Asfordby Hill Primary School

Individual Value; Valuing Individuals

Progression in Science:

Substantive Knowledge, Disciplinary Knowledge and Scientific Enquiry

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why & how? PRIMARY SCIENCE TEACHING TRUST

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Substantive Knowledge Objectives – Plants

	EYFS	KS1		LKS2		UKS2	
	EYFS	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
NC Objectives:	ELG: 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	• 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 name a variety of plants and animals in their habitats, including microhabitats. (Living Things and Habitats)	• 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 life process of reproduction in some plants and animals. (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. (Living Things and Habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Living Things and Habitats)
Vocab:	Leaf, roots, stem, flower, grow, water, soil,	**Parts of plants:** Plant, leaf, stem, flower, trunk, root **Types of trees:** evergreen, deciduous **Names of trees in the local area –** chestnut, willow, holly, rowan, beech, sycamore and oak. **Wild plants -** dandelion, daisy, buttercup, nettles **Garden plants -** rose, lavender, sunflower, pansy	Plant, seed, bulb, seedling, mature plant, germinate, conditions for growth, dormant	Photosynthesis, pollen, pollination, seed formation, seed dispersal, germination, reproduce	classification	Life cycle, reproduce, sexual reproduction, offspring, asexual reproduction, pollination, parent, clone, identical, bulb, runner, cuttings, plantlets,	Classification flowering, non-flowering

Substantive Knowledge Objectives – Living Things and Habitats

	EYFS	KS1		LKS2		UKS2	
	EYFS	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
NC Objectives:	ELG: 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	• Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees. (Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Animals including humans) • Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Animals, including humans) • Observe changes across the four seasons. (Seasonal change)	• 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. • Notice that animals, including humans, have offspring which grow into adults. (Animals including humans)	• Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (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 and wider environment. • Recognise that environments can change and that this can sometimes pose dangers to living things. • Construct and interpret a variety of food chains, identifying producers, predators and prey. (Animals, including humans))	• 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.	• Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. • Give reasons for classifying plants and animals based on specific characteristics. • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. (Evolution and inheritance) • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution. (Evolution and inheritance)
Vocab:	Habitat, animal, hot, cold, zoo, farm, Caterpillar, pupa, butterfly, insect, tadpole, frogspawn, frog, minibeast, life cycle, habitat		living, habitat, never alive, dead, food chain, micro-habitat Survival, basic needs, living, offspring, hygiene, live young, eggs, growth	pollen, pollination, seed formation, seed dispersal, germination, reproduce	Classification, habitat, hibernate, human impact, natural change, vertebrates, migration herbivore, carnivore, omnivore, producer, predator, prey, food chain	Life cycle, reproduce, sexual reproduction, offspring, asexual reproduction, pollination, parent, clone, identical, bulb, runner, cuttings, plantlets offspring, metamorphosis,	Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils

Substantive Knowledge Objectives – Animals, including Humans

	EYFS	KS1		LKS2		UKS2	
	EYFS	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
NC Objectives:	ELG: 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	• 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. • 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. (Living things and their habitats)	• 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. • Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Living things and their habitats) • Describe the life process of reproduction in some plants and animals. (Living things and their habitats	• Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. • Describe the ways in which nutrients and water are transported within animals, including humans. • 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. (Living things and their habitats) • Give reasons for classifying plants and animals based on specific characteristics. (Living things and their habitats)
Vocab:	Child, adult, head, shoulders, knees, toes, eyes, ears mouth, nose, see, hear, smell, touch, taste, healthy	Animal, carnivore, herbivore, omnivore Vocab associated with animals (wings, feathers, tail. Scales, etc.) Names of local and non-local animals Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue	Survival, basic needs, living, offspring, hygiene, live young, eggs, growth	Nutrients, skeleton, joint, bone, skull, spine, ribs, muscles	Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, herbivore, carnivore, omnivore, producer, predator, prey, food chain	Penis, testicles, vagina, breast, child, infant, teen, adult, elderly, puberty, adolescence, male, females, genitals, reproduce, hormones, scrotum, semen, ovaries, menstruation (repeated in Y6)	Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle

Substantive Knowledge Objectives – Evolution and Inheritance

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	•	• 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. (Living things and their habitats) • Notice that animals, including humans, have offspring which grow into adults. (Animals, including humans)	• Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Rocks) • Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Plants)	• Recognise that environments can change and that this can sometimes pose dangers to living things. (Living things and their habitats)	• Describe the life process of reproduction in some plants and animals. (Living things and their habitats)	• Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. • 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.
Vocab:			Survival, basic needs, living, offspring, hygiene, live young, eggs, growth habitat, never alive, dead, food chain, micro-habitat	Hardness, porosity, fossil, organic material, igneous, metamorphic, sedimentary, rocks/soil	Classification, habitat, hibernate, human impact, natural change, vertebrates, migration		Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils

Substantive Knowledge Objectives – Seasonal Change

	EYFS	KS1		LKS2		UKS2	
	EYFS	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
NC Objectives:	ELG: The Natural World • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	• Observe changes across the four seasons. • Observe and describe weather associated with the seasons and how day length varies.	•	• Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Light)	•	• Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky. (Earth and space)	•
Vocab:	Autumn winter spring summer seasons change	Weather seasons winter, spring, autumn, summer (not capitalised) Vocabulary associated with seasons and weather.					

Substantive Knowledge Objectives – Materials

	EYFS	KS1		LKS2		UKS2	
	EYFS	**Y1**	**Y2**	**Y3**	**Y4**	**Y5**	**Y6**
NC Objectives:	ELG: The Natural World • Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	• 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.	• Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Rocks) • Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Rocks) • 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. (Forces and magnets)	• 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 (°C). • Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. • Recognise some common conductors and insulators, and associate metals with being good conductors. (Electricity)	• 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.	•
Vocab:	Material, wood, plastic, soft, hard, freeze, melt, cold, straw, sticks, bricks, float, sink	Object, material/s, property, **Materials:** wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, **Properties:** hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through	Names of materials – wood, metal, plastic, glass, brick, rock, paper, cardboard Properties of materials – as for Year 1 plus opaque, transparent and translucent, reflective, non-reflective, flexible, rigid Shape, push/pushing, pull/pulling, twist/twisting, squash/squashing, bend/bending, stretch/stretching	Hardness, porosity, fossil, organis material, igneous, metamorphic, sedimentary, rocks/soil	Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle	• Soluble, insoluble, solution, reversible, irreversible, filtering, sieving, evaporation, insulator, conductor	

Substantive Knowledge Objectives – Rocks

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	• Distinguish between an object and the material from which it is made. (Materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Materials) • Describe the simple physical properties of a variety of everyday materials. (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)	• 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.	•	•	• 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)
Vocab:				Hardness, porosity, fossil, organis material, igneous, metamorphic, sedimentary, rocks/soil			

Substantive Knowledge Objectives – Light

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	• 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, including humans) • Describe the simple physical properties of a variety of everyday materials. (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)	• 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.	•	• 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. (Properties and changes of materials)	• Recognise that light appears to travel 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 objects that cast them.
Vocab:			transparent and translucent, reflective, non- reflective,	Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous			Light (Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous), plus straight lines, light rays

Substantive Knowledge Objectives – Forces

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	•	• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Uses of everyday 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.	•
Vocab:				Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole		Push, pull, start, stop, change direction, gravity, mass, weight, force, streamline, air/water resistance, friction, particles, streamline, mechanisms, simple machines, levers, pulleys, gears	

Substantive Knowledge Objectives – Sound

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	• 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, including humans)	•	•	• 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	•	•
Vocab:		Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue			Sound, medium, vibrations, source, ears, vacuum, volume, sound waves, pitch, insulator, high, low,		

Substantive Knowledge Objectives – Electricity

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	•	•	•	• 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. (Properties and changes of 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 position of switches. • Use recognised symbols when representing a simple circuit in a diagram
Vocab:					Electricity, appliance, electrical circuit, cell, wire, switch, conductor, component, battery, bulb, motor, insulator	Conductor insulator	Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage

Substantive Knowledge Objectives – Earth and Space

	EYFS	KS1		LKS2		UKS2	
	EYFS	Y1	Y2	Y3	Y4	Y5	Y6
NC Objectives:	•	• Observe changes across the four seasons. (Seasonal changes) • Observe and describe weather associated with the seasons and how day length varies. (Seasonal changes)	•	•	•	• 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. • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Forces)	•
Vocab:						Heliocentric, geocentric, Sun Earth, orbit, axis, planet, moon	

Disciplinary Knowledge Ladders – Asking Questions/Predicting

6	**UKS2: Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.** • Can independently raise questions about animals and how they are adapted to their environment and a range of other phenomena e.g., rainbows, colours on soap bubbles, objects looking bent in water, considering prior knowledge.	**UKS2: Using test results to make predictions to set up further comparative and fair tests.** • Can explain their predictions using their own prior knowledge, enquiries and experience. • Use test results to make predictions to set up further comparative and fair tests. **Y6 Heartrates TAPS** Develops predictions not based on results of a scientific enquiry but using own ideas and subject knowledge. Gathers evidence through practical science to support predictions.	6
5	**UKS2: Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.** • Can independently raise questions about materials that dissolve water, which materials would dissolve quicker, how changing conditions may affect dissolving, considering prior knowledge. **Y5 Dissolving TAPS:** Use their scientific experiences to explore ideas and raise different questions. Can form a testable enquiry questions when given an independent and dependent variable.	**UKS2: Using test results to make predictions to set up further comparative and fair tests.** • Can add further detail and explanations for their predictions, including prior scientific enquiry. • Make predictions for new values/results by looking for patterns (dissolving). **Y5 Insulation Layers TAPS** Use subject knowledge, observations, or previous learning to make predictions.	5
4	**LKS2: Asking relevant questions and using different types of scientific enquiries to answer them.** • Use a range of question stems independently to form questions. • Raise questions to help identify and group (such as how a habitat changes, animals, which materials are slid, liquid or gas, etc.). • Consider their prior knowledge when asking questions. **Y4 Investigating Pitch TAPS** Can write a range of questions inspired by their experiences and their own scientific knowledge, using questions stems independently.	• Independently, makes predictions which are based on scientific knowledge, observations, enquiries or experiences. • With support, make predictions for new values/results by looking for patterns (states of matter, melting, temperature etc).	4
3	**LKS2: Asking relevant questions and using different types of scientific enquiries to answer them.** • Use a range of question stems mostly independently to form questions (is… how are ___ similar and different, how does ____ work). • Raise questions about the world around them and why things happen the way they do (e.g. the role of the roots and stem in nutrition and support, or how rocks are formed). **Y3 Investigating Skeletons TAPS** Asking questions (using sentence stems and adult support) that can be investigated.	• Makes predictions using an "I think… because…" stem independently. • Mostly independently, makes predictions which are based on scientific knowledge, observations, enquiries or experiences.	3
2	**KS1: Asking simple questions and recognising that they can be answered in different ways.** • Ask simple questions using sentence stems to support (Is tin foil waterproof? Is a flame alive? Is a deciduous tree dead in winter? Do seeds grow quicker inside or out?). • Ask more complex questions using questions stems and with adult support (such as what something is, how things are similar and different, the ways things work, which alternative is better, how things change and how they happen). **Y2 Waterproof TAPS** Can ask different questions and recognise that one question can be answered in different ways.	• Makes predictions using an "I think… because…" stem independently. • With support from an adult, draws on knowledge from previous observations to make a prediction. **Y2 Waterproof TAPS** With support from an adult, draws on knowledge from previous observations to make a prediction.	2
1	**KS1: Asking simple questions and recognising that they can be answered in different ways.** • Explore the world around them and begin to raise simple questions using sentence stems. (e.g Is [material] waterproof/strong/rough/etc? Do daisies grow in our school grounds? Do frogs live in our pond area? etc.) **Y1 Reflection Test TAPS** Can recognise that questions can be answered by testing our ideas. Able to ask yes and no questions to sort and classify.	• Makes predictions using an "I think… because…" stem with support – these may be guesses.	1
FS	Shows curiosity about objects, events and people. Questions why things happen. Asks questions to clarify their understanding of and aspects of their familiar world (place they live or natural world).	• Makes predictions when exploring new things (this can be a guess).	FS

Disciplinary Knowledge Ladders – Planning/Setting Up Enquiries

6

UKS2: Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

- Children can mostly independently recognise the equipment needed to carry out an enquiry.
- Children can mostly independently plan an enquiry independently using the post-it note planning format.
- Children can plan a fair test enquiry by choosing one dependent variable (measure) and independent variable (change).
- Decide whether they need to increase the sample size for validity in pattern seeking enquiries.

Y6 Egg Strength/Bulb Brightness TAPS

Children can use the post it note planning format to plan an enquiry.
Can identify a range of variables which may affect their investigation and plan to control them.

5

UKS2: Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

- Children can mostly independently plan an enquiry using the post-it note planning format.
- Can identify independent (change) and dependent (measure) variables when investigating how temperature (independent) affects dissolving speed (dependent).
- Begin to control variables in an enquiry.
- Choose appropriate scientific enquiry approaches to answer questions.

Y5 Paper Planes TAPS

Begin to identify variables that need to be controlled in order keep an enquiry fair during a fair test using the post it note planning format.

4

LKS2: Using different types of scientific enquiries to answer them [questions].
LKS2: Setting up simple practical enquiries, comparative and fair tests.

- Aided by the teacher, can decide on appropriate enquiry approaches to answer questions.
- Follow a plan to carry out observations and tests.
- Can choose equipment from a pre-given selection to perform enquiries.
- Understand there are different things that can be measured/observed and changed in an enquiry.

Y4 Drying Materials TAPS

Use post it note planning approach with more independence to identify things to be changed and things to be measured/observed (no mention of variables).
Can set up a simple enquiry.

3

LKS2: Using different types of scientific enquiries to answer them [questions].
LKS2: Setting up simple practical enquiries, comparative and fair tests.

- Perform a range of scientific enquiry types.
- Follow basic instructions (may be scaffolded by the teacher) to conduct enquiries.
- Children plan enquiries together using a shared post-it note planning frame.
- Understand there are different things that can be measured/observed and changed in an enquiry (no mention of variables).

Y3 Magnet Tests TAPS

Children can use the post-it note planning approach as a whole class, answering questions about what could be changed and measured/observed (no mention of variables).

2

KS1: Performing simple tests

- Experience different types of enquiry including observing over time, pattern seeking, identifying and grouping, research and comparative/fair testing.
- Perform simple enquiries with more independence, including comparative tests about the properties of materials.

Y2 Rocket Mice TAPS

Can use a simple planning frame (question, equipment and method) to plan an enquiry as a class.
Within the planning frame can suggest equipment they may need for the test and the steps that may need to be followed.

1

KS1: Performing simple tests

- Experience different types of enquiry including observing over time, pattern seeking, identifying and grouping, research and comparative/fair testing.
- Perform simple enquiries guided by the teacher, including comparative tests about the properties of materials.

Y1 Floating and Sinking TAPS

Use practical resources provided by the teacher.
Can carry out simple enquiries guided by the teacher.

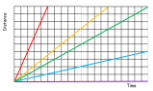
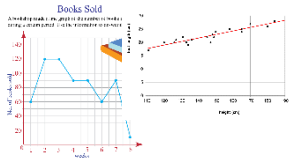
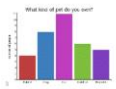
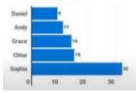
FS

Find ways to solve problems/find new ways to do things.
Test out their ideas.
Take risk through trial and error.
Engage in open-ended activities.
Choose resources needed for an activity from the learning environment.

Disciplinary Knowledge – Observing and Measuring

	Observation	Measurement	
6	**UKS2: Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.**		
	• Select appropriate equipment to make observations – magnifying glasses, digital microscope. • Children can make decisions mostly independently to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time). **Y6 Conductive Dough TAPS** Observe systematically and trouble shoot/problem solve is something is not working.	• Select appropriate equipment to measure and give precise results and explain the advantages and disadvantages (e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale). • Can record measurements to 2dp and use the correct units of measurement. • Children can make decisions mostly independently to: take repeat readings (fair testing); increase the sample size (pattern seeking); adjust the observation period and frequency (observing over time); or check further secondary sources (researching).	6
5	**UKS2: Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.**		
	• Observe and compare the life cycles of plants and animals in their local environment with other plants and animals around the world, as well as changes over a period of time. (e.g. animals, changes of states, dissolving etc) and discuss their observations.	• Can take repeat measurements where appropriate. • Select appropriate equipment to measure and give precise results (e.g. ruler, tape measure or trundle wheel, force meter with a suitable scale). • Can record measurements to 2dp and use the correct units of measurement most of the time. **Y5 Growth Survey TAPS** Select measuring equipment to give most precise results e.g., ruler, tape measure, trundle wheels, force metres with suitable scales. Take repeat measurements where appropriate.	5
4	**LKS2: Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.** **LKS2: Gathering…data in a variety of ways to help in answering questions**		
	• Make systematic and careful observations to identify plants and animals in their habitats and how the habitat changes throughout the year, and how materials change state. • Observe closely processes like changes of state. • Observe differences, similarities or changes related to simple scientific ideas or processes.	• Uses a range of equipment to measure length, time, temperature and capacity (thermometers, rulers, measuring jugs, stopwatch etc), recording up to 1dp where appropriate and using different units of measurement. • Use data loggers/apps to record sound in decibels and notice patterns. • Begin to gather repeat readings to increase accuracy, for example when melting. **Y4 Measuring Temperature TAPS** Use thermometers to measure temperature. Can record measurements to 1 dp.	4
3	**LKS2: Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.** • Make careful observations over time, such as stages of plant lifecycles. • Observe how water is transported in plants. • Observe patterns in the way magnets behave in relation to each other. • Can make observations using magnifying glasses, digital microscopes, etc.	**LKS2: Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.** • Uses a range of equipment to measure length, time, temperature and capacity and use different units of measurements. • Begin to use a range of scales – jumps of 2, 5, 10. • Can read digital measurements from apps and data loggers. **Y3 Measuring Plants TAPS** Measuring length using a ruler, giving measurements in mm and/or cm. Measuring volume using a jug, giving measurements in ml or cl.	3
2	**KS1: Observing closely, using simple equipment.** • Can identify a variety of plants and animals using observations. • Use their observations to suggest answers to questions. • Use video and first-hand observations to observe how different animals grow, how materials respond to stimuli, etc. • Use observations to compare things, e.g. best materials for a… **Y2 Plant Growth TAPS** Use technology (iPads and Seesaw) to document observations over time, adding voice or written annotations. Observe how different plants grow and record findings including similar plants at different stages of growth and notice similarities and differences.	**KS1: Observing closely, using simple equipment.** • Can use rulers, scales, thermometers and measuring vessels with some degree of accuracy to measure and compare length, height and capacity. • Can use non-standard units (like blocks). • Can use standard units with support (cm, m, g, kg, l). **Y2 Plant Growth TAPS** Use standard (cm, m) or non-standard units (like blocks) to estimate measure length, height, and capacity.	2
1	**KS1: Observing closely, using simple equipment.** Uses appropriate senses and some equipment such as magnifying glasses to make observations. With help and prompting, observe changes over time and can describe the changes, like with seasons and plants. Can identify and group, compare and contrast using observations, video and photographs, like documenting seasons over a year.	**KS1: Observing closely, using simple equipment.** • Can compare length visually. • Can use non-standard units (like blocks and string) to measure length, eg plant and height of children, size of feet, etc.	1
FS	Explore the natural world making observations (e.g seasons) Explore different equipment and finding out what its uses are. Observe and describe what they see using everyday language.	Take measurements initially by comparisons then begin to use non-standard units like strings and block with support.	FS

Disciplinary Knowledge – Recording

	Recording	Tables	Sorting	Charts and Graphs	
6	**UKS2: Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.**				
	• Decide how to record and present evidence. • Use scientific diagrams and labels using own scientific vocabulary. • Use technology to document recording. • Present the same data in different ways to help answering the question. **Y6 Shadows TAPS** Record data and results with increasing complexity.	• Can independently record data using a table, including where repeat measurements have been taken.	• Children record classifications using Venn diagrams (including 3 categories), Carroll diagrams and classification keys.	• Can create tally charts, bar charts, line graphs and scatter graphs to present data. **Y6 Shadows TAPS** Can independently collect data and produce scatter and line graphs using various scales and multiple data. 	6
5	**UKS2: Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.**				
	• Decide how to record data from a choice of familiar approaches. • Use scientific diagrams and labels using own scientific vocabulary. • Use technology to document recording.	• Can independently record simple data using a table. • Can use a table to present data where repeat measurements have been taken with support. **Y5 Craters TAPS** Can produce own results table independently.	• Use and develop classification keys and other information records to present the properties of materials. • Classify using Venn diagrams (3 categories), Carroll diagrams and classification keys with minimal support.	Use line or scatter graphs to present data.  **Y5 Craters TAPS** Can produce bar graphs making an independent choice as to an appropriate scale.	5
4	**LKS2: Gather and record data in a variety of ways to help in answering questions.** **LKS2: Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**				
	• Use technology to document recording. • Use scientific diagrams and appropriate labels using own scientific vocabulary.	Can create own tables with own headings.	**Y4 Local Survey TAPS** Can record using classification keys with support. Can use Venn (2 categories) and Carroll diagrams.	Can produce pictograms and bar charts independently to represent discrete data. 	4
3	**LKS2: Gather and record data in a variety of ways to help in answering questions.** **LKS2: Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables**				
	• Use technology to document recording, adding voice recordings. • Use simple diagrams and appropriate labels using own scientific vocabulary.	**Y3 Shadows/Car Ramps TAPS** Can complete a table (with given template) where they add headings and results.	Can use a Venn diagram with 2 sorting criteria and 1 intersecting with support. Begin to use Carroll diagrams.	**Y3 Car Ramps TAPS** Can produce bar charts with support.  	3
2	**KS1: Gathering and recording data to help in answering questions.** **KS1: Identifying and classifying.**				
	• Use simple diagrams and appropriate labels using vocabulary provided by the teacher. • Use technology to document recording - pictures/videos.	**Y2 Woodlice Habitats TAPS** Can record data using a tally chart where the table is prepared and they only add in tallies.	Can sort into 2 groups explaining their reasons clearly and with scientific vocabulary.	Can record using prepared vertical bar charts, only adding bars. Can create pictogram. 	2
1	**KS1: Gathering and recording data to help in answering questions.** **KS1: Identifying and classifying.**				
	Y1 Seasons/Body Parts TAPS Use drawings/take pictures and simple labels to record observations. Use key scientific vocabulary provided by the teacher to label observations.	Can complete a simple, pre-prepared table based on a yes/no response to a criteria.	Can using sorting rings to classify into at least 2 groups and begin to give reasons for their decisions.	Can complete a prepared block graph/pictogram. 	1
FS	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 sort things into at least 2 groups using familiar categories.		FS

Disciplinary Knowledge – Interpreting and Communicating

6	**UKS2: Identifying scientific evidence that has been used to support or refute ideas or arguments.** **UKS2: Reporting findings from enquiries, including conclusions, causal relationships and explanations in oral and written forms such as displays and other presentations.** • Look for patterns and relationships using a suitable sample. • Use results from scientific enquiries to draw conclusions. • Use oral and written forms to report conclusions using appropriate scientific language. • Can spot anomalies and identify results that do not fit the overall pattern. • Use data to refute or support ideas or arguments and answer scientific questions. **Y6 Invertebrate Research TAPS** Use ideas from secondary sources to support their ideas, choosing appropriate websites. Use scientific language and labelled diagrams to discuss, communicate and justify scientific ideas.	6
5	**UKS2: Identifying scientific evidence that has been used to support or refute ideas or arguments.** **UKS2: Reporting findings from enquiries, including conclusions, causal relationships and explanations in oral and written forms such as displays and other presentations.** • Identify patterns in data – e.g dissolving. • Use results from scientific enquiries to draw conclusions and answer scientific questions. • Use oral and written form to report on conclusions using appropriate scientific language. • Can begin to spot anomalies and identify results that do not fit the overall pattern.	5
4	**LKS2: Using straightforward scientific evidence to answer questions or to support their findings** **LKS2: Using results to draw simple conclusions and make predictions for new values.** **LKS2: Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions** • Draws simple conclusions from results to answer questions and support their ideas. • Use oral and written form to report on conclusions, using appropriate scientific language, with support. **Y4 Conductors TAPS** Draw conclusions based on straightforward evidence and current subject knowledge to support their findings. Report on findings orally or in writing using appropriate scientific vocabulary with support.	4
3	**LKS2: Using straightforward scientific evidence to answer questions or to support their findings** **LKS2: Using results to draw simple conclusions and make predictions for new values.** **LKS2: Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions** • Begin to look for naturally occurring patterns and patterns in data. • Able to adjust opinions based on results of enquiries • Can begin to independently draw conclusions from enquiries and answer scientific questions. • Use simple scientific language to discuss their findings. **Y3 Function of the Stem TAPS** Uses findings and results to answer questions. Begins to independently draw conclusions based on observations. **Y3 Rock Reports TAPS** Use simple scientific language to discuss their findings.	3
2	**KS1: Using their observations and ideas to suggest answers to questions.** • Can identify patterns in results. • Refers to the table of results when describing what has happened. **Y2 Nature Spotters TAPS** With support, use simple scientific language to discuss their findings. Draws a basic conclusion (with support from the teacher) using own observations. Uses results of enquires to answer questions.	2
1	**KS1: Using their observations and ideas to suggest answers to questions.** **Y1 Animals Classification TAPS** Can begin to use evidence from simple enquiries when answering questions. With support, begin to notice patterns. Talk about what they have found out and how they found it out.	1
FS	Offer explanations for why things happen- making use of some recently introduced scientific vocabulary which may have been prompted by an adult. Develop own narrative and explain by connecting ideas or events.	FS

Disciplinary Knowledge – Evaluating

6	**UKS2: reporting and presenting findings from enquiries, including degree of trust in results.** Evaluate their choice of method, the control of variables, the precision and accuracy of measurements and credibility of secondary sources. Evaluate how well their enquiry has answered the question and indicates when further observations or tests may be needed. Give an explanation of the degree of trust in their results. **Y6 Fossil Habitats TAPS** Children can describe and evaluate their own and other people's scientific ideas and evaluate evidence obtained from a range of sources.	6
5	**UKS2: reporting and presenting findings from enquiries, including degree of trust in results.** Evaluate their choice of method, the precision and accuracy of measurements and suggest improvements where appropriate. Evaluate, with support, how well variables were controlled during fair tests and how this may impact the degree of trust in results. Evaluate how well their enquiry has answered the question and begin to indicate when further observations or tests may be needed. **Y5 Aquadynamics TAPS** Evaluate different aspects of their enquiries (equipment, control of variables and accuracy of measurements) with prompts from an adult. Use a range of visuals to evaluate aspects of enquiries (equipment, variables, measurements) such as ranking scales, star diagrams including those with negative numbers.	5
4	**LKS2: Using results to … suggest improvements and raise further questions** With support, evaluate their method and equipment using different visuals such as ranking scales, star diagrams and success ladders and then suggest improvements. Consider how well their enquiry answered the original enquiry question. **Y4 Teeth in Liquids TAPS** Can recognise simple reasons why the results of their enquiry do not reflect actual teeth (extrapolation). Use different visuals to evaluate such as ranking scales, star diagrams and success ladders – particularly to rank their confidence that results can be applied to different phenomena (e.g. eggs to teeth).	4
3	**LKS2: Using results to … suggest improvements and raise further questions** Consider if their enquiry answered the original enquiry question. Make basic statements about what worked well about their enquiry. With support, suggest improvements to equipment and method used in an enquiry. Use visuals, with support from an adult, to evaluate the equipment and method used in an enquiry.	3
2	With support, suggest what went well about an enquiry. **Y2 Handspans TAPS** Begin to consider if an enquiry has answered their question.	2
1	With support, consider if an enquiry has answered their question. As a class, suggest what went well about an enquiry.	1
FS	Talk about what I have found and say what worked well. Children can say or indicate by smiley faces/scale if they have achieved the learning objective	FS