

Skills Progression for Science

National Curriculum:

Purpose of study

- A high-quality science education provides the foundations for understanding the world
- through the specific disciplines of biology, chemistry and physics. Science has changed
- our lives and is vital to the world's future prosperity, and all pupils should be taught
- essential aspects of the knowledge, methods, processes and uses of science. Through
- building up a body of key foundational knowledge and concepts, pupils should be
- encouraged to recognise the power of rational explanation and develop a sense of
- excitement and curiosity about natural phenomena. They should be encouraged to
- understand how science can be used to explain what is occurring, predict how things will
- behave, and analyse causes.

Aims

- The national curriculum for science aims to ensure that all pupils:
- ☐ develop scientific knowledge and conceptual understanding through the specific
- disciplines of biology, chemistry and physics
- ☐ develop understanding of the nature, processes and methods of science through
- different types of science enquiries that help them to answer scientific questions about
- the world around them
- ☐ are equipped with the scientific knowledge required to understand the uses and
- implications of science, today and for the future.

Y3 & 4 Pupils should be taught to:

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.

Plants Y3/4

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.

Animals & Humans Y3/4

Pupils should be taught to:

- ♣ 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

Rocks Y3

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.

Light Y3

Pupils should be taught to:

- ♣ recognise that they need light in order to see things and that dark is the absence of light
- ♣ notice that light is reflected from surfaces
- ♣ recognise that light from the sun can be dangerous and that there are ways to protect their eyes
- ♣ recognise that shadows are formed when the light from a light source is blocked by an opaque object
- ♣ find patterns in the way that the size of shadows change

Forces and Magnets Y3&4

Pupils should be taught to:

- ♣ compare how things move on different surfaces
- ♣ notice that some forces need contact between two objects, but magnetic forces can act at a distance
- ♣ observe how magnets attract or repel each other and attract some materials and not others
- ♣ compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials
- ♣ describe magnets as having two poles
- ♣ predict whether two magnets will attract or repel each other, depending on which poles are facing.

Living things and their habitats Y3&4

Pupils should be taught to:

- ♣ 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 Y3&4

Pupils should be taught to:

- ♣ 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

States of Matter Y3&4

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 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.

Electricity Y4

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 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.

Year 5 & 6 Pupils should be taught:

to 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 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.

Living things in their habitats Y5

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 observable characteristics and based on similarities and differences, including microorganisms, plants and animals
- ♣ give reasons for classifying plants and animals based on specific characteristics
- ♣ 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.

Continued....

Classification of living things and fossils Y5

Pupils should be taught to:

- ♣ recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years

Properties and Changes of Materials Y5&6

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
- ♣ 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.

Earth and Space Y5

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
- ♣ use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

Forces Y5

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 friction, that act between moving surfaces
- ♣ recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

Evolution and Inheritance Y6

Pupils should be taught to:

- ♣ 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.

Evolution is the change of physical form in a population over a long-time span

- Natural selection is the process which controls that change.
- In any population there is variation and competition for resources (food, water, mates).
- Within that variation, organisms that have features which make them better adapted at securing food, water, and mates, are more likely to survive and produce offspring which have inherited those same successful features. Those that are not well adapted will eventually go extinct.
- Over a long enough timeline all organisms in a population will have those successful features.
- This is known as the Theory of Evolution by Natural Selection and was developed by Charles Darwin in 1859
- Before Darwin, Lamarck's Idea of acquired characteristics was proposed. (Giraffes stretch their necks in life, which made their children have longer necks).
- Darwin as a young man travelled around the world on the HMS Beagle. On this 5-year voyage he saw lots of things and recorded down lots of evidence which allowed him to work out how organisms change over time by a different mechanism of Natural selection

Light Y6

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
- ♣ 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.

Sound Y6

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
- ♣ 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

Electricity Y6

Pupils should be taught to:

- ♣ 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

Animals – including humans Y6

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
- ♣ describe the ways in which nutrients and water are transported within animals, including humans

Skills Progression for Science Overview

Key for Units	<ul style="list-style-type: none"> • Skeleton and movement - SKM • Magnets and their effects _MGS • How plants make food. PLF • Light. LGT • Rocks RCKS • Mixtures and separating them MKS 	<ul style="list-style-type: none"> • How the body gets nutrients into the blood.BNB • Solids, liquids & gases SLG • Making electrical circuits work EC • Feeding, relationships and the environment – habitats FRH • Feeding relationships and the environment – adaptation FRA • How plants reproduce PRP 	<ul style="list-style-type: none"> • Making new substances. MNS • Forces that oppose motion. FOM • Space & Gravity.SPG • Classification & fossils CF • Sexual and asexual reproduction SSR 	<ul style="list-style-type: none"> • Controlling electrical circuits.CEC • How sound is made, travels and can be changed.STC • Evolution & natural selection ENS • How light behaves and how we see.LBS • Circulation & Digestion C&D
Using ideas to predict what might happen.	<p style="background-color: #e0ffe0; margin: 0; padding: 2px;">Year 3 Unit</p> <ul style="list-style-type: none"> • SKM – Why we have bones, what they do and how they move? • MGS –How do magnets behave near other materials and each other? • PLF – Why are leaves are so important? • LGT – What makes light? • RCKS – What are rocks made of? • MKS – What types of materials there are? 	<p style="background-color: #e0ffe0; margin: 0; padding: 2px;">Year 4 Unit</p> <ul style="list-style-type: none"> • BNB – How food gets into the blood? • SLG – How might water change to ice? • EC – How can we make a bulb light? • FRH –How does energy transfer along a food chaing • FRA – How are organisms adapted to their habitat and how does the habitat support them? • PRP – How does a plant make more of itself? 	<p style="background-color: #e0ffe0; margin: 0; padding: 2px;">Year 5 Unit</p> <ul style="list-style-type: none"> • MNS – How materials will change due to heating, cooling or mixing. • FOM – What will the affects how an object is moving towards or against another object or surface? • SPG -What happens when objects fall towards earth? What happens when large celestial bodies move close together? • CF – What does the fossil record tell us and what is missing? • SSR -What might offspring look like based on parental characteristics? 	<p style="background-color: #e0ffe0; margin: 0; padding: 2px;">Year 6 Unit</p> <ul style="list-style-type: none"> • CEC – What will change if extra components are added to circuits? • STC – How will sound travel in different media and over different distances? • ENS – What will happen to organisms over time as pressure is put on their habitats? • LBS – Which materials have the greatest opacity? • C&D – Is lung capacity affected by height? Is pulse rate affected byb intensity of activity>

<p>Using ideas to find out what happens (investigating & Explaining)</p>	<ul style="list-style-type: none"> • SKM – Many animals have skeletons that support their bodies • MGS - How far away can the magnetic attraction between two magnets be experienced? Is the repulsive force the same size? How is the magnetic attraction or repulsion force affected by putting materials between the magnets? • PLF – Investigate how removal of light, water or soil will affect plant growth. • LGT - How does the amount of light affect how well a plant grows? • RCKS – Which rock type is the most porous? • MKS - Give a range of mixtures and ask children to say what substances they think are in each 	<ul style="list-style-type: none"> • BNB – Explaining how nutrients get into the body. • SLG -What is needed for materials to change state? • EC – Explain how electricity travels in a circuit • FRH – What happens to grass when the light is removed? How does this affect plant growth? • FRA – How have animals (woodlice) and plants adapted to their habitat? What organisms will we find in different habitats within the school grounds? • PRP – How seed dispersal and soil conditions can affect a plant’s chances of growth. 	<ul style="list-style-type: none"> • MNS – Explain the affects of heating, cooling or mixing. • FOM – Test movement of different objects on different surfaces including interlocking surfaces. Investigate gears, pulleys and levers and how they can reduce forces needed to omve • SPG -Explaining that gravitational attaraction between large celestial boides osa affected by the mass. Use simulations for this purpose. That distance appart affects this. • CF – Explaining how fossils are formed over time • SSR -Investigating changes in generation. 	<ul style="list-style-type: none"> • CEC – What are the effects of adding extra bulbs or cells? • STC – Does is pitch and/or volume of sound produced by blowing over of tapping a bottle of water affected by the amount of water in the bottle? What is the effect on the volume of a heard sound if the distance from the source increases? • ENS – What will happen to organisms over time as pressure is put on their habitats? This through games and simulations • LBS – Which materials have the greatest opacity? Measure layers of material needed to see a light source from a fixed distance. • C&D – Is lung capacity affected by height? Is pulse rate affected by intensity of activity? Decide what to measure and record (Formative knowledge training.)
<p>Identifying what must be changed, what measured and what must be kept the same.</p>	<ul style="list-style-type: none"> • SKM - Compare X-rays and skeletons of animals looking for similarities and differences and predicting where vital organs are. • MGS - Focus on how the children will measure accurately the point at which one magnet is attracting another magnetic and then compare it to the repulsive force. • PLF - the purpose of all of these activities is to gather and record data to help answer a question. • LGT - How does the distance from a light source affect how bright it looks? • RCKS – The change in mass is then calculated to see which rock is the most porous, questioning can then dig into why the rock might be more porous than others • MKS – Recording in a simple table. Substances found. Place skittles in a shallow flat saucer so that water comes halfway up them. Children predict what will happen. Set and leave without touching 	<ul style="list-style-type: none"> • BNB – Compare effect of different liquids on teeth • SLG – Compare properties of solids, liquids and gases. (Focus on different viscosity of liquids.) • EC -How does • FRH –.Observation of changes in plants and coverage of plant types. • FRA -Woodlice choice chamber measurement • PRP – Choice of growing media 	<ul style="list-style-type: none"> • MNS – Changes in material and or temperature • FOM – Changes to materials, surfaces and direction of force 	<ul style="list-style-type: none"> • CEC – Change of components are added to circuits. Bulbs or cells • STC – How is pitch and volume of sound made by blowing over or tapping a bottle affected by the amount of liquid in the bottle? • ENS – Changes to the pressire on organisms (in the simulation games given.) • LBS – Change of materials (layers.) Light source kept the same. • C&D – Children learn and devise methods to measure height and lung capacity (using balloons.) Measure pulse rate after agreed time of agreed physical activity.

<p>•Using ideas to hypothesise why something did happen.</p>	<ul style="list-style-type: none"> • SKM - that skeletons protect vital organs by identifying where they think they may be found in a number of different skeletons • MGS - they should begin to draw arrows to represent the size and direction of the forces. • PLF – that altering the amount of light, water or soil type will affect how well a plant grows. • LGT - The purpose of these activities is to continue to work on the ‘how does ‘a’ affect ‘b’ type of enquiry. • RCKS – Use knowledge of different rock types to predict porosity. • MKS - . Ask children to make a prediction about what will happen. They could write this prediction down or say it verbally. They may ask why the colours don't mix (FYI- it's because each colour solution has slightly different properties (e.g., density which prevents them from mixing- this is called stratification) 	<ul style="list-style-type: none"> • BNB – That different liquids will affect decay of teeth • SLG – That different states of material will behave in different ways. That viscosity affects the flow of different types of liquid. • (including soils) for seeds. • EC -Effect of making and breaking circuits. Effects of adding components • FRH –.Measure area of plants and what has changed: before and after. • FRA -Observe over time where woodlice choose to go • PRP – How many plants grow and survive in different soils or soil substitutes. 	<ul style="list-style-type: none"> • MNS – How will materials change due to heating, cooling or mixing? • FOM – What will the affect be of an object moving towards or against another object or surface? • SPG -What happens when objects fall towards earth? What happens when large celestial bodies move close together? • CF – How are fossils formed? What does the fossil record tell us and what is missing? • SSR -What might offspring look like based on parental characteristics? 	<ul style="list-style-type: none"> • CEC – Why did output of chosen compot change if extra components are added to circuits? • STC – Why does the pitch or volume change if the amount of water is different? • ENS – What will happen to organisms over time as pressure is put on their habitats? • LBS – Will denser materials have a greater opacity? • C&D – Do taller children have bigger lungs? Does your pulse rate increase after exercise?
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Non specialist can look at to know depth to go to for their children. Lev