Year 6 – Evolution and Inheritance

National Curriculum Objectives

- Know about evolution and can explain what it is.
- Know how fossils can be used to find out about the past.
- 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- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago

Sticky Knowledge

- Life cycles have evolved to help organisms survive to adulthood.
- Over time the characteristics that are most suited to the environment become increasingly common.

NB: The following could be duplicated in Year 6 Living things and their habitats.

- Organisms best suited to their environment are more likely to survive long enough to reproduce. Organisms are best adapted to reproduce are more likely to do so.
- Organisms reproduce and offspring have similar characteristic patterns.
- Variation exists within a population (and between offspring of some plants)
- Competition exists for resources and mates

Vocabulary

Fossils, Adaptation, Evolution, Characteristics, Reproduction, Genetics, Variation, Inherited, Environmental, Mutation, Competition, Survival of the Fittest, Evidence,

Key Scientists

Charles Darwin and Alfred Russel Wallace
(Theory of Evolution by Natural Selection)

Jane Goodall
(Chimpanzees)

Linked Texts

One Smart Fish
(Christopher Wormell)

The Molliebird
(Jules Pottle)

Our Family Tree
(Lisa Westberg Peters)

Prior Learning

From Key Stages 1 & 2, children should:

- Understand there is a variety of life on Earth
- Know that some animal's differences are important to their survival
- Know how animals and plants reproduce
- Know how fossils form over time

Common misconceptions

Some children may think:

- Adaptation occurs during an animal's lifetime: giraffes' necks stretch during their lifetime to reach higher leaves and animals living in cold environments grow thick fur during their life
- Offspring most resemble their parents of the same sex, so that sons look like fathers
- All characteristics, including those that are due to actions during the parent's life such as dyed hair or footballing skills, can be inherited
- Cavemen and dinosaurs were alive at the same time

Future Learning

In Key Stage 3 children will learn about:

- heredity as the process by which genetic information is transmitted from one generation to the next
- the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation
- the variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection
- changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction
- the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research
What is the most common eye colour in our class? Compare strength of eggs TAPS	Compare the skeletons of apes, humans, and Neanderthals – how are they similar, and how are they different? Can you classify these observations into evidence for the idea of evolution, and evidence against?	How has the skeleton of the horse changed over time?	Is there a pattern between the size and shape of a bird's beak and the food it will eat?	What happened when Charles Darwin visited the Galapagos islands? What ideas did American geneticist Barbara McClintock have about genes that won her a Nobel Prize? Fossils TAPS

Year 6 – Animals, including humans

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• 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.	• The heart pumps blood around the body. • Oxygen is breathed into the lungs where it is absorbed by the blood. • Muscles need oxygen to release energy from food to do work. (Oxygen is taken into the blood in the lungs; the heart pumps the blood through blood vessels to the muscles; the muscles take oxygen and nutrients from the blood.)	Oxygenated, Deoxygenated, Valve, Exercise, Respiration Circulatory system, heart, lungs, blood vessels, blood, artery, vein, pulmonary, alveoli, capillary, digestive, transport, gas exchange, villi, nutrients, water, oxygen, alcohol, drugs, tobacco.

Key Scientists	Linked Texts
Justus von Liebig (Theories of Nutrition and Metabolism) **Sir Richard Doll** (Linking Smoking and Health Problems) **Leonardo Da Vinci** (Anatomy)	***Pig-Heart Boy*** *(Malorie Blackman)* ***Skellig*** *(David Almond)* ***A Heart Pumping Adventure*** *(Heather Manley)*

Prior Learning	Common misconceptions	Future Learning
In Year 5 children should: • **Describe the changes as humans develop to old age.** • **Know the life cycle of different living things, e.g. Mammal, amphibian, insect bird.** • **Know the differences between different life cycles.** • **Know the process of reproduction in plants.** **Know the process of reproduction in animals.**	Some children may think: • Your heart is on the left side of your chest • The heart makes blood • The blood travels in one loop from the heart to the lungs and around the body • When we exercise, our heart beats faster to work the muscles more • Some blood in our bodies is blue and some blood is red • We just eat food for energy • All fat is bad for you • All dairy is good for you • Protein is good for you, so you can eat as much as you want • Foods only contain fat if you can see it • All drugs are bad for you.	In Key Stage 3 children will learn about: • the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) • calculations of energy requirements in a healthy daily diet • the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • the structure and functions of the gas exchange system in humans, including adaptations to function • the effects of recreational drugs (including substance misuse) on behaviour, health and life processes.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research
How does the length of time we exercise for affect our heart rate? TAPS Can exercising regularly affect your lung capacity?	Which organs of the body make up the circulation system, and where are they found?	How does my heart rate change over the day? How much exercise do I do in a week?	Is there a pattern between what we eat for breakfast and how fast we can run?	How have our ideas about disease and medicine changed over time?

Year 6 – Living things and their habitats

<table>
<tr><th>National Curriculum Objectives</th><th>Sticky Knowledge</th><th colspan="2">Vocabulary</th></tr>
<tr>
<td>

Classify living things into broad groups according to observable characteristics and based on similarities and differences.
Give reasons for classifying plants and animals based on specific characteristics.

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<td>

Variation exists within a population (and between offspring of some plants) – NB: this Key Idea is duplicated in Year 6 Evolution and Inheritance.
Organisms best suited to their environment are more likely to survive long enough to reproduce.
Organisms are best adapted to reproduce are more likely to do so.
Organisms reproduce and offspring have similar characteristic patterns.
Competition exists for resources and mates.

</td>
<td colspan="2">Variation Organisms Populations. Classification Characteristics Environment, flowering, nonflowering, plants, animals, vertebrates, fish, amphibians, reptiles, mammals, invertebrate, human impact, nature reserves, deforestation. Classify, compare, bacteria, microorganism, organism, invertebrates, vertebrates, Linnaean.
<table>
<tr><th>Key Scientists</th><th>Linked Texts</th></tr>
<tr><td>Carl Linnaeus
(Identifying, Naming and Classifying Organisms)</td><td>Beetle Boy
(M G Leonard)
Insect Soup
(Barry Louis Polisar)
Fur and Feathers
(Janet Halfmann)</td></tr>
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<tr><th>Prior Learning</th><th>Common misconceptions</th><th colspan="2">Future Learning</th></tr>
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<td>In Year 4, children should:

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 danger to living things.

</td>
<td>Some children may think:

All micro-organisms are harmful
Mushrooms are plants.

</td>
<td colspan="2">In Key Stage 3 children will learn about:

the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere
the adaptations of leaves for photosynthesis.
the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops
the importance of plant reproduction through insect pollination in human food security
how organisms affect, and are affected by, their environment, including the accumulation of toxic materials.

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<tr><th colspan="5">Teaching Ideas</th></tr>
<tr><th><u>Comparative tests</u></th><th><u>Identify & Classify</u></th><th><u>Observation over time</u></th><th><u>Pattern Seeking</u></th><th><u>Research</u></th></tr>
<tr>
<td>How does the temperature affect how much gas is produced by yeast?
Which is the most common invertebrate on our school playing field?</td>
<td>How would you make a classification key for vertebrates/invertebrates or microorganisms? TAPS</td>
<td>What happens to a piece of bread if you leave it on the windowsill for two weeks?</td>
<td>Do all flowers have the same number of petals?</td>
<td>What do different types of microorganisms do? Are they always harmful?
Research invertebrates TAPS</td>
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</table>

Year 6 – Electricity

National Curriculum Objectives	Sticky Knowledge	Vocabulary
• **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.**	• Batteries are a store of energy. This energy pushes electricity round the circuit. When the battery's energy is gone it stops pushing. Voltage measures the 'push.' • The greater the current flowing through a device the harder it works. • Current is how much electricity is flowing round a circuit. • When current flows through wires heat is released. The greater the current, the more heat is released.	Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.

Key Scientists	Linked Texts
Alessandro Volta (Electrical Battery) Nicola Tesla (Alternating Currents)	Goodnight Mister Tom (Michelle Magorian) Blackout (John Rocco) Hitler's Canary (Sandi Toksvig)

Prior Learning	Common misconceptions	Future Learning
In Year 4, children should: • 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 the 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. • Know the difference between a conductor and an insulator; giving examples of each. • Safety when using electricity.	Some children may think: • Larger-sized batteries make bulbs brighter • A complete circuit uses up electricity • Components in a circuit that are closer to the battery get more electricity	In Key Stage Three children will learn: • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects • The idea of electric field, forces acting across the space between objects not in contact.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research
How does the voltage of the batteries in a circuit affect the brightness of the lamp / volume of the buzzer? TAPS Which make of battery lasts the longest? Which type of fruit makes the best fruity battery?	How would you group electrical components and appliances based on what electricity makes them do?	How does brightness of bulb change as the battery runs out? How can we measure how quickly a battery is used up?	Does the temperature of a light bulb go up the longer it is on?	How has our understanding of electricity changed over time?

Year 6 – ENERGY (light & sight)

National Curriculum Objectives

- 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.
- Know how simple optical instruments work, e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.

Sticky Knowledge

- Animals see light sources when light travels from the source into their eyes.
- Animals see objects when light is reflected off that object and enters their eyes.
- Light reflects off all objects (unless they are black). Non shiny surfaces scatter the light so we don't see the beam.
- Light travels in straight lines.

Vocabulary

Light source, dark, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, transparent, translucent. Reflect Absorb Emitted Scattered Refraction

Key Scientists

Thomas Young
(Wave Theory of Light)
Ibn al-Haytham (Alhazen)
(Light and our Eyes)
Percy Shaw
(The Cats Eye)

Linked Texts

Letters from the Lighthouse
(Emma Carroll)

The Gruffalo's Child
(Julia Donaldson)

The King Who Banned the Dark
(Emily Haworth-Booth)

Prior Learning

In Year 3 children should:

- 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 sizes of shadows change.

Common misconceptions

Some children may think:

- We see objects because light travels from our eyes to the object.

Future Learning

In Key Stage 3, children will learn about:

- the similarities and differences between light waves and waves in matter
- light waves travelling through a vacuum; speed of light
- the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface Science
- use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye
- light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras
- colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection.

Teaching Ideas

Comparative tests	Identify & Classify	Observation over time	Pattern Seeking	Research
What could we change to change the shadow? TAPS	Can you identify all the colours of light that make white light when mixed together? What colours do you get ifyou mix different colours of light together?	Does the temperature of a light bulb go up the longer it is on? How does my shadow change over the day?	Is there a pattern to how bright it is in school over the day? And, if there is a pattern, is it the same in every classroom?	Why do some people need to wear glasses to see clearly? How do our eyes adapt to different conditions?