Dunton Bassett & Claybrooke Primary School: Science Curriculum Framework

'It is important to view knowledge as sort of a semantic tree - make sure you understand the fundamental principles, i.e. the trunk and big branches, before you get into the leaves (details) or there is nothing for them to hang to.' Elon Musk

	Big Ideas *of* Science ('motorways' of conceptual understanding')											**Big Ideas *about* Science**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
	All matter in the Universe is made of very small particles.	Objects can affect other objects at a distance.	Changing the movement of an object requires a net force to be acting on it.	The total amount of energy in the Universe is always the same but can be transferred from one energy store to another during an event.	The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate.	Our solar system is a very small part of one of billions of galaxies in the Universe.	Organisms are organised on a cellular basis and have a finite life span.	Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms.	Genetic information is passed down from one generation of organisms to another.	The diversity of organisms, living and extinct, is the result of evolution.	Science is about finding the cause or causes of phenomena in the natural world.	Scientific explanations, theories and models are those that best fit the evidence available at a particular time.	The knowledge produced by science is used in engineering and technologies to create products to serve human ends.	Applications of science often have ethical, social, economic and political implications.

KS1

Science Big Ideas and Threshold Concepts

Curriculum designers take account of big ideas and pertinent threshold concepts to plan a coherent, 'spiral' curriculum for Science which secures mastery and progression in conceptual understanding and builds knowledge from 'novice' to 'expert'.

Teachers take account of big ideas and related threshold concepts in their Science planning for Science lessons to secure mastery of subject knowledge, year on year and over time.

Key Skills: procedural knowledge/domain specific skills. Know how to:

Ask simple questions and recognise that they can be answered in different ways
Observe closely, using simple equipment
Perform simple tests
Identify and classify
Use their observations and ideas to suggest answers to questions
Gather and record data to help in answering questions

Y1	**Y2**
Key Knowledge - know about:	**Key Knowledge – know about:**
Plants (Big ideas: 10) • 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	**Living things and their habitats (Big ideas: 4, 7, 8,11)** • 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.

Animals including humans (Big ideas: 10) ● Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals ● Identify and name a variety of common animals that are carnivores, herbivores and omnivores ● Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets) ● Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense	**Plants (Big ideas: 8,11)** ● 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.
Everyday materials (Big ideas: 1) ● Distinguish between an object and the material from which it is made ● Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock ● Describe the simple physical properties of a variety of everyday materials ● Compare and group together a variety of everyday materials on the basis of their simple physical properties	**Animals including humans (Big ideas: 4,7,9,11)** ● Notice that animals, including humans, have offspring which grow into adults ● Find out about and describe the basic needs of animals, including humans, for survival (water, food and air) ● Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.
Seasons (Big ideas: 5,11) ● Observe changes across the 4 seasons ● Observe and describe weather associated with the seasons and how day length varies.	**Uses of Everyday Materials (Big ideas: 1, 3, 13)** ● Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses; ● Compare how things move on different surfaces. ● Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

Lower KS2	
Science Big Ideas and Threshold Concepts	
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Key Skills: procedural knowledge/domain specific skills: know how to:	
Ask relevant questions and using different types of scientific enquiries to answer them. Set up simple practical enquiries, comparative and fair tests. Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. 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.	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. Use straightforward scientific evidence to answer questions or to support their findings.
Y3	**Y4**
Key Knowledge - know about:	**Key Knowledge – know about:**
Plants (Big ideas: 7, 8, 11) 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.	**All Living Things** Recognise that living things can be grouped in a variety of ways Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment Recognise that environments can change and that this can sometimes pose dangers to living things.
Animals including humans (Big ideas: 4, 8, 11) Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat Identify that humans and some other animals have skeletons and muscles for support, protection and movement. Describe the simple functions of the basic parts of the digestive system in humans Identify the different types of teeth in humans and their simple functions Construct and interpret a variety of food chains, identifying producers, predators and prey.	
Rocks (Big ideas: 5,11) 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.	**States of Matter (Big ideas: 1, 4, 11, 13)** Compare and group materials together, according to whether they are solids, liquids or gases Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C) Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
Light (Big ideas: 13) Recognise that they need light in order to see things and that dark is the absence of light Notice that light is reflected from surfaces Recognise that light from the sun can be dangerous and that there are ways to protect their eyes Recognise that shadows are formed when the light from a light source is blocked by a solid object Find patterns in the way that the size of shadows change.	**Sound (Big ideas: 13)** Identify how sounds are made, associating some of them with something vibrating Recognise that vibrations from sounds travel through a medium to the ear Find patterns between the pitch of a sound and features of the object that produced it Find patterns between the volume of a sound and the strength of the vibrations that produced it. Recognise that sounds get fainter as the distance from the sound source increases
Forces and Magnets (Big ideas:2,3, 13) Compare how things move on different surfaces Notice that some forces need contact between 2 objects, but magnetic forces can act at a distance Observe how magnets attract or repel each other and attract some materials and not others Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials Describe magnets as having 2 poles Predict whether 2 magnets will attract or repel each other, depending on which poles are facing.	**Electricity (Big ideas: 13)** Identify common appliances that run on electricity Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit Recognise some common conductors and insulators, and associate metals with being good conductors.

Upper KS2	
Science Big Ideas and Threshold Concepts	
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Key Skills: Know how 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. • Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, and bar and line graphs	• Use test results to make predictions to set up further comparative and fair tests. • Report and present findings from enquiries, including conclusions, causal relationships and explanations of results, in oral and written forms such as displays and other presentations. • Identify scientific evidence that has been used to support or refute ideas or arguments.
Y5	**Y6**
Key Knowledge - know about:	**Key Knowledge – know about:**
Living things and their habitats (Big ideas: 4,11) • Describe the differences in the life cycles of a mammal, amphibian, an insect and a bird • Describe the life process of reproduction in some plants and animals.	**Living Things and Their Habitats** • Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals • Give reasons for classifying plants and animals based on specific characteristics
Animals, including humans (Big ideas: 7) • Describe the changes as humans develop to old age.	**Animals Including Humans (Big ideas:4, 8, 11)** • Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood • Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function • Describe the ways in which nutrients and water are transported within animals, including humans
Properties and changes of materials (Big ideas: 1) • Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets • Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution • Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic Demonstrate that dissolving, mixing and changes of state are reversible changes • Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.	**Evolution (Big ideas: 9, 10, 12)** • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago • Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents • Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
Earth and Space (Big ideas: 6,12,13) • Describe the movement of the Earth, and other planets, relative to the Sun in the solar system • Describe the movement of the Moon relative to the Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Use the idea of the Earth's rotation to explain day and night, and the apparent movement of the sun across the sky.	**Light (Big ideas: 13)** • Recognise that light appears to travel in straight lines • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them

Forces (Big ideas: 2,3,13) ● Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object ● Identify the effects of air resistance, water resistance and friction, that act between moving surfaces ● Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect	**Electricity (Big ideas: 13)** ● Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit ● Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches ● Use recognised symbols when representing a simple circuit in a diagram.