Science Knowledge Sequencing at Knavesmire Primary

Science - Working Scientifically and sequence of Substantive Knowledge:	
Intent:	All pupils at Knavesmire Primary School access a broad, balanced and enriching Science curriculum. INTENT: Our intent is to teach scientific concepts through our Big Ideas, making cross-curricular links where possible. Sometimes we do this through whole class teaching, while at other times we engage children in an enquiry based research activity. We encourage children to ask as well as answer scientific questions. They have the opportunity to use a variety of data, such as statistics, graphs, pictures and photographs, and use computing where appropriate. The IMPACT is to develop children's knowledge, skills and understanding and to be positive in their approach to Science. We recognise that there are widely differing scientific abilities in all classes and we ensure that suitable learning opportunities are provided for all children. IMPLEMENTATION: We have adapted the National Curriculum Science Programme of Study for the teaching of Science:
Substantive knowledge in Science:	This is the factual content produced by the areas of biology, physics and chemistry e.g. naming the simple physical properties of everyday materials or that plants need water, light and a suitable temperature to grow and stay healthy.
Disciplinary knowledge in Science:	This is the scientific methods e.g. using the skills of predicting, investigating, gathering data and hypothesising an idea. It is the opportunity to developing understanding of a substantive knowledge e.g. investigating if a plant will grow healthily in the dark will develop understanding of what a plant needs to be healthy.
Science:	The systematic study of the physical and natural world. The organisation of knowledge in the form of explanations and predictions.

Science sequence of Knowledge:

Nursery

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Begin to ask 'why' questions about their experiences

Sequence of Substantive Knowledge

Physical Development	Communication and Language	Understanding the World
• Make healthy choices about food, drink, activity and teeth brushing at home and at snack time.	• Know how to respond to 'why questions' such as Why do caterpillars get so fat?	• Comment on things that they see in the Natural World. • Explore natural materials such as wood and leaves in the Forest School garden. • Explore materials with different properties such as different textures. • Knows how to use a wide range of vocabulary that relates to exploration and things that they see. • Knows how some simple things work such as simple technology (Toni Box etc)

		• Knows how to plant seeds and care for growing plants with support. • Knows the key features of the life cycle of a plant and animal (butterfly or frog). • Begin to understand the need to respect and care for the natural environment and all living things such as being kind to the nature in the Forest School garden. • Explore and talk about different forces they can feel such as magnetic forces.

Science sequence of Knowledge:

Reception

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Answer how and why questions about their experiences
- Find ways to solve problems and test their ideas
- Use senses to explore the world around them

Sequence of Substantive Knowledge

Physical Development	**Understanding the World**	**Understanding the World**
• Know and talk about the different factors that support their overall health and wellbeing. • Make healthy choices more independently and know that some foods are bad if too much is eaten.	• Learn new vocabulary. • Ask questions to find out more and to check what has been said to them. • Articulate their ideas and thoughts in well-formed sentences. • Describe events in some detail.	• Explore the natural world around them. • Knows how to describe what they see, hear and feel whilst outside. • Can recognise some environments that are different to the one in which they live.

• Understand why looking after our oral health is important and know some things to help us do this. • Know how exercise makes us hot and hearts beat fast.	• Use talk to work out problems and organise thinking and activities. • Explain how things work and why they might happen. • Use new vocabulary in different contexts.	• Knows and understands the effect of changing seasons on the natural world around them. • Knows a bit about how they can look after our world such as recycling and turning lights off. • Knows how their immediate environment differs from that of others that we have learnt about. • Revisits lifecycles and extends their knowledge built in Nursery to learn another lifecycle. • Knows how to plant seeds and care for plants with increasing independence

Science sequence of Knowledge:

Year 1

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Observe closely using simple equipment
- Use their observation and ideas to suggest answers to questions
- Identify and classify

Sequence of Substantive Knowledge

1	**Plants** Pupils should be taught to: • identify and name a variety of common wild and garden plants, including deciduous and evergreen trees • identify and describe the basic structure of a variety of common flowering plants, including trees • observe and describe how seeds and bulbs grow into mature plants • find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	2	**Animals, including humans** Pupils should be taught to: • identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals • identify and name a variety of common animals that are carnivores, herbivores and omnivores • describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets) • find out about and describe the basic needs of animals, including humans, for survival (water, food and air) • describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene

Science sequence of Knowledge:

Year 2

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Ask simple questions and recognising they can be answered in different ways
- Perform simple tests
- Gather and record data to help in answering questions

Sequence of Substantive Knowledge

1	**Living things and their habitats** Pupils should be taught to: • explore and compare the differences between things that are living, dead, and things that have never been alive • identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other • identify and name a variety of plants and animals in their habitats, including microhabitats • describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food	2	**Everyday materials and their uses** Pupils should be taught to: • identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses • identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock • describe the simple physical properties of a variety of everyday materials

Science sequence of Knowledge:

Year 3

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Ask relevant questions and using different types of scientific enquiries to answer them
- Set up simple practical enquiries, comparative and fair tests
- Gather, record, classify and present data in a variety of ways to help in answering questions
- Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- Use straightforward scientific evidence to answer questions or to support their findings.

Sequence of Substantive Knowledge

1	**Plants** Pupils should be taught to: • identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • investigate the way in which water is transported within plants • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	2	**Animals, including humans** Pupils should be taught to: • identify that humans and some other animals have skeletons and muscles for support, protection and movement • describe the simple functions of the basic parts of the digestive system in humans • identify the different types of teeth in humans and their simple functions • construct and interpret a variety of food chains, identifying producers, predators and prey	3	**Rocks** Pupils should be taught to: • compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • describe in simple terms how fossils are formed when things that have lived are trapped within rock • recognise that soils are made from rocks and organic matter

Science sequence of Knowledge:

Year 4

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Ask relevant questions and using different types of scientific enquiries to answer them
- Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- Identify differences, similarities or changes related to simple scientific ideas and processes
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Sequence of Substantive Knowledge

1	**States of matter** Pupils should be taught to: • compare and group materials together, according to whether they are solids, liquids or gases • observe that some materials change state when they are heated or cooled, and measure	2	**Sound** Pupils should be taught to: • identify how sounds are made, associating some of them with something vibrating • recognise that vibrations from sounds travel through a medium to the ear	3	**Electricity** Pupils should be taught to: • identify common appliances that run on electricity • construct a simple series electrical circuit, identifying and naming its basic parts, including

	or research the temperature at which this happens in degrees Celsius (°C) • identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature		• find patterns between the pitch of a sound and features of the object that produced it • find patterns between the volume of a sound and the strength of the vibrations that produced it • recognise that sounds get fainter as the distance from the sound source increases		cells, wires, bulbs, switches and buzzers • identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery • recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit • use recognised symbols when representing a simple circuit in a diagram • recognise some common conductors and insulators, and associate metals with being good conductors • associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit

Science sequence of Knowledge:

Year 5

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- Record and report data and results including conclusions in oral and written forms including scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- Use test results to make predictions to set up further comparative and fair tests

Sequence of Substantive Knowledge

1	**Living things and their habitats** Pupils should be taught to: • describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird • describe the life process of reproduction in some plants and animals • describe how living things are classified into broad groups according to common	2	**Properties and changes of materials** Pupils should be taught to: • compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets	3	**Earth and space** Pupils should be taught to: • describe the movement of the Earth and other planets relative to the sun in the solar system • describe the movement of the moon relative to the Earth • describe the sun, Earth and moon as approximately spherical bodies

	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 • explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment • recognise that environments can change and that this can sometimes pose dangers to living things		• know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic • demonstrate that dissolving, mixing and changes of state are reversible changes • explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda		• use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky

Science sequence of Knowledge:

Year 6

Working Scientifically, Disciplinary Knowledge

Pupils should be taught to:

- Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- 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

Sequence of Substantive Knowledge

1	**Animals including humans** Pupils should be taught to: • identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	2	**Light** Pupils should be taught to: • recognise that light appears to travel in straight lines • use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye	3	**Forces and magnets** Pupils should be taught to: • explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object • identify the effects of air resistance, water resistance and

	• describe the ways in which nutrients and water are transported within animals, including humans • describe the changes as humans develop to old age		• explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them • recognise that light from the sun can be dangerous and that there are ways to protect their eyes • find patterns in the way that the size of shadows change		friction, that act between moving surfaces • recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having 2 poles • predict whether 2 magnets will attract or repel each other, depending on which poles are facing