

OUR SCIENCE CURRICULUM



Our Assessment Overview linked to detailed adapted Schemes of Work Assessed using triangulated assessment three times a year and against end of year						
Assessment strands	Strand 1	Strand 2	Strand 3	Strand 4	Strand 5	Strand 6
DT 1-2blocked	milepost skills	User and purpose	Design and make	Tools and skills	Safety	Big Ideas
History 1-2blocked	milepost skills	Chronological understanding	Historical depth and knowledge	Historical Enquiry Interpretations of history		Big Ideas
Geography 1-2 blocked	milepost skills	Locational Knowledge	Place Knowledge	Human and physical Geography	Fieldwork and geography skills	Big Ideas Linking concepts across multiple subjects
Art 1-2blocks	milepost skills	Colour Pattern Tone	Technique	Texture and form	Artists and Art from around the world	Big Ideas
Music Ongoing Skills focus	Singing /Play	Listen and appreciation History of music *Key composer knowledge linked to historical periods	Interrelated dimensions Rhythm Pulse Pitch Texture Timbre Dynamics *Chords	Composition and notation	Improvisation	Performance
Science 2-3 Per year	milepost skills	Working scientifically	Biology Anatomy Adaptation Botany	Physics and Chemistry	Materials, states rock and soil formation	Big Ideas
PSHE Ongoing	Changes	Relationships	Differences	Healthy me	Aspirations (dreams and goals)	RSE SEP: 2020
GAMES Ongoing Skills focus	Running /Jumping /Throwing /Catching				Participation and applying skills Competitive games Attack and defence	Health and fitness including mental health and lifestyle choices
GYM/ Dance Ongoing	Movement, pattern Balance		Agility Coordination and flexibility		Personal performance /Group performance Health, Fitness and Lifestyle	
Swim Blocked	Swimming to NC; stand-alone block					
MFL KS2 Ongoing	Oracy		Literacy		Intercultural understanding	
RE Ongoing	Making sense of beliefs			Understanding the impact		Making connections
Computing Ongoing	Computer science online safety			Information technology online safety		Digital Literacy –including online safety
Our curriculum must: - Have International/SMSC/British values dimensions - Be cyclical - Build in first hand experiences - Reinforces the schools values : AFTER - Have a heavy focus on subject specific vocabulary, learning vocabulary (Blooms WoW) and expected vocabulary (related to spelling) Pupil Discussion in groups and 1:1 Because this is how we know our children learn best				Assessment methodology: - Ongoing assessment via short summative low stakes tests/tasks - Focussed practical activities and sequenced activities observed (FPTs) - Cumulative work individual or group piece, including project based on task centric - Collaborative work/Performance/Demonstration 1:1 or group discussion -questioning - Ongoing assessment formative-including home study or targeted observation		

The Importance of Science

Statement of intent:

Our teaching has explicit activities and cross referencing to ensure the National Curriculum is fully met.

Aims and Objectives

Science teaches an understanding of natural phenomena.

- It aims to stimulate a child's curiosity in finding out why things happen in the way they do. It teaches methods of enquiry and investigation to stimulate creative thought.
- Children learn to ask scientific questions and begin to appreciate the way science will affect their future on a personal, national, and global level.

The aims of science are to enable children to:

- ask and answer scientific questions;
- plan and carry out scientific investigations, using equipment, including computers, correctly;
- know and understand the life processes of living things;
- know and understand the physical processes of materials, electricity, light, sound and natural forces;
- know about the nature of the solar system, including the earth;
- evaluate evidence and present their conclusions clearly and accurately.

Science Curriculum Statement of Intent: *Rationale – why this curriculum design?*

- Primarily, we want to be sure the curriculum meets the National Curriculum requirements and from this we have built an enhanced offer that goes beyond the requirements.
- Secondly, the adaptations we have made mean each year group has a set and specific set of objectives that also encompass linked learning, British Values and SMSC.
- Each unit has a precise discussion document that allows us to assess learning at a “micro”, week by week level closely linked to teacher's planning.

At The Valley Primary School, we recognise the importance of Science in every aspect of daily life. We give the teaching and learning of Science the prominence it requires.

The Scientific area of learning is concerned with increasing pupils' knowledge and understanding of our world, and with developing skills associated with Science as a process of enquiry. It will develop the natural curiosity of the child, encourage respect for living organisms and the physical environment and provide opportunities for critical evaluation of evidence.

- 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;
- Be equipped with the scientific knowledge required to understand the uses and implications of Science, today and for the future.
- Develop the essential disciplinary scientific enquiry skills to deepen their scientific knowledge.
- Use a range of methods to communicate their scientific information and present it in a systematic, scientific manner, including I.C.T. diagrams, graphs and charts.
- Develop a respect for the materials and equipment they handle with regard to their own, and other children's safety.
- Develop an enthusiasm and enjoyment of scientific learning and discovery.
- Learning will be direct (discrete) and indirect (linked across the wider curriculum)

The National Curriculum provided a structure and skill development for the science curriculum being taught throughout the school, which is now linked, where possible to the theme topics to provide a creative scheme of work, which reflects a balanced programme of study.

- In Early years, science is taught through the children learning about the world around them in their learning through play.
- Additional opportunities are provided in Science, such Science days for children, Science fairs in school and educational visits linked to the science curriculum, such as visits to local Zoos, parks and areas related to science.
- We endeavour to ensure that the Science curriculum we provide will give children the confidence and motivation to continue to further develop their skills into the next stage of their education and life experiences.

Knowledge is classed as:

- **substantive knowledge** this is referred to as scientific knowledge and conceptual understanding in the national curriculum
- **disciplinary knowledge** (knowledge of how scientific knowledge is generated and grows): this is specified in the 'working scientifically' sections of the national curriculum and it includes knowing how to carry out practical procedures

Disciplinary knowledge: knowing how science establishes knowledge through scientific enquiry taught progressively within Working Scientifically

- Knowledge of methods that scientists use to answer question
- Knowledge of apparatus and techniques, including measurement
- Knowledge of data analysis
- Knowledge of how science uses evidence to develop explanations

Adaptations:

- We felt our curriculum adaptations needed to add specific content knowledge that is more progressive and incremental.
- The additions also added requirements to learn about issues of relevance that we feel **are most significant for our children to learn**, here at The Valley Community School, specific to each unit and each year. These incremental programmes set out precise unit and end of phase teaching elements, with key knowledge to learn.

High quality features of our curriculum

Based on the above, high-quality science education

- The curriculum is planned to build increasingly sophisticated knowledge of the products (substantive knowledge) and practices (disciplinary knowledge) of science.
- Disciplinary knowledge (identified in the 'working scientifically' sections of the national curriculum) comprises knowledge of concepts as well as procedures.
- When pupils develop their disciplinary knowledge, they learn about the diverse ways that science generates and grows knowledge through scientific enquiry. This is not reduced to a single scientific method or taken to mean just data collection.
- The curriculum outlines how disciplinary knowledge advances over time and teaches pupils about the similarities and differences between each science.
- Pupils are not expected to acquire disciplinary knowledge simply as a by-product of taking part in practical activities. Disciplinary knowledge is taught.
- Scientific processes such as observation, classification or identifying variables are always taught in relation to specific substantive knowledge. They are not seen as generalisable skills.

How knowledge is organised in our curriculum:

Principle of "curriculum coherence" knowledge builds on knowledge

- In the early years, pupils are introduced to a wide-ranging vocabulary that categorises and describes the natural world. These words are not too technical but provide the 'seeds' for developing scientific concepts that will be built on in later years.

- Attainment targets, specification points and the EYFS educational programmes are broken down into their component knowledge.
- Substantive knowledge is sequenced so that pupils build their knowledge of important concepts such as photosynthesis, magnetism and substance throughout their time at school.
- Knowledge is sequenced to make the deep structure of the scientific disciplines explicit. This allows teachers and pupils to see how knowledge is connected.
- Disciplinary knowledge is sequenced to take account of:
 - its hierarchical structure
 - the best substantive contexts in which to teach it.
- Once disciplinary knowledge is introduced, it is used and developed in a range of different substantive contexts.
- Planning for progression takes account of what is taught in other subjects. For example, the science curriculum should be coherent with what is taught in mathematics. Where there are differences, these are made explicit to pupils and teachers.

Statement of Implementation

Teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science. Our whole school approach to the teaching and learning of science involves the following;

- There is a vision for science teaching across school that closely allies to broader school vision.
- Science will be taught in planned and arranged topic blocks by the class teacher. This is a strategy to enable the achievement of a greater depth of knowledge.
- Science teaching embraces the wider “Theories of action” used across school and is linked to the teaching toolkit.
- Through our planning, we involve problem solving opportunities that allow children to find out for themselves.
- Children are encouraged to ask their own questions and be given opportunities to use their scientific skills and research to discover the answers. This curiosity is celebrated within the classroom.
- Planning involves teachers creating engaging lessons, often involving high-quality resources to aid understanding of conceptual knowledge.
- Teachers use precise questioning in class to test conceptual knowledge and skills, and assess children regularly to identify those children with gaps in learning, so that all children keep up.
- We build upon the learning and skill development of the previous years. As the children’s knowledge and understanding increases, and they become more proficient in selecting, using scientific equipment, collating and interpreting results, they become increasingly confident in their growing ability to come to conclusions based on real evidence.
- Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children’s school career and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in-keeping with the topics.
- Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills in order to embed scientific understanding.
- Teachers find opportunities to develop children’s understanding of their surroundings by accessing outdoor learning and workshops with experts.

Statement of Impact

- The successful approach results in a fun, engaging, high-quality science education, that provides children with the foundations for understanding the world.
- Our engagement with the local environment ensures that children learn through varied and first hand experiences of the world around them. So much of science lends itself to outdoor learning and so we provide children with opportunities to experience this. Through various workshops, trips and interactions with experts, children have the understanding that science has changed our lives and that it is vital to the world's future prosperity.
- Children learn the possibilities for careers in science as a result of our community links and connection with national agencies and secondary school links.
- Pupil voice is used to further develop the Science curriculum, through questioning of pupil's views and attitudes to Science to support the children's enjoyment of science and to motivate learners.
- Pupils and families appreciate the cultural capital of STEM subjects and these are often the favourite chosen career routes for our families for both boys and girls.

EXAMPLE : Monitoring forms

We use monitoring forms for each of the twenty one Science topics between Y1 - 6. These are an excellent tool to see how embedded the pupils' learning is. Here is Y1's 'Green fingers' as an example.

Overview of end of Year 1 Expectations : Example of end of Unit review	
Specific Area of Review Science "Green fingers"	
Previous learning from EYFS Substantive Knowledge: Humans share the world with plants and animals. Plants and animals are living things. Plants and animals change over time (link to seasonal changes – leaves falling off trees and new growth etc). Know that plants generally grow from seeds or bulbs planted in the ground.	
Stakeholder Views: Green fingers General: observe, equipment, identify, sort, investigate, group, Compare, test, fair, record, results Specific to unit: Evergreen, stem, petal, root, leaves, flower, seed, fruit, trunk, branches, tree, deciduous, bulb.	
NC – Plants	Topic – Green fingers
Pupils should be taught: names of a variety of common wild and garden plants, including deciduous and evergreen trees. Substantive Knowledge - Name common flowering plants (daisy, sunflower, tulip, rose, pansy) - Name common plant types (tree, bush, flowering plant, grass) Common misconceptions to address: - All trees lose leaves in Autumn. - A leaf is a type of plant in itself. basic structure of a variety of common flowering plants, including trees. Substantive Knowledge - Recognise the general structure of a flowering plant (roots, stem, leaves, flowers) - Recognise the general structure of a tree (roots, trunk, branches, leaves, flowers) Common misconceptions to address: - All trees lose leaves in autumn. - A flower is the whole plant.	
NC Year 1 and 2 NC - Working scientifically: Disciplinary During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: - asking simple questions and recognising that they can be answered in different ways - observing closely, using simple equipment - performing simple tests - identifying and classifying - using their observations and ideas to suggest answers to questions - gathering and recording data to help in answering questions	

The Valley Science Map

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
YEAR 1	Super Humans NC - Animals, including humans	Super Humans NC - Animals, including humans	NC - Seasonal change	Green Fingers NC – Plants	Green Fingers NC – Plants	All Dressed Up NC - Everyday materials
YEAR 2	What's it Made of? NC - Uses of everyday materials	What's it Made of? NC - Uses of everyday materials	How Are You? NC - Animals, including humans	How Are You? NC - Animals, including humans	Flowers and Insects NC – Plants NC - Living things and their habitats	Flowers and Insects NC – Plants NC - Living things and their habitats
YEAR 3	How Humans Work NC - Animals, including humans	Bright Sparks NC – Electricity (year 4)	NC - Light	Active Planet NC – Rocks	NC - Forces and magnets	Let's Plant It NC – Plants
YEAR 4	Turn it Up NC – Sound	Save the World NC - Living things and their habitats	Shake It NC - States of matter	Shake It NC - States of matter	Nature of Life NC - Living things and their habitats	Nature of Life NC - Living things and their habitats
YEAR 5	Science consolidation. NC - Properties and changes of materials	NC - Properties and changes of materials	Existing... Endangered...Extinct NC - Living things and their habitats	Fascinating Forces NC – Forces	Space Explorers NC - Earth and space	Space Explorers NC - Earth and space
YEAR 6	Full Power NC – Electricity	Out of Africa NC - Evolution and inheritance	Look Hear! NC – Light	Look Hear! NC – Light	NC - Animals including humans	NC - Animals including humans

The Valley Science Progression Map

EYFS yearly overview

	Autumn 1	Autumn 2	Spring1	Spring 2	Summer 1	Summer 2
Little Learners	Marvellous me!	No place like home	Food, glorious food!	Amazing animals	Come outside!	Let's pretend
	       	   	   	   	   	   
Nursery	Fantastic families, Fabulous ME!	Local heroes and Superheroes	Our Wonderful World	Let's go on an adventure	If you go down to the woods	All creatures great and small
	   	   	   	   	   	   
Reception	Our place in space	Fantasy and fairy tales	Dinosaur dig	Superheroes	Explorers	Pirates
	   	   	   	   	   	   
Year 1	From A to B	The Magic Toymaker	People and the Past	Super Humans	Green Fingers	All Dressed up
	   	   	   	   	   	   

Geography	History	Science – Human body	Expressive Arts	Science – healthy living	Science – living things	The World

LL Understanding the world Science enquiry led learning (see Treasure baskets)	Seasonal change - Autumn Using our senses Our bodies Growth and change (humans)	Seasonal change - Autumn Light and Dark	Seasonal change - Winter Using our senses Food & healthy choices Changing states of matter – snow and ice	Growing - Spring Changing states of matter – melting chocolate (for nests)	Seasonal change - Summer Growth and decay	Seasonal change - Summer Growth and decay
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Little Learners science vocabulary

Little Learners Understanding the world Science Senses – see, hear, touch, smell, taste, look enquiry led learning (see Treasure baskets)	Seasonal change leaves Autumn Brown, orange My Body – Head, nose, mouth, eye, ear, hair, cheeks, tongue Chest, neck, shoulder, back, bottom Arm, elbow, hand, thumb, finger Leg, knee, foot, toe Oral health Clean, brush	Seasonal change Autumn sunny Windy Cold cloudy States of matter Water, ice Oral health Clean, brush	Seasonal change Winter, snow, ice, cold States of matter Ice, water	Seasonal change Spring, blossom States of matter melting (chocolate) Farm animals As above Planting, growth & change Seeds, bulbs, leaves, roots Dig, plant	Seasonal change Summer Warm hot Life cycles Change Egg, caterpillar, cocoon, butterfly	Seasonal change Summer Living things water sunshine soil Flower, bees Jungle safari animals Elephants giraffe zebra lion tiger Healthy lifestyles Sun hat Sun cream
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NURSERY Understanding the world Science enquiry led learning (see Treasure baskets)	Seasonal change - Autumn	Seasonal change - Autumn Changing states of matter – steaming up the mirror	Seasonal change - Winter Changing states of matter – snow and ice	Seasonal change - Spring Growth and decay Changing states of matter – Magical mud	Seasonal change - Summer Growth and decay	Seasonal change- Summer Growth and decay

Nursery science vocabulary

Understanding the world Science <u>Common vocab in each term</u> Senses – see, hear, touch, smell, taste Look Sort Explore Name enquiry led learning (see Treasure baskets)	Seasonal change	Seasonal change	Seasonal change	Seasonal change	Seasonal change	Seasonal change
	leaves Autumn Brown, orange, green My Body Face hair toe mouth eyes nose ear tongue Head, shoulders, knees, toes, tummy, back, arms, legs, elbows Oral health Clean, brush, plaque, decay, filling	Autumn Dark(er) Weather Windy Cold cloudy States of matter Water, ice Oral health Clean, brush, plaque, decay, filling	Winter, snow, ice, cold States of matter Ice, water Melt Freeze Changes over time Colder Darker	Spring, blossom Lighter warmer States of matter melting (chocolate) Farm animals As above Planting, growth & change Seeds, bulbs, leaves, roots Dig, plant	Summer Warm hot Life cycles Change Egg, caterpillar, cocoon, butterfly	Summer Living things Food water sunshine soil Flower, pollen, fruit, bees Jungle safari animals Elephants giraffe zebra lion tiger Healthy lifestyles Sun hat Sun cream Sun safe

RECEPTION Understanding the world Science enquiry led learning (see Treasure baskets)	Seasonal change – Autumn (leads into Y1 Seasonal changes)	Seasonal change – Autumn (leads into Y1 Seasonal changes)	Seasonal change – Winter (leads into Y1 Seasonal changes)	Seasonal change- Spring (leads into Y1 Seasonal changes)	Seasonal change – Summer (leads into Y1 Seasonal changes)	Seasonal change – Summer (leads into Y1 Seasonal changes)
	Space (leads into Y1 Seasonal changes)	Changing states of matter – Chippy Breath (by Michael Rosen) (leads into Y1 All dressed up)	Changing states of matter – Ice experiment (leads into Y1 All dressed up)	Changing states of matter – melting chocolate (leads into Y1 All dressed up)	Changing states of matter – Bartholomew & the Oobleck (Dr Seuss) (leads into Y1 All dressed up)	Living things (leads into Y1 Green fingers)
		British wildlife (leads into Y2 Flowers and Insects)	Changes over time (leads into Y1 Seasonal changes)	Healthy lifestyles (leads into Y2 How are you?)	Jungle and safari animals and their habitats (leads into y1 Super Humans and Y2 Flowers and Insects)	Growing & harvesting (leads into Y1 Green fingers)
		Oral health (leads into Y2 How are you?)		Planting, growth & change (leads into Y1 Green fingers)	Life cycles (leads into Y2 Flowers and Insects/How are you?)	Sorting and classifying (leads into Y1 Working scientifically)

Reception science vocabulary

UTW SCIENCE <u>Common vocab in each term</u> Senses – see, hear, touch, smell, taste Observe, compare, test, investigate Identify,	Seasonal change leaves Autumn Fall Space Moon stars sun sky earth planet	Seasonal change Autumn Dark(er) States of matter Liquid gas steam British wildlife Squirrel rabbit mole otter mouse frog habitat	Seasonal change Winter, snow, ice States of matter Ice water Melt Freeze Solid, liquid Changes over time	Seasonal change Spring, blossom Lighter warmer States of matter melting (chocolate) solid, liquid Healthy lifestyles	Seasonal change Summer Warm hot States of matter Experiment Jungle safari animals habitats Elephants giraffe zebra lion tiger, carnivore, herbivore	Seasonal change Summer Living things Food water sunshine soil Flower, pollen, fruit Healthy lifestyles Sun Protection
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sort/Group/Classify Pattern Research		Oral health Clean, brush, plaque, decay	Colder Darker Carnivore, herbivore	Exercise, healthy, diet, grow, change, senses, Sugar, fat Planting, growth & change Seeds, shoots, seedlings, leaves, roots, buds	Life cycles Change Egg, caterpillar, cocoon, butterfly	
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The Valley EYFS Science Progression Map	
<u>Disciplinary Knowledge:</u>	Children can: ask simple <u>questions</u> about the world around them ask teachers or adults within school about things they <u>observe</u> make <u>observations</u> about things they see around them conduct guided <u>investigations</u> with supervision make choices when performing simple <u>identifying and classifying</u> make some <u>comparison</u> between objects or living things make some <u>predictions</u> about living things based on prior knowledge make <u>suggestions</u> about how things work based on their own <u>observations</u> use basic <u>observations</u> to help answer questions with help from the teacher <u>explore</u> the natural world around them, making observations and drawing pictures of plants and animals identify some <u>similarities and differences</u> between the natural world around them and <u>contrasting environments</u>, drawing on their experiences and what has been read in class

EYFS	FOCUS – LIVING THINGS – investigating PLANTS caring for our ENVIRONMENT (ECOLOGY) THEMES: LL – Food glorious food LL – Amazing Animals LL – Come outside! LL – Let’s pretend N – Our wonderful world N – Let’s go on an adventure N – If you go down to the woods R – Superheroes R - Explorers Pupils should be taught: Substantive Knowledge: • <i>To know what is healthy and not healthy</i> • <i>Understand reduce, reuse, recycle</i> • <i>Know we need to care for the natural environment and all living things</i> • <i>Know what plants need to grow</i> • <i>Similarities and differences in relation to settings/environments</i> • <i>Understand their part in looking after the environment</i> • <i>Names parts of a plant –leaf, stem, stalk, roots</i> • <i>How to care for growing plants</i> • <i>Similarities and differences in relation to plants</i> • <i>Talk about similarities and differences between habitats</i> <i>Common Misconceptions to address:</i> • <i>Plants are not alive</i> • <i>Trees, grass, weeds and vegetables are not plants</i> • <i>Leaves take in water</i>
EYFS	FOCUS - Understand some sense of themselves and their place in the world around them (being human) THEMES: LL Marvellous Me! N - Fantastic families, Fabulous ME! R - Our place in space R - Superheroes Pupils should be taught: Substantive Knowledge: • <i>We are human</i> • <i>Some of us are boys and some are girls</i> • <i>Name some parts of the body (head, eyes, nose, mouth, ears, neck, shoulder, arms, hands, fingers, chest, tummy/belly, bottom, legs, knees, feet, toes)</i>

	• Know we need food, drink and sleep. • identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense <i>Common Misconceptions to address:</i> • Our “body” is just our torso. • mixing up elbows/shoulders/knees • All animals are born from eggs • Humans/Birds/fish aren’t animals
EYFS	FOCUS: Plants and Animals - Recognise that humans share the world with animals and plants and these can change over time. THEMES: LL – Amazing Animals LL – Come Outside! N – If you go down to the woods N – All creatures great and small R - Our place in space R – Superheroes R – Pirates (stages of change for a caterpillar) Substantive Knowledge: • Humans share the world with plants and animals. • Plants and animals are living things • Plants and animals change over time (link to seasonal changes – leaves falling off trees and new growth etc). • Know that plants generally grow from seeds or bulbs planted in the ground. • Name some animals and types of animals (eg insects/minibeasts) • Talk about the life cycle of a butterfly • Know general classifications of some animals eg farm animals, zoo animals, pets <i>Common Misconceptions to address:</i> • All animals live together eg tigers on a farm • All animals are born from eggs • Humans/Birds/fish aren’t animals
EYFS	FOCUS - Understand that not all objects are made from the same MATERIALS (also see D&T curriculum) THEMES: N – Our wonderful world R – Dinosaurs (states of matter ice/melting) R – Superheroes (states of matter solid/liquid) Pupils should be taught: Substantive Knowledge: • A material is what something is made from. • Objects can be made from different things. • Name some common materials (wood, brick, stone, glass, plastic, metal, cotton) <i>Common Misconceptions to address:</i>

	- Everything is made from the same thing. - Clothes are made from "material"	
EYFS	FOCUS – changes in the natural world inc Seasonal changes Also taught daily in basic skills THEMES: LL – No place like home N – Our wonderful world R – Dinosaurs (comparing) R – Explorers (similarities and differences) Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. Substantive Knowledge: - Identify features of day and night - Recognise the Sun and moon. Seasons: - The year is separated into four seasons. - Winter is cold. - Spring is getting warmer. - Summer is hot. - Autumn gets cooler. - Christmas is in Winter. - Easter is in Spring - Spring is associated with new life. - Leaves fall off many trees in Autumn - Some animals hibernate over Winter – link to squirrels hiding nuts. - We wear different clothes at different times of year. Changing States - Some solids melt when they get warm (ice, chocolate, cheese) - If you heat water up in a kettle it creates steam. - If liquid is frozen it becomes solid <i>Common Misconceptions to address:</i> - Moon only comes out at night. - It always snows in Winter - It can only snow in Winter - All solids can melt (eg wood burns) - Steam is different to water – it is water as a gas	
EYFS	FOCUS – Processes and change Also taught daily in basic skills THEMES: LL – No place like home N – Our wonderful world R – Dinosaurs (comparing)	

R – Explorers (similarities and differences)

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

Substantive Knowledge:

- Identify features of day and night
- Recognise the Sun and moon.

Seasons:

- The year is separated into four seasons.
- Winter is cold.
- Summer is hot.
- Christmas is in Winter.
- Easter is in Spring
- Leaves fall off many trees in Autumn
- We wear different clothes at different times of year.
- Spring is getting warmer.
- Autumn gets cooler.
- Spring is associated with new life.
- Some animals hibernate over Winter – link to squirrels hiding nuts.

Changing States

- Some solids melt when they get warm (ice, chocolate, cheese)
- If you heat water up in a kettle it creates steam.
- If liquid is frozen it becomes solid

Recognise that weather and temperature is not always the same.

Substantive Knowledge:

- See above – seasons.
- There are different types of weather.
- Know about and be able to describe simply: rain, snow, sun, wind, cloudy.
- Know generally in which seasons it rains more and in which it is sunnier.
- Know generally in which seasons it is cooler and in which it is warmer.
- Understand connection between weather and temperature: eg sunnier usually hotter, wind and rain usually colder.
- Know that rainbows can appear when it is rainy and sunny.

Common Misconceptions to address:

- It is always hot in Summer
- It is always cold in Winter
- It always snows in Winter
- It can only snow in Winter
- Rainbows always appear when it rains

THEME:

N – Local heroes and Superheroes

N – Our wonderful world

Understand electricity exists and can be dangerous.

Substantive Knowledge:

- Electricity is what makes many things work – be able to name some.
- Know not to play with plug sockets.
- Identify plugs and plug sockets are linked to electricity.
- Understand electricity can be dangerous.
- Lightning is electricity.

Common Misconceptions to address:

- Plugs are safe.
- Lightning is the sound
- Lightning is “made of light”

FOCUS: Sun safety

THEME:

LL- Come outside!

N – Our Wonderful world

R – Our place in space

R - Superheroes

Understand the sun can be dangerous.

Substantive Knowledge:

- The sun produces heat and light
- It is dangerous to look at the sun because it can hurt your eyes.
- It is dangerous to be out in the sun too long as it can burn your skin
- Sun cream is good protection for skin
- Sunglasses are protection for eyes
- A cap can protect the eyes and face.

Common Misconceptions to address:

- The Sun isn't hot in Winter.
- If it isn't very hot, you can't get sunburn.
- Sun cream means you can't get burnt.
- sunglasses mean your eyes can't be hurt by the sun

EYFS progression map in accordance with Key Stage 1 and 2

	Little Learners	Nursery	Reception
Animals inc humans	Marvellous me! Food glorious food Amazing animals	Fantastic families, fabulous me! Local heroes and superheroes If you go down to the woods All creatures great and small	Fantasy and fairy tales Dinosaurs Superheroes Explorers Pirates
Plants	Let's pretend	Let's go on an adventure	Superheroes
LT a t habitats	Amazing animals Come outside!	Our wonderful world If you go down to the woods	Explorers
Evolution/inheritance			
Seasonal changes	No place like home (aut) Food glorious food (wint) Come outside! (spr) Let's pretend (sum)	Local heroes and superheroes (aut) Our wonderful world (wint) If you go down to the woods (spr) All creatures great and small (sum)	Fantasy and fairy tales (aut) Dinosaurs (wint) Explorers (spr) Pirates (sum)
Forces			
Light	No place like home		Our place in space
Sound			
Earth and space			Our place in space
Electricity			
Materials			Dinosaurs (melting ice) Superheroes (melting choc) Pirates

The Valley Science Progression Map KS1/2

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals Inc Humans	S Humans	How are you?	HH Work			Animals I H
Plants	Green fingers	F and I	Let's plant it			
LTat Habitats		F and I		NoL/StW	Ex...En...Ex	
Evolution/Inheritance						Out of Africa
Seasonal Changes	SC					
Forces			Magnets		Forces	
Light			Light			Look hear
Sound				Turn it up		
Earth and Space					Space	
Electricity			Bright sparks			Full power
Materials	All dressed up	WiMo?	Active planet	Shake it	PaCoM	

Year 1

NC – Plants

Topic – Green fingers

Previous learning from EYFS

Substantive Knowledge:

- Humans share the world with plants and animals.
- Plants and animals are living things.
- Plants and animals change over time (link to seasonal changes – leaves falling off trees and new growth etc).
- Know that plants generally grow from seeds or bulbs planted in the ground.

Pupils should be taught:

names of a variety of common wild and garden plants, including deciduous and evergreen trees.

Substantive Knowledge

- Name common flowering plants (daisy, sunflower, tulip, rose, pansy)
- Name common plant types (tree, bush, flowering plant, grass)

Common misconceptions to address:

- All trees lose leaves in Autumn.
- A leaf is a type of plant in itself.

basic structure of a variety of common flowering plants, including trees.

Substantive Knowledge

- Recognise the general structure of a flowering plant (roots, stem, leaves, flowers)

	- Recognise the general structure of a tree (roots, trunk, branches, leaves, flowers) Common misconceptions to address: - All trees lose leaves in autumn. - A flower is the whole plant.
Vocabulary	Green fingers General: observe, equipment, identify, sort, investigate, group, Compare, test, fair, record, results Specific to unit: Evergreen, stem, petal, root, leaves, flower, seed, fruit, trunk, branches, tree, deciduous, bulb
Disciplinary	<u>Comparative/fair testing</u> Conditions a plant needs to grow
Year 1	Previous learning from EYFS Substantive Knowledge: - Humans share the world with plants and animals. - Plants and animals are living things. - Animals change over time (link to seasonal changes – leaves falling off trees and new growth etc). - Name some animals and types of animals (eg insects/minibeasts) - Talk about the life cycle of a butterfly - Know general classifications of some animals eg farm animals, zoo animals, pets NC - Animals, including humans Topic – Super Humans Pupils should be taught: - identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense Substantive Knowledge: - Name a variety of main body parts (head, shoulders, chest, arms, legs, “belly”-stomach, feet, hands, knee, elbow, bottom, back - Sight = eyes, Hearing = ears, Smell = nose, Taste = tongue, Touch = skin Common Misconceptions to address: - You use your hands to touch – any part of your skin can sense touch. - You use your mouth to taste – only the tongue has taste buds. names of a variety of common animals including fish, amphibians, reptiles, birds and mammals. Substantive Knowledge: - Names of common animal groups (fish, amphibians, reptiles, birds, insects, arachnids and mammals) - Names of individual common animals, native and otherwise (eg Native - dog, cat, horse, cow, chicken, frog, fly, goldfish, spider. Non-native – monkey, snake, elephant, lion, bear) - Humans are animals – mammals Common Misconceptions to address: - humans are not animals - spiders are insects

	names of a variety of common animals that are carnivores, herbivores and omnivores Substantive Knowledge: - Can explain the meaning of carnivore, herbivore and omnivore. - Names examples of carnivores (eg wolf, cat, lion) - Names examples of herbivores (eg chicken, rabbit, snail) - Names examples of omnivores (eg human, fox, bears) Common Misconceptions to address: - Whales/dolphins are fish (They are mammals) - dogs/bears/foxes are carnivores - Anything with sharp teeth must be a carnivore. - Vegetarians or vegans are herbivores (this is a choice, not a biological truth)
Vocabulary	Super Humans General: observe, growth, changes, similarities, differences, patterns Specific to unit: sense, hearing, taste, touch, humans, carnivore, herbivore, omnivore
Disciplinary	<u>Identifying, grouping and classifying</u> Investigating the waste of an animal – carnivore, herbivore or omnivore
Year 1	Previous learning from EYFS Substantive Knowledge: - A material is what something is made from. - Objects can be made from different things. - Name some common materials (wood, brick, stone, glass, plastic, metal, cotton) NC - Everyday materials Topic – All Dressed Up Pupils should be taught: there is a difference between an object and the material from which it is made. Substantive Knowledge: - object = item or thing, material= what the thing is made from. Common Misconceptions to address: - Material is “what clothes are made from.” “Material” is the name of a material – “This is made of material.” names of a variety of everyday materials. Substantive Knowledge: - Be able to name wood, plastic, glass, metal, cotton, brick, water, and rock as materials. Common Misconceptions to address: - All metals are the same - All rocks are the same simple physical properties of a variety of everyday materials.

	- Months in each season. - Temperature changes across the seasons (link to EYFS learning) - Leaves fall off deciduous trees in Autumn. - New life in Spring (plants and animals) - Changes in appropriate clothing - Important days in each season (Christmas, Easter, Bonfire Night, Midsummer, Midwinter) Common Misconceptions to address: - All plants lose their leaves in Autumn/Winter – not true. - No flowering plants can survive in Winter (snowdrops, pansies) observe and describe weather associated with the seasons and how day length varies Substantive Knowledge: - As we move from Winter to Summer, days get longer and nights get shorter. Weather becomes warmer. - As we move from Summer to Winter, days get shorter and nights get longer. Weather becomes colder. - Seasons are linked to the Earth moving around the Sun. Common Misconceptions to address: Seasons are linked to the Earth turning around/spinning
Vocabulary	Seasons: spring, summer, autumn, winter, seasonal change. Weather: e.g. sun, rain, snow, sleet, frost, ice, fog, cloud, hot/warm, cold, storm, wind, thunder, weather forecast. Day length: night, day, daylight.

Year 2	NC – Plants Pupils should be taught: how seeds and bulbs grow into mature plants. Substantive Knowledge: - Show the stages of growth of a typical plant (seed, germination, roots, seedling, stem, leaves, flower, seed dispersal) Common Misconceptions to address: - all flowers grow from seeds. - The plant grows up first, then roots. plants need water, light and a suitable temperature to grow and stay healthy. Substantive Knowledge: - Identify plants need water, light and a suitable temperature to grow and stay healthy. Common Misconceptions to address: - Temperature doesn't matter. - Plants need soil to grow. - Plants won't grow at all without light. - Plants can grow with no water.	Topic – Flowers and Insects
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Vocabulary	Flowers and Insects General: investigation, observation, measurement, prediction Specific to unit: habitat, insect, bulb, conditions, germination, food chain
Disciplinary	<u>Comparative/fair testing</u> Germinating/growth of beans – conditions to grow healthy
Year 2	NC - Animals, including humans Topic – How are you? Pupils should be taught: animals, including humans, have offspring which grow into adults. Substantive Knowledge: - Understand animals reproduce - Live birth (mammals) - Many animals lay eggs (birds, fish, reptiles, amphibians, insects, arachnids) - Names of common young (baby, child, lamb, piglet, puppy, kitten, foal, calf, chick, snakelet, spiderling, larvae) Common Misconceptions to address: - Humans aren't animals (revisit this misconception from previous year) - mammals don't have eggs at all – all internal. - All animal young are like small adults (insect larvae, tadpoles) basic needs of animals, including humans, for survival (water, food and air) Substantive Knowledge: - Animals need oxygen to survive. - Animals need water and food to survive. Common Misconceptions to address: - Fish don't need air – they take it in through their gills. - Aquatic mammals (dolphins, whales) must come to the surface to breathe – hence the blowholes. - Fish etc don't drink water because they live in it. importance for humans of exercise, eating the right amounts of different types of food, and hygiene. Substantive Knowledge: - Understand exercise is important to be healthy - Understand a balanced diet is important to be healthy - Understand sleep is important to be healthy - Understand good hygiene (washing hands before food/drink, brushing teeth, cleaning self regularly, avoiding spread of germs) is important to be healthy Common Misconceptions to address: - Unhealthy means “fat” – slim people can be unhealthy too. - Exercise on its own will keep you slim. - Eating only fruit and veg is a healthy diet. - You can eat lots of unhealthy food as long as you have some veg as well. - Sleep doesn't affect your health.

	- You only need to wash your hands before you eat. "Diet" means being "on a diet" structure of a variety of common animals. Substantive Knowledge: - Most common animals have a skeleton. - Generally, adult animals have 0, 2, 4, 6 or 8 limbs - Insects have a head, thorax abdomen Common Misconceptions to address: - all animals have a skeleton (jellyfish) - Fish don't have a skeleton. - All animals have legs (snake, worm) - humans/monkeys have 2 limbs – discuss difference between legs and limb
Vocabulary	How Are You? General: Investigation, classify Specific to unit: animals, humans, basic needs, exercise, diet, offspring
Disciplinary	<u>Observation over time/Pattern seeking</u> Exercise impact on heart rate (Discovery Dog – panting pup)
Year 2	Previous learning from EYFS Substantive Knowledge: - To know what is healthy and not healthy - Understand reduce, reuse, recycle - Know we need to care for the natural environment and all living things - Know what plants need to grow - Similarities and differences in relation to settings/environments - Understand their part in looking after the environment - Names parts of a plant –leaf, stem, stalk, roots - How to care for growing plants - Similarities and differences in relation to plants - Talk about similarities and differences between habitats NC - Living things and their habitats Topic – Flowers and Insects Pupils should be taught: differences between things that are living, dead, and things that have never been alive. Substantive Knowledge: - Recognise the features of living things (MRS GREN – Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion, Nutrition) - Identify that a dead plant or animal used to be alive. Recognise things which have never been alive. Common Misconceptions to address: - Rocks etc are "dead" because they aren't alive. - Plants don't move – plants can move towards the sun (show time-lapse video)

	names of a variety of plants and animals in their habitats, including micro-habitats. Substantive Knowledge: - Understand the difference between a habitat and micro-habitat. - Identify a variety of plants and animals which live in given habitats. - Identify a variety of plants and animals which live in given micro-habitats. Common Misconceptions to address: - A habitat refers to where animals live, not plants. - A plant can't be a habitat (a tree/bush is also an example of a micro-habitat) most living things live in habitats to which they are suited and different habitats provide for the basic needs of different kinds of animals and plants, and they depend on each other. Substantive Knowledge: - Identify a variety of habitats (forest, grassland, desert etc) - Identify a variety of plants and animals which live in given habitats. - Recognise ways in which animals/plants are suited to their habitats (frogs are good swimmers, camels store fat, monkeys have feet they can use to climb) Common Misconceptions to address: - a desert is hot (Note – no rain; Antarctic also desert), - Camels store water – actually fat how animals obtain their food from plants and other animals, using the idea of a simple food chain, and different sources of food. Substantive Knowledge: - A Producer starts every food chain. It is always a plant. - All animals are consumers. - Animals which eat other animals are predators. Animals eaten by other animals are prey. - An animal can be both predator and prey (eg fox) - An animal with no predators is an apex predator. - The arrows in a food chain show “is eaten by”. - Identify/create a food chain with at least three links. Common Misconceptions to address: - Arrows show what the animal eats. - Plants can't be consumers (Venus fly trap) - An animal is either predator or prey but not both.
Vocabulary	Flowers and Insects General: investigation, observation, measurement, prediction Specific to unit: habitat, insect, bulb, conditions, germination, food chain
Year 2	NC - Uses of everyday materials Topic – What's it made of? Pupils should be taught: suitability of a variety of everyday materials for particular uses.

	Substantive Knowledge • identify what materials certain items are made from. • Explain why items are made from given materials – eg. walls made of bricks as they are strong, hard, heavy etc. • Explain why certain materials would be unsuitable for given items – eg teapot made of chocolate unsuitable because the chocolate would melt. Common misconceptions to address: • Mix up items/materials/ properties shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Substantive Knowledge • Solids do not change shape on their own. • A force must be applied to change the shape of a solid. • Solids can be squashed, bent, twisted or stretched. • Different solids may take a different amount of force to change shape. Common misconceptions to address: • “squishing” • solids can change shape on their own • If we can't apply enough force it can't be done (eg iron bar – we couldn't bend it but a machine could). •
Vocabulary	Key Vocabulary What's It Made Of? General: investigation, classify Specific to unit: material, elasticity, absorbent, waterproof, natural, man-made, opaque, transparent
Disciplinary	<u>Observation over time</u> Changes in state (Discovery Dog)
NC - Working scientifically	During years 1 and 2, Pupils should be taught use the following practical scientific methods, processes and skills through the teaching of the programme of study content: • asking simple questions and recognising that they can be answered in different ways • observing closely, using simple equipment • performing simple tests • identifying and classifying • using their observations and ideas to suggest answers to questions • gathering and recording data to help in answering questions

	Substantive Knowledge: - Water is taken into plants by the root. - Water is transported up the stem to the rest of the plant. - Some water evaporates from the leaves. Common Misconceptions to address: - The stem is only for support “It just holds up the plant” - The roots are only to anchor the plant. - A plant uses all of the water it takes in. what part flowers play in the life cycle of flowering plants Substantive Knowledge: - Recognise the flower is linked to reproduction in plants. - Plants produce seeds to reproduce. - Name and explain function of parts of flower (petal – attract, stamen (filament/anther) – male: pollen, carpel (ovary, style, stigma) – female: receive pollen. - Pollination – insects and birds going to different flowers carry pollen and fertilise the other. - Some flowers can self-pollinate (peanut, orchid, peas, sunflowers). - Seed dispersal – wind, animals, water, explosion Common Misconceptions to address: - The idea of a “mummy and daddy flower” - seeds grow near the parent plant
Vocabulary	Key Vocabulary Let’s Plant It General: investigate, transport, classify, environment Specific to unit: nutrients, pollination, seed formation, seed dispersal, stem / trunk, flower
Disciplinary	<u>Comparative/fair testing/Observation over time</u> Water transportation in plants – will they change colour? Investigating and monitoring growing conditions of plants
Year 3	NC - Animals, including humans Topic – How humans work Pupils should be taught: 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. Substantive Knowledge: - Animals, including humans, get nutrition from what we eat. - Animals cannot make their own food. - We need the right type of nutrition (carnivores, herbivores, omnivores) - Omnivores (eg humans) need a balanced diet. Common Misconceptions to address: - Humans “make” their own food – this means create food within the body, not the way we make a sandwich etc. humans and some other animals have skeletons and muscles for support, protection and movement. Substantive Knowledge:

- Humans and some other animals have skeletons.
- Difference between vertebrates and invertebrates.
- Endoskeletons are inside the body (with examples eg humans)
- Exoskeletons are outside the body (with examples eg tortoise)
- Skeletons and muscles support the body – keep it in shape.
- Skeletons and muscles protect the organs – know which, eg ribs protect heart and lungs.
- Skeletons and muscles are used in movement – note: learn about how muscles pull the bones and work in pairs.

Common Misconceptions to address:

- All animals have skeletons.
- Skeletons are always inside the body.
- Skeletons can move without help.
- Muscles can push or pull – they only pull but work in pairs.
- May be some misconceptions about where organs are in the body

simple functions of the basic parts of the digestive system in humans.

Substantive Knowledge:

- Parts of the digestive system – mouth, oesophagus, liver, stomach, pancreas, small intestine, large intestine, rectum, anus
- Basic understanding of the job of each part.
- mouth – teeth break down food and mix with enzymes in saliva.
- oesophagus – thin tube connecting mouth to stomach.
- liver – releases bile into intestines. Bile breaks down lipids.
- stomach – muscular bag mixes food and drink with acid.
- pancreas – releases enzymes into the intestines, which break down carbohydrate, proteins and lipids.
- small intestine – proteins, carbohydrate, and lipids digest. Nutrients absorbed into the blood.
- Large intestine – food which can't be broken down (mainly fibre) passes into here. Water absorbed into the blood.
- Rectum – undigested food is stored here as faeces.
- anus – opening where faeces leave the body.

Common Misconceptions to address:

- nutrients only pass into the blood from the stomach.
- no food is digested in the mouth.

different types of teeth in humans and their simple functions.

Substantive Knowledge:

- There are different types of teeth in the mouth with different jobs.
- Teeth have an enamel coat which is hard and strong.
- Incisors – bite off and chew food.
- Canines – for ripping and tearing food
- Molars – for crushing and grinding food.

Common Misconceptions to address:

- Teeth are all the same.

	variety of food chains, identifying producers, predators and prey. Substantive Knowledge: • How to build a food chain. • Arrows show “eaten by” or transfer of energy. • producers are plants – they produce their own food. • prey is the name for animals which are eaten by others. • predators are animals which eat other animals. • an animal can be both predator and prey – eg a fox. • an apex predator is a predator which is not eaten by any other animals. Common Misconceptions to address: • the arrows show what something eats.
Vocabulary	Key Vocabulary How Humans Work General: grouping, exercise, oxygen, carbon dioxide Specific to unit: circulation, digestive system, hydration, green producer, molar, canine, incisors, nutrition
Disciplinary	Observing over time digestive system experiment/demonstration
Year 3	NC – Rocks Topic - Active planet Pupils should be taught: different kinds of rocks can be grouped together on the basis of their appearance and simple physical properties. Substantive Knowledge • Recognise not all rocks are the same. • Recognise rocks look different. • Recognise rocks can have different properties. Common misconceptions to address: • All rocks are hard. • All rocks are heavy. fossils are formed when things that have lived are trapped within rock Substantive Knowledge • Fossils are caused by dead animals/plants. • Dead matter is trapped within rock and compressed over thousands/millions of years. • Dead matter rots/decays and the imprint is left behind. • Fossil casts can be created by pouring plaster into the space left by dead matter. Common misconceptions to address: • Fossils are always the actual remains of the living thing. soils are made from rocks and organic matter. Substantive Knowledge

	• Soil is made from broken down rock & organic matter. • Soil is formed over time. Common misconceptions to address: • Soil is something completely different to rock/organic matter. "It's just dirt."
Vocabulary	Key Vocabulary Active Planet Specific to unit: impressionism, tonal key, impasto, pointillism, General: representational, colour tone
Disciplinary	Observing over time Rocks: permeable rock experiment
Year 3	NC – Electricity Topic – Bright Sparks Pupils should be taught: names of common appliances that run on electricity. Substantive Knowledge: • Name a variety of common appliances using electricity (kettle, microwave, clock, shower, toaster etc) Common Misconceptions to address: • some appliances children may not realise use electricity – eg showers names of basic parts of simple circuits. Substantive Knowledge: • A circuit is a path for electricity. • A component is a part of a circuit. • A cell is the power source. • a battery is more than one cell together. • wires connect components. • bulb is a component that gives out light. • buzzer is a component which gives out sound. • A motor is a component which produces movement. • A switch is a component which can make or break a circuit. Common Misconceptions to address: • a cell is a battery. 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. Substantive Knowledge • identify a circuit must be a complete loop with a cell/battery to work. Common misconceptions to address: • a bulb will light as long as both sides of the bulb are connected. a switch opens and closes a circuit and determines whether or not a lamp lights in a simple series circuit.

	Substantive Knowledge • A switch can be open or closed. • An open switch breaks the circuit. • A closed switch completes the surface. • open: off – closed: on Common misconceptions to address: • closed = off. some common conductors and insulators, and metals are good conductors. Substantive Knowledge • a conductor is a material electricity can travel through. • an insulator is a material electricity can't travel through. • Identify some conductors (metal, graphite etc) • Metals are particularly good conductors, which is why wires are made from metal. • Identify some insulators (wood, plastic etc) Common misconceptions to address: • electricity can travel through anything. • electricity can only travel through metal
Vocabulary	Key Vocabulary Bright Sparks General: investigate, appliance, Specific to unit: circuit, switch, conduct, insulate, electricity, complete, incomplete
Disciplinary	<u>Identifying, grouping and classifying</u> Conductors and insulators – all different materials Circuit building (cross curricular with DT to use in an electronic game)
Year 3	NC – Light taught additionally during the year (light touch as covered again in Y6). Pupils should be taught: we need light in order to see things and that dark is the absence of light. Substantive Knowledge: • Light is created by a light source. • Light is required to see. • Darkness is the absence of light. Common Misconceptions to address: • Darkness is a “thing” as opposed to the absence of light. • The moon is a light source. • Reflective surfaces (eg high-vis) are light sources. light is reflected from surfaces. Substantive Knowledge: • Light is reflected off surfaces. We see when the light is reflected into our eyes.

	Common Misconceptions to address: • The moon is a light source. • Reflective surfaces (eg high-vis jackets) are light sources. • “Reflective surface” means mirror. light from the sun can be dangerous and that there are ways to protect their eyes. Substantive Knowledge: • The Sun is a light source. • The Sun is so bright it can harm our eyes. • Other bright lights can harm our eyes. • We can protect our eyes (sunglasses, shade, coloured lenses). Common Misconceptions to address: • If you look directly at the sun for even a second you will go immediately blind. • You can only harm your eyes by looking directly at the sun (reflection in highly reflective surfaces can also harm, as can other light sources) • If you wear sunglasses you can stare directly at the sun for as long as you want. • Wearing sun cream will protect your eyes. shadows are formed when the light from a light source is blocked by an opaque object. Substantive Knowledge: • Shadows are formed when light is blocked. • Shadows can change size and shape. Common Misconceptions to address: • You can run away from your shadow. • Transparent objects can’t have a shadow (eg glass windows – they do cast a very, very pale shadow) there are patterns in the way that the size of shadows change. Substantive Knowledge: • Shadows can change size and shape. • The closer the light source to the object, the bigger the shadow, and vice versa. • The angle of the light source to the object will change the shape of a shadow. Common Misconceptions to address: • Shadows are always the same size. • Shadows are always the same shape. • Only big things can have big shadows.
Vocabulary	• Light and seeing: dark, absence of light, light source, illuminate, visible, shadow, translucent, energy, block. • Light sources: e.g. candle, torch, fire, lantern, lightning. • Reflective light: reflect, reflection, surface, ray, scatter, reverse, beam, angle, mirror, moon, opaque, transparent, sunlight, sun.
Disciplinary	Pattern seeking Light: Reflection of surfaces experiment

NC - Forces and magnets**taught additionally during the year**

things move differently on different surfaces.

Substantive Knowledge:

- Recognise that items move differently on different surfaces.
- Understand the concept of friction.
- Recognise friction as a pulling force – pulls against movement.
- Predict how an item will move on a given surface eg. ice/ gravel.
- Recognise friction can create heat.

Common Misconceptions to address:

- Friction can make things go faster – lack of friction.

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

Substantive Knowledge

- Know forces as a push or pull.
- Recognise that most forces are a push or pull between two objects through contact.
- Recognise magnetism acts at a distance.

Common misconceptions to address:

- All forces are a push.
- All forces need contact.

magnets have two poles.

Substantive Knowledge

- Magnets have two poles – North and South.

two magnets will attract or repel each other, depending on which poles are facing.

Substantive Knowledge

- Magnets can attract and repel.
- Like poles (S/S, N/N) repel
- Opposite poles (S/N) attract.

Common misconceptions to address:

- Like poles attract.
- Definition of repel – some children think if it doesn't attract something (eg wood) it repels it – not true, it just has no effect.

some materials are attracted by magnets and others are not.

Substantive Knowledge

- Magnets can attract materials or have no effect on them.
- Magnets only attract metals.
- Magnets do not attract all metals.

	- Identify whether a material is magnetic or not. Common misconceptions to address: - Magnets attract all metals. - Definition of repel – some children think if it doesn't attract something (eg wood) it repels it – not true, it just has no effect
Vocabulary	Magnets: magnetic, magnetic field, magnetic force, bar magnet, horseshoe magnet, ring magnet, magnetic poles (north pole, south pole), attract, repel, compass. Magnetic and non-magnetic materials: e.g. iron, nickel, cobalt.
Disciplinary	<u>Comparative/fair testing</u> Magnets investigation - magnetic or not?

Year 4	NC - Living things and their habitats Topic – Nature of life Pupils should be taught: living things can be grouped in a variety of ways. Substantive Knowledge - Living things have characteristics by which they can be grouped. - Identify some characteristic of each of main living thing types. - Main types of living thing are: reptile, mammal, amphibian, bird, fish, insect, arachnid, plant Common misconceptions to address: - spiders are insects. classification keys can help group, identify and names of a variety of living things in their local and wider environment Substantive Knowledge: - We would use a classification key when we see an animals which we are unsure of. Common Misconceptions to address: - Classification keys are the only way to classify animals. NC - Living things and their habitats Topic – Save the world environments can change and that this can sometimes pose dangers to living things. Substantive Knowledge: - Environments can change. - Humans can affect the environment. - Environment changes can affect plants and animals living there. - Environment change can be dangerous for living things. Common Misconceptions to address: - Only humans can cause environment change. - Littering is harmless because it's "only one piece"
Vocabulary	Key Vocabulary Nature of Life (Food chains and animal classification) General: survive Specific to unit: Habitat classification adaptation food chain food web life cycle living non living

Disciplinary	<u>Observation over time/Pattern seeking</u> Tadpoles – how does temperature affect the lifecycle <u>Comparative/fair testing</u> Stick insects favourite food
Year 4	NC - States of matter Topic – Shake it Pupils should be taught: materials can be grouped together, according to whether they are solids, liquids or gases. Substantive Knowledge: • All materials are solid, liquid or gas. • Solids have a rigid particle structure, with particles packed close together. A solid cannot be poured. • Liquids have a fluid particle structure with particles further apart which will fill a container from the bottom. Liquids can be poured. • Gases have a very fluid particle structure with particles which expand to fill a container. Gases can be poured but will expand into the space. Common Misconceptions to address: • salt etc are not solid because they can be poured. some materials change state when they are heated or cooled, at different temperatures in degrees Celsius (°C) Substantive Knowledge: • Adding or reducing heat can change the state of an object. • solids can be melted into liquid. • liquids evaporate into gas • gas condenses into liquid. • liquid freezes into a solid. • Different materials change state at different temperatures. Common Misconceptions to address: • All materials have the same freezing/ boiling points. • All materials change state this way (eg wood burns, doesn't melt.) evaporation and condensation plays a part in the water cycle and the rate of evaporation is affected by temperature. Substantive Knowledge: • water on Earth is all part of the water cycle. • evaporation cause water to become gas and rise into the air. • condensation creates clouds. • When the clouds are heavy enough, the water falls as rain. • When the temperature is warmer, water evaporates faster. Common Misconceptions to address: • clouds aren't made from water. • rain is different to the water in streams/ seas. • water evaporates at the same speed whatever the temperature. • Water only evaporates when the weather is 100oC

	everyday materials can be grouped together on the basis of their properties. Substantive Knowledge: - Group a variety of materials independently based on properties such as hardness, waterproof, density etc. Common Misconceptions to address: - certain materials all have same properties eg rocks all hard, metals all solid. reasons for the particular uses of everyday materials for specific products, including metals, wood and plastic Substantive Knowledge: - Identify, using properties, why given materials are used for specific products. Common Misconceptions to address: - metals are always solid (look at mercury use in thermometers)
Vocabulary	Key Vocabulary Shake It (materials) General: material properties particles temperature Specific to unit: evaporation condensation state
Disciplinary	<u>Comparative/fair testing</u> Water cycle in a bag (separating materials)
Year 4	NC – Sound Topic – Turn it up Pupils should be taught: how sounds are made, associated with something vibrating. Substantive Knowledge: - Sound is caused by vibration Common Misconceptions to address: - Sound is caused by impact vibrations from sounds travel through a medium to the ear Substantive Knowledge: - Sound travels via vibration. - Sound can travel through gas, liquid or solid media. Common Misconceptions to address: - Sound only travels through air. there are patterns between the pitch of a sound and features of the object that produced it. Substantive Knowledge: - Pitch (high/low) is determined by the speed of the vibrations. - Pitch is affected by the features of the vibrating object.

	Common Misconceptions to address: - Pitch/volume mixed up. there are patterns between the volume of a sound and the strength of the vibrations that produced it. Substantive Knowledge: - Volume (loud/quiet) is determined by the strength of the vibrations. - Louder sounds are created by stronger vibrations. Common Misconceptions to address: - Pitch/volume mixed up. sounds get fainter as the distance from the sound source increases. Substantive Knowledge: - Sound dissipates over distance. - Sound gets fainter as it moves further from its source. Common Misconceptions to address: - Sound is as fast as light.
Vocabulary	Key Vocabulary Turn it up (Sound) General: predict fair test variable constant Specific to unit: pitch volume vibration sound wave
Disciplinary	<u>Comparative/fair testing/Research</u> Changing pitch and volume of stringed and percussion
NC - Working scientifically	During Y3 and 4, pupils should be taught use the following practical scientific methods, processes and skills through the teaching of the programme of study content: - asking relevant questions and using different types of scientific enquiries to answer them - setting up simple practical enquiries, comparative and fair tests - making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers - gathering, recording, classifying and presenting data in a variety of ways to help in answering questions - recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables - reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions - using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions - identifying differences, similarities or changes related to simple scientific ideas and processes - using straightforward scientific evidence to answer questions or to support their findings.

Working scientifically – incremental steps	<u>LKS2 Plan</u>	<u>Do</u>	<u>Record</u>	<u>Review</u>
	a start to raise their own relevant questions about the world around them in response to a range of scientific experiences; b start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; c recognise when a fair test is necessary; d help decide how to set up a fair test, making decisions about what observations to make, how long to make them for and the type of simple equipment that might be used.	a make systematic and careful observations; b observe changes over time; c use a range of equipment, including thermometers and data loggers; d ask their own questions about what they observe; e where appropriate, take accurate measurements using standard units using a range of equipment; f set up and carry out simple comparative and fair tests; g talk about criteria for grouping, sorting and classifying; h group and classify things.	a collect data from their own observations and measurements; b present data in a variety of ways to help in answering questions; c use, read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge; d record findings using scientific language, drawings, labelled diagrams, keys, bar charts and tables.	a draw simple conclusions from their results; b make predictions; c suggest improvements to investigations; d raise further questions which could be investigated; e first talk about, and then go on to write about, what they have found out; f report and present their results and conclusions to others in written and oral forms with increasing confidence; g make links between their own science results and other scientific evidence; h identify similarities, differences, patterns and changes relating to simple scientific ideas and processes; i use straightforward scientific evidence to answer questions or support their findings; j recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations.

Year 5	NC - Living things and their habitats Topic – Existing, Endangered, Extinct Pupils should be taught: 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. Substantive Knowledge: - Living things have different characteristics (nocturnal, plant, animal, herbivore, winged, predators etc) - Plants and animals are two main groups but there are other living things that do not fit into these groups e.g. micro-organisms such as bacteria and yeast, and toadstools and mushrooms. - Plants can make their own food whereas animals cannot. - Animals can be divided into two main groups: those that have backbones (vertebrates); and those that do not (invertebrates). - Vertebrates can be divided into eight small groups: fish; amphibians; reptiles; birds; insects; arachnids; crustaceans and mammals. - Each group has common characteristics. - Invertebrates can be divided into a number of groups, including insects, spiders, snails and worms. - Plants can be divided broadly into two main groups: flowering plants; and non-flowering plants. Common Misconceptions to address: - All plants flower. - spiders are insects. - All birds fly.
Vocabulary	Reproduction: gestation, metamorphosis, tuber, runners/side branches, plantlet, cuttings, embryo, adolescent, egg, pregnancy, gestation, life cycle, pollination, offspring

Disciplinary	<u>Identifying, grouping and classifying</u> Classifying sweets <u>Observation over time</u> Moldy bread – different environments
Year 5	NC - Properties and changes of materials taught additionally during the year Pupils should be taught: some materials will dissolve in liquid to form a solution, and how to recover a substance from a solution. Substantive Knowledge: • Some materials dissolve in liquid to form a solution. • Dissolving is a reversible change. • Substances can be recovered from a solution. Common Misconceptions to address: • Substances “disappear” in a liquid. • Once a substance has dissolved it is gone forever. mixtures might be separated (eg by filtering, sieving and evaporating) Substantive Knowledge: • A mixture can be separated. Common Misconceptions to address: • A mixture of very small things is impossible to separate dissolving, mixing and changes of state are reversible changes. Substantive Knowledge: • Dissolving, mixing and changes of state are reversible changes. • Understand a reversible change means the original material can be retrieved. • Reversible changes are a physical change Common Misconceptions to address: • The original material will look exactly the same – eg sugar crystals. 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. Substantive Knowledge: • Irreversible change forms new materials. • Irreversible changes are a chemical change. • Understand an irreversible change means the original is gone forever. • Recognise burning is irreversible. Common Misconceptions to address:

	• smoke is not a material – note carbon
Vocabulary	• Properties of materials: thermal conductor/insulator, magnetism, electrical resistance, transparency. • Mixtures and solutions: dissolving, substance, soluble, insoluble. • Changes of materials: reversible change, physical change, irreversible change, chemical change, burning, new material, product. • Separating: sieving, filtering, magnetic attraction.
Disciplinary	<u>Identifying, grouping and classifying</u> Testing materials for different properties
Year 5	NC - Earth and space Topic – Space Explorers Pupils should be taught: the movement of the Earth, and other planets, relative to the Sun in the solar system. Substantive Knowledge: • The names and order of the planets (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto-note “dwarf planet”) • The relative sizes of the planets. • Different types of planets (rock, gas giants, dwarf planets) • General facts – eg Saturn’s rings. • Earth and the other planets orbit the sun. • One orbit of the sun is known as a year. • Earth’s year is 365 days, 6 hours, 9 minutes and 10 seconds (a sidereal year). The extra hours are made up every 4 years as an extra day – A Leap Year. • The planets take different times to orbit the sun (length of a “year” is different). • The orbits of the planets are different shapes and none are exactly circular. Common Misconceptions to address: • The Sun goes around the Earth. • Orbits are circular. • Planets are evenly spaced out. • Orbits are all parallel • A year is the same for all planets. • All planets are made of rock. Sun, Earth and Moon are approximately spherical bodies. Substantive Knowledge: • Sun, Earth and Moon are approximately spherical. • None of them are exact spheres. Common Misconceptions to address: • They are exact spheres the movement of the Moon relative to the Earth. Substantive Knowledge: • Understand that the Moon orbits the Earth. • The Moon’s orbit is approx. 28 days which is approx. one month

	Common Misconceptions to address: • The moon orbits the Sun. • The Moon's orbit is one month (each month is different) • The Moon is the only moon –other planets have many moons. the Earth's rotation explains day and night and the apparent movement of the sun across the sky. Substantive Knowledge: • The Earth turns on its axis. • Earth takes approx. 24 hours (23 hours, 56 mins – called the sidereal period) to spin on its axis. • The axis is the reason for the seasons – when tilted away from the Sun, it is Winter, towards the Sun is Summer. Also explains shift in length of day/night. Common Misconceptions to address: • Earth is straight up – North Pole perfectly on top, South Pole perfectly on bottom. • Sun goes round the Earth. • The Earth spins slower in Summer/Winter so the day/night is longer.
Vocabulary	Key Vocabulary Space Explorers General: investigate, approximate, equipment, conclude, observe Specific to unit: rotate, orbit, day/night, seasons/year, planet, moon, solar system (and names of planets), star, tilt
Year 5	NC – Forces Topic - Forces Pupils should be taught: unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. Substantive Knowledge: • Forces are a push or a pull. • Gravity is a pulling force produced by the Earth. • Gravity pulls towards the centre of the Earth. • All objects have gravity, but an object has to be truly massive to allow the gravity to have an effect. Common Misconceptions to address: • Gravity pulls “down” – it pulls towards the centre of the Earth, • Gravity only exists on Earth. air resistance, water resistance and friction all have an effect when they act between moving surfaces. Substantive Knowledge: • Air resistance acts when something moves through the air. • Water resistance acts when something moves through water. • Friction acts when something moves against a solid. • Air resistance, water resistance and friction are all pulling forces. Common Misconceptions to address: • There is no resistance moving through the air.

	some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. Substantive Knowledge: - Basic knowledge of what levers, pulleys and gears are and how they work. - The longer the lever, the less force needed to move the object. Common Misconceptions to address: - If you apply the force close to the object it will have greater effect (use eg of door – we push further from the hinges to make it easier).
Vocabulary	Key Vocabulary Fascinating Forces General: investigate, fair test, predict, evaluate, measure, variable/constant Specific to unit: force, friction, push/pull, air/water resistance, gravity, mass/weight, Newton, pulley, gear
Disciplinary	<u>Comparative/fair testing/Problem solving</u> Friction of stair-lip at school

Year 6	NC - Animals including humans taught additionally during the year Pupils should be taught: changes as humans develop to old age. Substantive Knowledge: - Baby – toddler – child – teenager – adult – old age - Babies feed only on milk and then smooth food. Toddlers begin to eat solid food. - Children go through puberty as they move into teenage years. - Puberty also means both sexes produce lots of hormones which can affect mood and behaviour. - As we reach old age, our bodies don't work as well. We become more vulnerable to disease and injury. - Some people may shrink in old age. Common Misconceptions to address: - All people reach old age. - babies can eat food. - Teenagers are moody for no reason. - We get bigger as we get older (note – stay at full adult height until old age shrinkage). - Children can become pregnant (not until puberty begins). - It is possible to live forever if you don't get ill. names of the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood Substantive Knowledge: - heart is a pump. It is made up of 4 chambers (ventricles and atria) - Arteries carry oxygenated blood from the heart to the muscles and organs. - Veins carry deoxygenated blood back from the muscles and organs to the heart. - Capillaries are tiny vessels which cover a large area of muscles and organs to allow oxygen to easily diffuse from the blood to where it is needed. - Blood contains red blood cells, white blood cells, plasma and platelets. - Red blood cells carry oxygen around the body - White blood cells work to fight disease and illness - Plasma is made up of water and protein and carries the blood cells and platelets around the body
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- Platelets help to stop bleeding when you are cut.

Common Misconceptions to address:

- Blood is blue when it is deoxygenated – not true: blood is always red (it is a deeper, darker red when deoxygenated and hence looks bluer on skin surface)

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

Substantive Knowledge:

- Diet is the most important factor in weight.
- A healthy, balanced diet will ensure your body is at its most efficient.
- Short term effects of exercise: increased heart rate, stronger pumps, increased breathing speed and depth, increased heat, sweat.
- Long term effects of exercise: slower, more efficient heart, larger heart, greater lung capacity, more efficient lungs, muscle growth, mental health benefits.
- Effects of drugs on body – look at alcohol, general illegal drugs
- Effect of lifestyle – look at smoking, drinking, laziness, overeating compared to healthy lifestyle.

Common Misconceptions to address:

- “one won’t hurt” – Stress that the choice to have one can be the first step to addiction
- Exercise means immediate growth – stress long term benefits
- Lots of exercise means being huge and muscular – develop understanding of “fitness” over muscle.
- Exercise is more important than diet when it comes to weight.

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

Substantive Knowledge:

- Nutrients and water are transported via the blood.
- Nutrients diffuse into the blood from the stomach & intestines and are transported around the body.
- Waste water is taken to the bladder to be removed.

Common Misconceptions to address:

- Nutrients stay within the digestive system

From Y5 'Living things and their habitats'

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

Substantive Knowledge:

- Mammals life cycle – live birth, child, adult,
- Amphibian – egg birth, tadpole, adult (start in water, end on land)
- Bird – egg, chick, adult
- Insect – egg, larvae, pupa, adult

Common Misconceptions to address:

- Mammals don’t have eggs - internal.
- tadpoles are only baby frogs.

describe the life process of reproduction in some plants and animals.

	• The best suited of animals and plants survive better. • Eventually an adaptation can lead to permanent change in a species (eg peppered moth originally 98% white, 2% dark. After industrial revolution 95.5% black because white ones could no longer hide due to pollution). • Permanent change in a species is known as evolution. • Evolution can take hundreds, thousands, even millions of years. Common misconceptions to address: • God made everything how it is. • Evolution didn't happen because the Bible doesn't contain it
Vocabulary	Key Vocabulary Out of Africa General: classification, process, variables, observation, research, explanation Specific to unit: Adaption, Habitats, Environment, Evolution, fossilisation, sedimentary /palaeontologist/DNA
Disciplinary	<u>Pattern seeking/Problem solving</u> Keep/share evolution decision making
Year 6	NC – Light Topic – Look hear Pupils should be taught: light appears to travel in straight lines. Substantive Knowledge: • Light is created by a light source. • Light moves in straight lines. • Light can be bent. • Light can be split. Common Misconceptions to address: • Light can curve around things on its own. objects are seen because they give out or reflect light into the eye. Substantive Knowledge: • Main parts of the eye (pupil, iris, cornea, retina) • The pupil is where the light enters our eye. • The retina is where the light is received by our eye and the information is then sent to the brain. • Sight is not an “active” sense. • Eyes are “input” organs, not “output” – they receive light and interpret it. They do not actively “see”. Common Misconceptions to address: • Looking at something is an active process. • Eyes output something which helps us to see. we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. Substantive Knowledge: • Light is created by a light source.

	- We see when light enters our eye and is read by the retina. - Light reflects from objects into our eyes, and this is how we see. Common Misconceptions to address: - We see because we “look at” an object. - Squinting your eyes will help you see better. shadows have the same shape as the objects that cast them. Substantive Knowledge: - An object can only cast the shape of itself. - The shape can be stretched or compressed by the angle of the light. - The shape can be made larger or smaller by the distance from the light source. Common Misconceptions to address: - A shadow can only be the same size as the object. - A shape can cast different shaped shadows – the shape can be stretched or change size, but will be the same shape
Vocabulary	Key Vocabulary Look Hear General: measurement, equipment, accuracy, precision, diagrams, amplify Specific to unit: Iris, light-source, retina, reflection, shadow, transparent, translucent, opaque
Disciplinary	<u>Observation over time/Pattern seeking</u> Length and angle of shadows from the sun
Year 6	NC – Electricity Topic – Full power Pupils should be taught: the brightness of a lamp or the volume of a buzzer is affected by the number and voltage of cells used in the circuit. Substantive Knowledge - More/higher voltage cells in a circuit: brighter lamp/louder buzzer etc. - Less/lower voltage cells in a circuit: duller lamp/quieter buzzer etc. Common misconceptions to address: - It doesn't matter how many cells there are, “a light is a light” etc know about variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. Substantive Knowledge - As above with cell quantity/ voltage. - A switch will cause components to begin/cease performing. Common misconceptions to address: - A switch is the only way to affect performance of components. recognised symbols for representing a simple circuit in a diagram. Substantive Knowledge: - Use correct symbols for: wire, cell, buzzer, bulb, switch, motor

	- Accurately draw simple circuit diagrams. Common Misconceptions to address: - a cell is a battery – not that a battery is made of multiple cells			
Vocabulary	Key Vocabulary Full Power General: scientist, comparative, cause, accuracy, predictions, equipment Specific to unit: voltage, conductor, circuit, parallel, series, cell, symbol, component			
Disciplinary	Research/Pattern seeking Investigations involving series v parallel circuits			
NC - Working scientifically	During Year 6, Pupils should be taught use the following practical scientific methods, processes and skills through the teaching of the programme of study content: - planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary - taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate - recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs - using test results to make predictions to set up further comparative and fair tests - reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations - identifying scientific evidence that has been used to support or refute ideas or arguments			
Working scientifically – incremental steps	UKS2 Plan - a with growing independence, raise their own relevant questions about the world around them in response to a range of scientific experiences; - b with increasing independence, make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; - c explore and talk about their ideas, raising different kinds of scientific questions; - d ask their own questions about scientific phenomena; - e select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; - f make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; - g plan, set up and carry out comparative and fair tests to answer questions, including recognising and controlling variables where necessary.	Do - a choose the most appropriate equipment to make measurements and explain how to use it accurately; - b take measurements using a range of scientific equipment with increasing accuracy and precision; - c make careful and focused observations; - d know the importance of taking repeat readings and take repeat readings where appropriate; - e independently group, classify and describe living things and materials; - f use, and develop keys and other information records to identify, classify and describe living things and materials.	Record - a decide how to record data from a choice of familiar approaches; - b record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar graphs and line graphs.	Review - a notice patterns; - b draw conclusions based in their data and observations; - c use their scientific knowledge and understanding to explain their findings; - d read, spell and pronounce scientific vocabulary correctly; - e identify patterns that might be found in the natural environment; - f look for different causal relationships in their data; - g discuss the degree of trust they can have in a set of results; - h independently report and present their conclusions to others in oral and written forms; - i use their test results to identify when further tests and observations may be needed; - j use test results to make predictions for further tests; - k use primary and secondary sources evidence to justify ideas; - l identify evidence that refutes or supports their ideas; - m recognise where secondary sources will be most useful to research ideas and begin to separate opinion from fact; - n use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas; - o talk about how scientific ideas have developed over time.

Autumn 1	Autumn 2
Marvellous Me! – My body, senses, growth and change (humans), taking care of me	No Place like home – seasonal change, light and dark
• I can talk about how I have changed since I was a baby. • I can name some body parts • I can explore using my senses • I am beginning to show some independence in self-care	• I can identify light and dark / day and night • I can explore with torches to make different shadows and colours. • I can talk about changes I can see in autumn.
Spring 1	Spring 2
Food Glorious Food – food, healthy choices, tasting, senses, looking after the environment (recycling)	Amazing Animals – naming animals, exploring habitats
• I am beginning to learn what is healthy and not healthy • I am beginning to understand reduce, reuse, recycle • I can talk about changes I can see in winter.	• I am beginning to know how to care for animals. • I am beginning to know I need to care for the natural environment and all living things.
Summer 1	Summer 2
Come Outside! – farm visit, caterpillars to butterflies, contrasting environments	Let's Pretend – growing (Jack and the Beanstalk)
• I am beginning to know where different animals can be found • I know I need to care for the natural environment and all living things. • I am beginning to know some features of a farm • I can talk about changes I can see in spring.	• I can talk about changes I can see in summer. • I am beginning to know what a plant needs to grow

Nursery

Autumn 1	Autumn 2
Fantastic families, Fabulous ME! – Senses, growth and change (humans)	Local Heroes and Superheroes –
• I can talk about how I have changed since I was a baby. • I am beginning to talk about similarities, differences, pattern and change in relation to people. • I can recognise and talk about feelings	• I can talk about different professions that can help us with our safety and health • I can talk about changes I can see in autumn.
Spring 1	Spring 2
Our Wonderful World – comparing and contrast	Let's go on an adventure – growing plants and flowers, naming
• I can talk about similarities and differences in relation to settings • I am beginning to understand my part in looking after the environment • I can talk about changes I can see in winter.	• I can name parts of a plant. • I know how to care for growing plants. • I know some similarities and differences in relation to plants.
Summer 1	Summer 2
If you go down to the woods – farm visit, caterpillars to butterflies, familiar environments	All creatures great and small – life cycles, farm animals
• I know how to care of some animals. • I know I need to care for the natural environment and all living things. • I know some features of our school environment and how they might vary from another (habitat of the week). • I can talk about changes I can see in spring.	• I can talk about similarities and differences in relation to farm animals • I can talk about changes I can see in summer.

Reception

Autumn 1	Autumn 2
Our place in space – space exploration, contrasting environments, starting school feelings	Fantasy and fairy tales – Harvest, oral health
- I can talk about different feelings experienced when starting school - I can name planets in the solar system. - I can explore with torches to make different shadows and colours. - I can talk about famous scientists who are linked to space.	- I can talk about changes I can see in autumn. - I am beginning to talk about how water changes - I can talk about Harvest - I am beginning to know good oral health practices - I can name some British wildlife
Spring 1	Spring 2
Dinosaurs – comparing and grouping,	Superheroes – healthy lifestyles, growing plants, naming
- I can talk about similarities and differences in relation to dinosaurs. - I can name different body parts from dinosaurs. - I can talk about changes I can see in winter. - I can talk about how water changes (ice/melting)	- I can name parts of a plant. - I know how to care for growing plants. - I know some similarities and differences in relation to plants. - I can talk about healthy practices and choices - I can talk about how to melt chocolate (solid/liquid)
Summer 1	Summer 2
Explorers – wild animals, compare and contrast environments	Pirates! – Floating and sinking, caterpillars to butterflies, zoo trip
- I know I need to care for the natural environment and all living things. - I know some animals that are native and non-native to the UK - I can talk about some similarities and differences between environments/habitats - I can talk about changes I can see in spring.	- I can sort objects into those that float and those that sink. - I can create my own floating object. - I can talk about stages of change for a caterpillar - I can talk about changes I can see in summer.

Home learning

Each year group completes a range of home and personal study projects

Literacy links

Linked literacy texts where appropriate: refer to literacy spine and key vocabulary listings

International dimension/British Values/SMSC

International dimension: Learn about the importance of sharing scientific understanding and how scientists can work together from different parts of the globe

British Values: Understanding that scientific “laws”, rules and conventions govern our understanding of the universe-where this is appropriate

SMSC: Experiencing enjoyment and fascination in learning appreciating and valuing the wonders of nature and scientific learning (spiritual). We are a Fairtrade school.

Assessment

All topics begin with a 'Pre-topic Assessment'

All topics completed with an 'End of topic Assessment'

During and after each topic the science lead monitors the learning through triangulation (observation, book scrutiny and pupil voice)

After each topic the class teacher will enter the child's level on 'Educater'

Big linking ideas/Super sevens

Year 1

Big linking ideas: developing environmentally conscious citizenships

- PE: focus on exercise and positive benefits both in terms of health and mental well-being
- Mental well-being: PSHE positive relationships - importance of diet and exercise
- Practised activity mindfulness within PSHE
- Geography A to B: Seasonal change

Super Seven - DT craftsperson/engineers/inventors: Alexander Graham Bell

Super Seven - Scientist: Stephen Hawking

Year 2

Big linking ideas: Developing environmentally conscious citizenships

- Within global work and plant growth pupils should understand their responsibilities to look after and protect the vulnerable whilst securing the planets future by being aware of environmental issues
- PSHE: healthy me-lifecycles and growth
- Importance of hygiene and dental care – exercise and diet
- Offspring and growth
- PE: focus on exercise and positive benefits both in terms of health and mental well-being
- Mental well-being: PSHE positive relationships importance of diet and exercise
- Practised activity mindfulness within PSHE

Super Seven - DT craftsperson/engineers/inventors: Tim Berners Lee

Super Seven - Scientist: Alan Turing

Year 3

Big linking ideas: Developing environmentally conscious citizenships

- Within global work and farming pupils should understand their responsibilities to look after and protect the vulnerable whilst securing the planets future by being aware of environmental issues.
- Importance of farming and soil
- Plant growth, life cycles of flowering plants (farming) functions of plants – water and plants
- Strong Technology link using basic circuitry – developing design criteria – designing solutions to tasks
- PSHE: Healthy me –role of exercise and diet
- PE: focus on exercise and positive benefits both in terms of health and mental well-being
- Mental well-being: PSHE positive relationships importance of diet and exercise
- Practised activity mindfulness within PSHE

Super Seven - DT craftsperson/engineers/inventors: Zaha Hadid

Super Seven - Scientist: Thomas Edison

Year 4

Big linking ideas: Developing environmentally conscious citizenships

- Within global work and rain forest preservation pupils should understand their responsibilities to look after and protect the vulnerable whilst securing the planet's future by being aware of environmental issues - endangered species
- Music Link: Making sounds using musical instruments and change of pitch
- PSHE: Lifecycles
- PE: focus on exercise and positive benefits both in terms of health and mental well-being
- Mental well-being: PSHE positive relationships importance of diet and exercise
- Practised activity mindfulness within PSHE

Super Seven - DT craftsperson/engineers/inventors: Leon Theremin

Super Seven - Scientist: Alfred Russel Wallace

Year 5

Big linking ideas: Developing environmentally conscious citizenships

- Within global work and water pupils should understand their responsibilities to look after and protect the vulnerable whilst securing the planets future by being aware of environmental issues
- PSHE: life changes/aging and need to look after elderly (active citizenship)
- Safety aspect: not to look directly at the sun
- PE: focus on exercise and positive benefits both in terms of health and mental well-being
- Mental well-being: PSHE positive relationships importance of diet and exercise
- Practised activity mindfulness within PSHE

Super Seven - DT craftsperson/engineers/inventors: Katherine Johnson

Super Seven - Scientist: Isaac Newton

Year 6

Big linking ideas: Developing environmentally conscious citizenships

- Pupils should understand that we all evolve from single African based roots, links to PHSE and tolerance
- Within global work and climate change pupils should understand their responsibilities to look after and protect the vulnerable whilst securing the planets future by being aware of environmental issues
- PE: focus on exercise and positive benefits both in terms of health and mental well-being
- Mental well-being: PSHE positive relationships importance of diet and exercise – negatives of drug and alcohol use
- Practised activity mindfulness within PSHE

Super Seven - DT craftsperson/engineers/inventors: Isambard Kingdom Brunel

Super Seven - Scientist: Charles Darwin

Questioning in Science

Based on Bloom's Revised Taxonomy and including Metacognition

Bloom's Taxonomy of cognitive objectives was originally developed in the 1950s by Benjamin Bloom and revised by Anderson and Krathwohl. This resource has been designed to support teachers in developing effective questioning based on these revisions and utilising the 'Knowledge Dimension' as it has been applied to each stage of the taxonomy. Focusing on the acquisition of knowledge recognises the recent Ofsted demand that schools ensure pupils are taught knowledge, as well as skills, in all subjects.

The format also acknowledges metacognition as a proven way to rapidly improve pupils' learning and progress. The Education Endowment Foundation's 'Teaching and Learning Toolkit' states, "Metacognition and self-regulation approaches have consistently high levels of impact..."

The questions in the following pages are designed as a starting point for adults and are provided as examples to be adapted.

Ideally, the pupils will also be involved in asking their own questions and developing an awareness of their own learning, following the principles of metacognition.

Where applicable, the questions are based on the National Curriculum Programme of Study (2014).

The Knowledge Dimension

concrete knowledge		abstract knowledge	
Factual	Conceptual	Procedural	Metacognitive
Knowledge of terminology Knowledge of specific details and elements	Knowledge of classifications and categories Knowledge of principles and generalisations Knowledge of theories and, models and structures	Knowledge of subject-specific skills, techniques and methods Knowledge of when to use appropriate procedures	Strategic knowledge Self-knowledge Knowledge about cognitive tasks including appropriate contextual and conditional knowledge.

"They (*teachers*) use questioning highly effectively and demonstrate understanding of the ways pupils think about subject content. They identify pupils' common misconceptions and act to ensure they are corrected."

"Teachers check pupils' understanding systematically and effectively in lessons, offering clearly directed and timely support."

"Pupils love the challenge of learning and are resilient to failure. They are curious, interested learners who seek out and use new information to develop, consolidate and deepen their knowledge, understanding and skills."

"They (*teachers*) use questioning skilfully to probe pupils' responses and they reshape tasks and explanations so that pupils better understand new concepts. Teachers tackle misconceptions and build on pupils' strengths."

Supplementary subject-specific guidance

The Ofsted subject-specific grade descriptors, that were used for subject survey visits, are still useful for self-evaluation.

For Science the descriptors for Outstanding and Good teaching included these statements:

"Pupils are aided in moving beyond the limits of the National Curriculum...in order to maintain curiosity."

"Answers to pupils' questions are accurate and effective at stimulating further thought." (Outstanding)

"Further discussion is prompted by informed responses to pupils' questions... They are taught how to summarise and present their research as part of developing their literacy and communication skills." (Good)

Questioning in Science	The Knowledge Dimension			
	Factual	Conceptual	Procedural	Metacognitive
Remember	What is this flower called? Can you make a list of different reptiles? What are the ends of the magnet called? Who is the naturalist in the picture?	What is a variable? What is a fossil? Which did we learn about digestion? What happened to the water?	What happened next? What are the steps we follow when carrying out an experiment? What happens to food once it is inside the mouth? Can you remember the next stage in the life cycle?	Is there a way of helping you remember each stage of the process? Can you use an acronym or acrostic to help you? What have you learned about in other science lessons that could help you? Why do scientists make notes and recordings?
Understand	Why does the plant have roots? What is the function of the liver? Can you give me a definition for this scientific word? Why must we be careful when using...?	Can you sort these flowers by size? Why were only some objects attracted to the magnet? Why didn't the feather fall straight downwards? If there were fewer rabbits, what effect	Why should you only change one variable in the experiment? Why is it important to repeat experiments? Can you explain why the days are shorter in winter in this country? How is sedimentary rock formed?	Can you predict the results of the experiment? Why do you think this happened? Can you explain the findings in your own words? What might help you to better understand the

		would this have on the food chain?		movements of the moon and Earth?
Questioning in Science	The Knowledge Dimension			
	Factual	Conceptual	Procedural	Metacognitive
Apply	What do you already know about this plant? Using your research, how can you group the animals? Which scientific words would best describe...? Which observations prove that?	Are there any similarities between...? Can you think of another process like this? When does digestion begin and when does it end? Can you give some advice to the other group?	How do you carry out a fair test? How do you use this equipment accurately? What safety rules do you need to follow? How will you plot the data?	What questions would you ask a scientist? Do you need to adapt a task to fit your preferred learning style? How are you being a scientist? What scientific methods and techniques did you use?
Analyse	What do your results tell you? Were your predictions accurate? How did you check your facts? Did any results surprise you? If so, why?	Why do the rocks have different properties? Which of our 'healthy lifestyle' timetables would you recommend and why? Why was this experiment more reliable? Why did the cress grow better in that location?	What do you think went wrong? Can you explain what must have happened when...? How did that famous scientist carry out their work? What caused the change to occur?	What do you already know about this aspect of science that might be useful? What are the most useful pieces of information? How would finding out more information help you? What motivated the person to become a scientist?

Questioning in Science

	The Knowledge Dimension			
	Factual	Conceptual	Procedural	Metacognitive
Evaluate	Why is that website a reliable source of scientific information? What specific scientific vocabulary best describes this? Why are your results accurate? What information or data is missing?	What influence has that scientist / naturalist had? What are the positive and the negative aspects of selective breeding in dogs? Why is that scientific knowledge of value? Are all the results of the experiment relevant?	Why did you choose this approach? Was this the most reliable way to test your hypothesis? Why is it difficult to replicate some experiments? How would you defend Darwin and Wallace against their critics?	If you were learning about this aspect of science again, what would you do differently and why? What helps you learn in science and why? What do you find most difficult in science lessons and why? Which are the most useful things to remember and why?
Create	Can you prepare an assembly about the importance of cleaning our teeth? Can you produce a ppt about amphibians? Can you provide illustrations for each season of the year? How many objects can you find made of that material?	Who could help you carry out this investigation? How will you convince me the test was fair? Can you compare the data in more than one way? Can you create and illustrate your own scale to measure wind strength?	Can you produce a 'Guide to Carrying Out Experiments' for the younger children? During the day, can you prove the Earth is rotating on its axis by using webcams from around the world's cities? Can you explain the process to a friend? What could change the results of the test and why?	What do you want to learn in this unit of work and why is it useful? Can you select work that demonstrates your learning? How might this scientific knowledge be useful in other subjects? How will you develop your science skills and knowledge next?

Appendix 7: Teaching Modules into practice

From observation and results over time we know that the majority of pupils at The Valley like structure, this creates a degree of *ubiquitous understanding* for “peer coaching” and “supported development” in methods that work. Many of our teaching methods employ a range of teaching modules. However, we do not stifle creativity and consider teaching to be a creative craft not a process of ticking boxes.

Here are our components that we look for in high quality lesson delivery:

High degrees of vocabulary reinforcement

High degree of first hand experiences and enquiry

High degree of structured and scaffolded conversation

Structured recall of prior learning

Our 10 Theories of Action are embedded and evident

Guides to teaching models:

- Comprehend the concept of Models of Teaching
- Understand the various essential elements of Models of Teaching
- Acquire information about various families of Models of Teaching
- See how this applies in a real life context

A model of teaching can be defined as the depiction of teaching and learning environment, including the behaviour of teachers and students, while the lesson is presented through that model.

Models of teaching enable the students to engage in robust, cognitive and social task and teach the student how to use them productively. Models of teaching are the specific instructional plans which are designed according to the concerned learning theories. It provides a comprehensive blue print for curriculum to design instructional materials, planning lessons, teacher pupil roles, supporting aids and so forth. Joyce & Weil (2014) defines A model of teaching is a description of a learning environment, including our behavior as teachers when that model is used, outcome of instruction may be the student’s increased capabilities to learn more easily and effectively in the future. Hence the main aim of models of teaching is to *create powerful learners*.

CHARACTERISTICS OF A GOOD AND BETTER TEACHING MODEL

The following are the chief characteristics of a good teaching model

- Each model has built up based on particular learning theory
- Creation of congenial learning environment in the classroom
- Effective interaction between the teacher and students
- Planned use of appropriate strategies
- Teaching process are systematically, sequentially and logically arranged
- Clear and specified roles for teachers and students
- Large scope for supporting material
- Ensure active participation of entire students in the class
- It raises the students' level of aspiration, motivation and interest in learning
- Every model foster and strengthen the cognitive structure of the student

ELEMENTS OF MODELS OF TEACHING

Element of a model of teaching represent its structure, process and teaching aids of the instruction. A model of teaching consists of syntax, social system, principle of reaction and support system. The detailed descriptions are as follows.

Syntax

It is the steps or phases of the model being presented before the class. It illustrates the logical and sequential order of the teacher student activities of the instruction procedure. It describes the complete programme of action of the model.

Social system

Social system of a model explains its nature of learning environment. It describes the role and relationship of the teacher and students through the phases as well as designing the lesson. As each and every model is unique, the role of teacher and students in every model may vary according to the respective learning theory of the model is built. It also varies in phases to phases.

Principle of Reaction

This is the extension of social system. It deals with the rules of reaction to the students responses in the classroom interaction. The reaction of the teacher must be in accordance with the theory of which model has been built. The teacher reaction is desired when the students' responses/ behavior are untouched with expected level responses and for giving reinforcement. It depends the family of the model is presented.

Effect of models of Teaching

Models of teaching have a very positive effect on students' behavior. Bruce Joyce classified the effect as Instructional effect and Nurturant Effect. Instructional effects are the direct effect of an instruction on students' cognitive, affective and psychomotor

domain. Nurturant effects are the indirect effect other than the teacher intends to achieve through the model. It is the additional achievement gained by the students through the unique nature classroom interaction. Examples are the development of problem solving ability, analytical thinking, critical thinking, social skill, tolerance etc.

Models of Teaching: Categorising and teaching models

Example models of teaching sequences

At The Valley School we know our pupils respond to direct instruction (typical 4-5 part lesson) it is default point that teachers can return to and it is tried and tested, but this is only one model of teaching and may not always be suitable. If we adapt our teaching sequences, incorporate different models into our structural model or make the model more best suit the subject

“Instructional

Science model mapped over 6-8 weeks

Recall and harvest –this can include home study and personal research	Big Picture and ideas Generate questions	Investigation	New information	Investigation	Gathering what we know now - can do apply understand	Present Learning Formally link learning
“Informational processing”	“Enquiry focused system” investigation interspersed with behavioural system –direct teaching-Group investigation, paired and individual				“Social family” possible group presentation of findings	
	Investigation opportunities interspersed with factual learning				Application of knowledge and presentation of learning Combine concepts	
Webb’s Depth of knowledge 1-2						
Webb’s Depth of knowledge 3-4						
Create/Test/Refine						

Systemic	When	By Whom
We use a range of tried and tested and often research informed intervention strategies Interventions are either “prescriptive” and developed in house or “programmed” off the shelf and sequential	Often these take place outside of the normal class time but at times to ensure that no one subject is affected	Where possible our philosophy is to use teachers for intervention, where this is not possible highly trained and quality assured teaching assistants are used.
Same day Intervention, at the point of error, is always our preferred way of addressing misconceptions	In class during or immediately after the lesson	Teachers and trained adults
Pre teach and post teach Prior to a sequence of lessons we will often pre-assess pupils and begin earlier supportive work, especially around language acquisition	Pre-teach before sequence starts Post teach within sequence or in following weeks	Teachers and trained adults
Systemic tracking of small step improvement and question level analysis with a strong focus on milestone assessment, strong link of data to feedback	Post teach and within each half termly assessment block	Teachers and SLT
Home project based guidance-we will often encourage research at home with pupils prior to a new unit of work	Weekends and holiday periods	Parents
Paired pupils of mixed ability and groups with a variety of pupils	Intra-lesson	Pupils as peer support
Knowledge organisers and prompts –to support metacognition and long term memory	Before and during taught sequences	Pupil led
Concrete and hands on learning	Intra–lesson	Teachers and trained adults
Visible prompts to reinforce learning	Intra–lesson	Teachers and trained adults
Sequenced default “mastery” focussed lessons that allow time to synthesise information	Intra-lesson	Teachers and trained adults
Metacognitive practices use of Rosenshine’s principles – staff coaching and mentoring	Intra-lesson	Teachers and trained adults
Blue files of school support pupils and individualised small step learning plans	Intra-lesson and pre sequence reference	Teachers and trained adults
Parental engagement and additional support —additional assertive mentoring 6 weekly	Intra-lesson and pre sequence reference	Teachers and Parents