusions and can identify external factors that cannot be controlled e.g. temperature inside and outside. Use scientific language and illustrations to discuss, communicate and justify scientific ideas. Use results to make predictions and identify whether further observations, comparative tests, fair tests, pattern seeking, or research might be needed. Can use comparative statements to explain results and how things work. Evaluate how effectively variables were controlled and what they may do to improve the enquiry.
4	Draws simple conclusions from results to answer questions and support their ideas. Look for casual relationships in data and identify evidence that refutes/supports ideas. Report on findings to an audience orally and in writing using appropriate scientific vocabulary for a range of audiences. Children use evidence to suggest values for different items tested using the same method. Draw conclusions based on straightforward evidence and current subject knowledge to support their findings, Suggest improvements and raise further questions.
3	Begin to look for naturally occurring patterns and relationships from data. Draws conclusions based on observations. Can compare something using results and the conclusion is consistent with the data. Able to adjust opinion and predictions based on results. Can give reasons for results including any anomalies. Uses findings and results to answer questions raised. Use simple scientific language to discuss ideas and communicate their findings in ways appropriate for different audiences orally and written. Apply their knowledge of the topic when evaluating. Explain any amendments and how this impacted the investigation/test.
2	Communicate findings to an audience using relevant scientific language and illustrations. Can identify casual relationships and patterns in results. Can identify which results do not fit the overall pattern and explain findings. Refers to the table of results when describing what has happened. Draws a basic conclusion (with support from the teacher) using own scientific knowledge, observations and comparisons. Uses results of investigations to answer enquiry questions.
1	Can use evidence from simple tests when answering questions. With help begin to notice patterns and relationships. Talk about what they have found out and how they found it out. Can make comparisons and recognise biggest/smallest, most effective/least effective from data. Can use simple models to explain processes e.g. seasonal changes, lifecycles.
F.	Offer explanations for why things happen- making use of some recently introduced scientific vocabulary. Develop own narrative and explain by connecting ideas or events. Develop vocabulary which meets the breadth of their experiences

Making Predictions

6	Develops predictions not based on results of a scientific enquiry but using own ideas and subject knowledge. Use evidence to support predictions. Gathers evidence through practical science to support predictions. Use test result to make predictions to set up further comparative and fair tests.
5	Use subject knowledge, observations, or previous learning to make predictions. Can add further detail and explanations for their predictions. They review their predictions to state whether their predictions were correct. Can base predictions on previous scientific enquiry. Can identify a range of variables which could affect their investigation.
4	Use subject knowledge or research to make predictions. Predictions are detailed and explains their thinking, they link to previous tests and use scientific language. Raise further predictions from results based on patterns. Make predictions for new values.
3	Uses evidence and subject knowledge to refute statements. Make predictions from questions posed. Add detail to their predictions giving reasons linked to own scientific knowledge. Makes further predictions from what is observed or tested.
2	Draws on knowledge from observations to make a prediction. Can begin to test predictions and later answer questions (predictions can be a guess). Ask questions about what might happen in the future.
1	Can make basic predictions over things they can see or their own ideas. Can use some scientific vocabulary.
F.	Shows curiosity about objects, events and people. Question why things happen. Can make simple predictions based on comparisons e.g. float or sink?

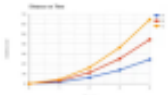
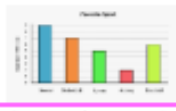
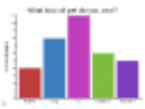
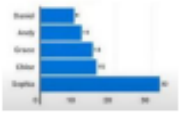
Observation and Measurement

	Observation	Measurement
6	Children answer their own and others' questions on observations they have made. Their answers are based on evidence. Observe and raise questions about animals and how they are adapted to their environment. Observe properties of materials to group and classify based on their characteristics and properties. Can make accurate detailed drawings of plants and animals based on their own observations.	Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings where appropriate. When collecting measurements, the decide whether they need to increase sample size for validity and reliability. Can record measurements to 3dp. Can use protractors and rulers and force metres to measure accurately choosing correct units.
5	Observe and compare the life cycles of plants and animals in their local environment with other plants and animals around the world. Observe changes over a period of time. (e.g. animals) Make own decisions about what to observe. Can use observation skills and ID kits to identify different animals and minibeasts. Can use careful observations to identify different rocks and group them depending on their observable characteristics.	Take repeat measurements where appropriate. Can choose the middle value or finds mean average. Select measuring equipment to give most precise results e.g., ruler, tape measure, trundle wheels, force metres with suitable scales. Can explain advantages and disadvantages of different measuring equipment. Children make quantitative measurements about conductivity and insulation.
4	Make systematic and careful observations to identify plants and animals in their habitats and how the habitat changes throughout the year. Use observations to ask questions and group objects using classification keys. Observe closely and describe processes such as changes of state. Observe and record evaporation over a period of time. Identify differences, similarities or changes related to simple scientific ideas or processes.	Uses a range of scales. Takes and records accurate measurements using standard units. Can record measurements to 2dp. Use thermometers to explore the effects of temperature on substances. Use data loggers to record sound in decibels and notice patterns. Use volt metres to measure voltage in a circuit to observe patterns and answer questions. Begin to gather repeat readings to increase accuracy.
	Make systematic and careful observations. Draw diagrams and pictures with detail. Select own equipment for observing e.g. magnifying glasses, viewers, microscopes, digital cameras. Look for naturally occurring patterns and relationships. Collect data from their own observations and measurements.	Take accurate measurements using standard units, can measure and compare. (e.g., amount of liquid and height of a plant to nearest ½ cm) Use a range of equipment for measuring time, length, capacity and temperature. Begin to use a range of scales. Can read digital measurements from data loggers
2	Observe closely, using simple equipment with greater precision. Can identify a variety of plants, animals and materials using observations. May use ID charts with support. Observe how different plants grow and record findings including similar plants at different stages of growth and notice similarities and differences. Use their observations and ideas to suggest answers to questions. Observe through video, first-hand observations and measurement how different animals including humans grow and offer explanations. Compare objects based on observable features.	Use standard units to estimate and measure length, height, temperature, and capacity. Can use rulers, scales, thermometers and measuring vessels with some degree of accuracy. Make decisions about what measurements to use and how long to make them for.
1	Uses appropriate senses aided by equipment such as magnifying glasses, viewers and digital microscopes to make observations. With help and prompting, observe changes over time and can describe the changes. Can identify and group, compare and contrast using observations, video and photographs.	Use discrete e.g., counting and continuous data e.g. liquid to manageable common standard units. Can use simple measurements and equipment such as hand lenses and egg timers to gather data. Can use non-standard measures to compare.
F.	Explore the natural world making observations (e.g seasons) Explore different equipment, finding out what its uses are. Know similarities and differences between the natural world around them. Observe and describe what they see using everyday language. Use basic equipment such as magnifying glasses and viewers.	Take measurements initially by comparisons then begin to use non-standard units. Make links and notice patterns in their experiences.

Planning Enquiries

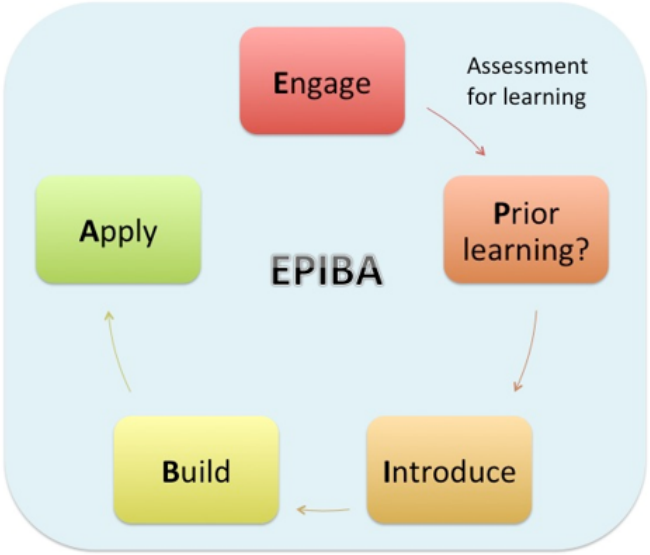
6	Children choose the type of enquiry needed to carry out their investigation. Children can pose and answer their own questions, controlling variables where necessary independently. Decide whether they need to increase the sample size for validity. Children understand how to gather data to prove a prediction. Can identify a range of factors which may affect their investigation. 
5	Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and changed. Can identify independent and dependent variables to identify causal relationships. Understand what type of scientific enquiry is needed to answer and prove/disprove scientific questions or phenomenon. 
4	Can identify the type of enquiry needed to answer a question. Follow a plan to carry out observations and tests. Can select from a range of resources to gather evidence and answer questions, to classify, compare and perform fair tests. Use post it note planning approach with more independence in identifying variables and what needs measuring. Children choose their method to carry out the investigation.  
3	Perform a range of scientific investigations including different types of scientific enquiry. Set up practical enquiries: comparative, and fair tests. (post it note approach scaffolded by the teacher). Children investigate and answer own questions linked to shared planning 
2	Carry out simple comparative tests using own ideas (May use Discovery Dog model) Experience different types of enquiry including practical activities. Within the planning frame can suggest resources they may need for the test. Can carry out simple tests linked to the types of enquiry: observation, testing, pattern seeking, identifying and classifying and research. 
1	Begin to recognise different ways they may answer scientific questions. Experience different types of enquiry including practical activities. Use practical resources provided by the teacher and can suggest some resources of their own e.g pipettes, viewers, magnifying glasses. Can carry out simple tests to classify, compare or pattern seek. 
F.	Find ways to solve problems/find new ways to do things. Test out ideas. Take risks through trial and error. Engage in open ended activities. Choose the resources they need for their chosen activity from their environment. 

Recording

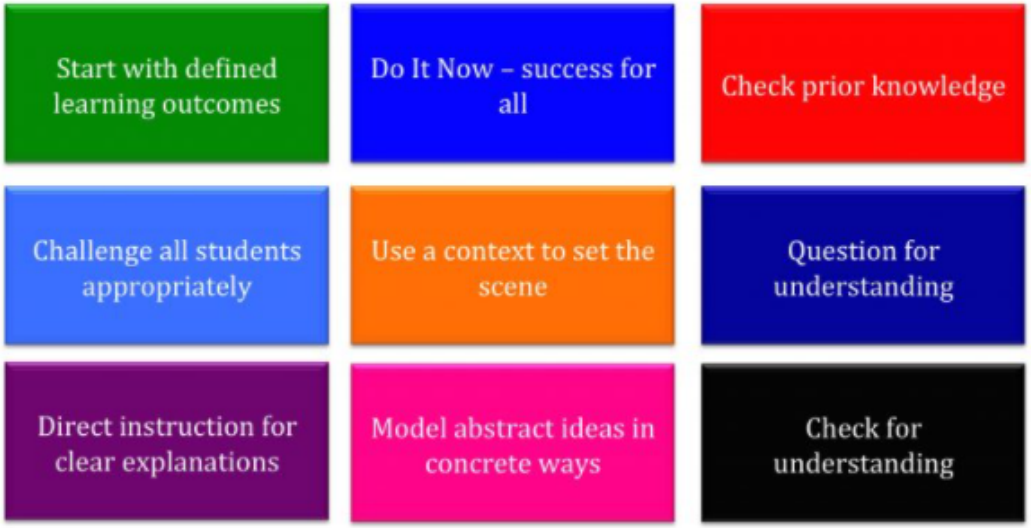
	Recording	Tables	Sorting	Charts and Graphs
6	Children present the same data in different ways to help answering the question. Record data and results with increasing complexity e.g accuracy of measurements, multiple data sets and different scales. Use scientific diagrams, models and labels.	They can calculate the mean and range of a set of data. Use multiple data sets.	Can use and produce classification keys independently by posing questions.	Can independently collect data and produce scatter and line graphs using various scales and multiple data. Can create bar charts and pie charts to present data.  
5	Children decide how to record data from a choice of familiar approaches. Present results in a variety of ways to help in answering questions. Can record ideas using accurately labelled diagrams using scientific language.	Can produce own results table indicating cause and effect. Records results systematically.	Use and develop classification keys and other information records to identify, classify and describe. Can classify in a number of ways.	Use line or scatter graphs to calculate range in a set of data. (Different scales used) Can produce bar graphs with various increments.  
4	Record findings using systematic and careful observational drawings and labelled diagrams. Children supported to present the same data in different ways- choice over recording.	Can create own tables with own headings. Can convert between units of measure.	Can record using classification keys. Can use Venn and Carroll diagrams for classification, choosing own criteria.	Can use discrete and continuous data, presenting data in a line/scatter graph. Can construct a pictogram/bar chart independently.  
3	Record findings using scientifical language, drawings and labelled diagrams and detailed written explanations based on observations.	Can complete a table (with given template) where they add headings and results.	Can use simple classification keys and Venn diagram with 2 sorting criteria and 1 intersecting. Begin to use Carroll diagrams. Can give reasons for their sorting criteria.	Can produce vertical and horizonal bar charts adding own labels and bars.  
2	Children record their observations e.g. using photographs, videos, drawings, labelled diagrams or in writing. Record findings using scientific language. Gather and record data to help in answering questions.	Count results using a tally chart. Use prepared tables to record results.	Can identify and classify. Use simple keys based and yes or no questions. Can sort into 2 groups explaining their reasons clearly.	Can record using prepared vertical bar charts. Can use results from tally charts. 
1				
F	Begin to show accuracy in drawings, observations and simple labels. Use key scientific vocabulary provided by the teacher.	Can complete a simple table of results. (Prepared) Can add marks to a chart to collect data.	Can using sorting rings to classify in more than 2 groups answering yes or no questions. Can sort using a simple 2 criteria Venn diagram.	Can complete a prepared block graph/pictogram. 
	Draw pictures of objects in their own environment. Can take photos of things of interest to them.	Can count results. Start to mark make to record results.	Can order items. Can sort in more than 2 groups using familiar categories.	Can create a class chart using pictures and objects. 

Lesson Design in Science

For many lessons, we follow the EPIBA planning approach below:



Our lessons design is based on the Institute for Teaching guide to what makes expert teaching:



Defined learning outcomes: Teachers will introduce both the knowledge and skills that will be covered in the lesson. This may also include the introduction of key vocabulary and an articulation of the big picture aim (the 'why') that makes sense to the students.

Engage / Do It Now: The purpose of the Do Now is to quickly engage students in learning and provide an opportunity for all students to be successful at the start of the lesson. These activities might typically include odd one out, true or false, mind map, what was the question.

Check prior knowledge: Prior knowledge provides the framework for learning new knowledge. Teachers may use spider diagrams, retrieval practice quizzes, concept maps or cartoons to elicit the current understanding and identify any misconceptions which will need to be corrected.

Challenge all students: Challenging students develops their cognition and addresses misconceptions, but it also serves important and often understated roles in student motivation and assessment for learning. When we challenge students we find out what they do and do not know; only then can we provide rapid and specific feedback. We know that learning new knowledge can overload working memory so we need to challenge with care. 4 good strategies for challenging learners are:

1. Cognitive conflict – present a scenario that is incompatible with students' current thinking and then present an alternative idea
2. Pace – limit the time taken to do something
3. Off you go… – limit the number of instructions before an open task is set. It is best if the outcome is focused so students know when they have succeeded. This gives them immediate feedback.
4. Probing questions – ask fundamental questions that promote deep learning e.g. where do the stars go during the day?

Use a context: A context shows the relevance of what we are learning and therefore improves student attitudes. It provides a rationale to make the problem clear – this reduces the need for teacher instruction and supports students if they get stuck to be clear on the end goal e.g. make salt for dinner. It makes abstract ideas more concrete and can spark curiosity. If a relevant context is used it can help to personalise the science too e.g. investigating air pollution in your local area.

Question for understanding: While closed questions have their place, teachers should encourage thinking and arouse curiosity with deep, open questions e.g. where do the stars go during the day? Are humans still evolving?

Direct instruction for clear explanations: Great direct instruction relies on teachers having strong subject knowledge **and** good pedagogy. These teachers need to deploy this knowledge using appropriate clarity, pace and pitch. They need good behaviour management and must not get lost in superfluous detail during explanations. When done well, direct instruction provides students with bespoke explanations that allow knowledge and understanding to be acquired quickly, without over burdening working memory.

Model abstract ideas in concrete ways: Models help students understand abstract scientific ideas that cannot always be seen – these are representational models. If students create models it can make their thinking visible, allowing rapid feedback from teacher to child and child to teacher.

Check for understanding: Teachers will use a range of strategies to check for understanding against the knowledge and skills objectives, respond and try again if necessary (see impact section below).

Science for learners with SEND

Inclusion in Science means: everyone feeling they can be successful, opportunities to explore their creativity from their own starting points, supporting language and communication for all learners.

Possible struggle or challenge	Scaffold or support to consider
- Difficulties with language/ vocabulary	- Support students in remembering and being able to read and write key words and names of apparatus, processes etc. (taking time to introduce and explain new words, providing word banks). - Be aware of the confusion that may arise from words having more than one meaning (eg light, solution, resistance, concentration, etc). - Use speaking frames to develop understanding of scientific concepts and language (listen, imitate, innovate). - Allow time for checking understanding and repeating explanations/ modelling when appropriate. - Pacing, using a slower pace in conversation to give pupils time to think and formulate a response. - Pausing frequently and expectantly when talking to a pupil or group of pupils can encourage their participation. - Confirming, by confirming their understanding of what a child has said, adults can maintain the conversation and reassure the child that they are being listened to and understood. - Imitating, teaching staff can imitate and repeat what a pupil has said; for example, if a child says, 'Look at our bridge', the adult can respond by saying, 'Wow, look at your strong bridge'. - Commenting, adults comment on what is happening or what a child is doing. - Comments about the immediate situation can help the child to associate phrases and vocabulary with their actions or surroundings. - Extending, by repeating what a child has said, but adding some syntactic or semantic information, adults can introduce new words or grammatical structures. This should be done in a way that is immediately accessible and understandable to the child. - Labelling, you can build a child's vocabulary by providing the names of objects, actions or abstractions.

	- Scripting, it is helpful for adults to provide a verbal routine for activities; for example, 'First you do this, then you do that...'. Encourage pupils to talk through known routines; for example, 'Now it's practical time, what do we do first?'. - Gesture, drawings, photos, artefacts, prompt cards and where appropriate, symbols are used alongside words – oral and written. - Pre-teach key vocabulary, then ensure multiple and regular exposure to these words
- Difficulties with specific literacy skills (including dyslexia)	- Use visual prompts to direct students - Give only one or two instructions at a time - Build a topic specific vocabulary guide - Provide a transcript of text on the board for the student to highlight - Encourage the use of mind maps/pictures/flow charts – this increases a spatial approach - Use lots of short activities to reinforce concepts - Offer extra time to complete work - Create over-learning opportunities for automaticity - When assessing writing – look for quality before quantity - Find ways to compensate for working memory difficulties (e.g. knowledge organisers)
- Difficulties with specific mathematical skills (including dyscalculia)	- Reassurance when any mathematical skills are needed. - Use concrete apparatus to help e.g. number lines, unifix blocks. - Check the mathematical language is understood. - When organising a practical session, use templates to help drawing tables and graphs.
- Difficulties with engagement, resilience and self-esteem	- Create firm expectations by displaying and repeating rules clearly and reminding students of a rule when he/she starts to misbehave. - Give advance warning of any changes to regular events.

	- Give very clear guidelines, for instance: 'I expect you to have produced at least four sentences by ten past ten. I will be asking you then to share them with your talk partner'. - Use eye contact and non-verbal signals, wherever possible, to let the pupil know if their behaviour is inappropriate.
- Processing difficulties, or struggles to retain information	- Give pupils time to think about answering questions. - Encourage discussion with peers in advance of feeding back to the group or answering questions. - Teach pupils to ask for help, using supports for this, such as prompts. - Check for understanding, perhaps involving other adults in the class. - Help students to plan effectively (eg provide instructions for them to sequence in the correct order). - Sequencing activities – writing up experiments, cycles, cut and paste. (it is perfectly acceptable for a TA to write sentences or draw diagrams for the pupil to cut and paste themselves. - Write instructions on the board – use different colours for each line, or to indicate instructions for different students. - Teach mind-maps, spider diagrams, to organise learning. - Task plans - provide instructions for a task visually using the headings, What do I need? What do I need to do? What happens after that? This can be also be used as a scaffold to support homework tasks. The student progressively is given more responsibility for creating the plan. - A visual framework can be used as a consistent guide for planning an investigation in science. Headings of what am I finding out? What I need? What will I do? What to look for? What happened? Why did it happen? Each with picture support will simplify the method, results and conclusion format for many students. - Make use of songs, rhymes and rhythm to aid learning sequences.
- Sensory challenges or visual/hearing impairment	- Additional equipment such as non-slip mats and a free-standing magnifying glass may also be useful.

	- Measuring cylinders with large-scale readings, talking scales etc can also be considered. - Explore shape and function of any equipment - Use specialist equipment e.g. talking thermometers - Record instructions - Use equipment trays with polystyrene cut out shapes for equipment to fit in - Use large print or Braille to label chemicals - Colour water so it is easier to see - Ensure everyone follows rules e.g. to keep floors free of obstructions

Assessment in Science

Our approach to assessment in science is in line with John Hattie's approach about the importance of "knowing thy impact" and how feedback should work two ways; from teacher to student *and* from student to teacher. For us to know our impact, we must constantly get feedback from our students as to whether learning has or hasn't happened so that we can respond appropriately.

Some examples of formative assessment activities completed within a unit:

Mini whiteboards on the desk. So many concepts in science can be understood quicker (and sometimes better!) through pictures or diagrams, eg. asking children to draw an annotated picture of a plant on their mini whiteboards.
Walk and watch. Watch what children are doing when you ask them to complete a task rather than looking at the work when has been completed. Teachers may look to "live mark" (marking some answers as they move around the classroom) which can be a real motivator and also acts as a check of understanding.
Can students apply? Teachers may use a task that challenges students to apply their knowledge to a new or different context, eg. design an animal which has evolved to live on this fantasy planet.
Teaching the class. Getting a student to come to the front of the class and use the teacher's whiteboard to explain a concept is an incredibly powerful way to gauge class understanding.
Questioning – probe and probe again It's only by probing at depth with our questioning that we can begin to get a handle on what our students understand.
Exit tickets. Writing the exit ticket helps us articulate the key learning of the lesson and can be an invaluable tool in finding out whether students did or did not learn these ideas.
Marking (the right work). If we want to use marking to give and capture feedback, we have to set the right task. Open pieces of writing, where students have the opportunity to display their thinking and misconceptions, can be especially valuable. Written feedback when used identifies strengths and errors in the work, providing next steps for thinking or corrections to make.

Teachers also use scientific enquiry activities as summative assessments at the end of units to inform their ongoing tracking of children's understanding and disciplinary knowledge. These activities are taken from the Primary Science Teaching Trust's Teacher Assessment in Primary Science (TAPS) focused assessment tasks and allow for assessment of knowledge and of working scientifically. To assess children's substantive understanding, the use of 'vocab lab' and mind mapping both before and after a teaching is very useful for informing teacher assessments.