



Progression of Substantive Knowledge in Biology

Years R - 6

Year	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
R	Longitudinal Study linked to ELG Understanding the world- The Natural World - <i>explore the seasonal changes that take place around them throughout the year. They learn how these changes affect trees - create tree diaries, create observational drawings, measure and look closely at the changes to the leaves, take bark rubbings and photograph a tree, to see the changes over the seasons.</i>					
1	Longitudinal Study – link to Seasonal Changes unit - How does the weather change over the four seasons? (temperature and light)					
	Animal survival Sensing for survival	Seasons	Describing materials	Plants	Animal survival Feeding for survival Moving for survival	Habitats
2	Longitudinal Study – link to Animal Life Cycles – How a pond habitat changes over a year					
	Animal life cycles		Changing materials		Making New Plants	Pushes and pulls
3	Longitudinal Study – link to Light - How a shadow changes over a day and through the year					
	Rocks and soils	Solids, Liquids and Gases	Animals, Skeletons and Movement	Magnets	Plants and their food production	Light
4	Longitudinal Study – link to Plant Reproduction - How the seasons affect plants					
	Mixtures and separating them	Sound	Plant Reproduction	Making electrical circuits work	Living things	
5	Longitudinal Study – link to Space and gravity unit – How does our night sky change over the year?					
	Space and gravity	Fossils, geological time and classification	Making new substances	Forces that oppose motion	Digestion	
6	Longitudinal Study – Micro-organism study					
	Controlling electrical circuits	Circulation	How light behaves	Classification and Evolution		
BIOLOGY	CHEMISTRY	PHYSICS				

Understanding the World	
EYFS	• <i>Explore the natural world around them.</i> • <i>Describe what they see, hear and feel whilst outside using a wide vocabulary.</i> • <i>Plant seeds and care for growing plants.</i> • <i>Understand the key features of the life cycle of a plant and an animal.</i> • <i>Begin to understand the need to respect and care for the natural environment and all living things.</i> • <i>Recognise some environments that are different to the one in which they live.</i>

Animals (including humans)



BIOLOGY		
Animals (including humans)		
Year 1	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Animal Survival</u> Knowledge Block 1- Feeding for survival - Animals are groups of organisms that need to consume food to survive. - Food provides energy and the building blocks of growth. - There are many different groups of animals including fish, amphibians, reptiles, birds and mammals. They have different structures, and they eat different types of foods. - The structure of a variety of common animals varies Mammals have hair/fur and give birth to live young, fish can breathe underwater using gills, birds have feathers, beaks and wings. Females lay eggs. Most birds can fly, reptiles are air breathing and have scaly skin and lays eggs, and amphibians have smooth slimy skin and live on land and in water. - Some eat other animals (carnivores), and others only eat vegetables (herbivores), and some like to eat both plants and meat (omnivores) - Common animals that are carnivores include lions, cats, sharks and snakes - Common animals that are herbivores include cows, horses, sheep, elephants and deer - Common animals that are omnivores include humans, bears, monkeys and seagulls Knowledge Block 2- Moving for survival - Animals must move to get their food - They will move in different ways to get their food - Animals that eat other animals are called predators - Animals that are eaten by other animals are called prey - Animals feeding relationships can be illustrated in a food chain Knowledge Block 3- Sensing for survival - The five sense organs are the eyes (for seeing), nose (for smelling), ears (for hearing), tongue (for tasting), and skin (for touching or feeling). - Animals have senses to help them survive - Animals have developed a range of ways to find prey or avoid being eaten	<u>Year 1 Animals, including humans</u> <i>Pupils should be taught to:</i> <i>identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals</i> <i>identify and name a variety of common animals that are carnivores, herbivores and omnivores</i> <i>describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets)</i> <i>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> <u>Year 2 Animals, including humans</u> <i>Pupils should be taught to:</i> <i>find out about and describe the basic needs of animals, including humans, for survival (water, food and air)</i>

Science Knowledge progression document.



Year 2	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Animal Life Cycles</u> Knowledge Block 1- Animal timelines - Things that are living, move, feed, grow, reproduce and use their senses - Animals grow until they reach maturity and then don't grow any larger - Animals reproduce when they reach maturity (adulthood) - All animals eventually, die - Different animals live to different ages - Different animals reach different sizes before they are able to reproduce - Different animals reproduce at different ages - Animals, including humans, have offspring which grow into adults - Exercise, eating the right amounts of different types of food and hygiene are important to maintain good health and wellbeing Knowledge Block 2- How animals get their food Habitats are places where animals and plants live (from Year 1) - Animals live in habitats in which they are suited. - Different kinds of animals and plants depend on each other within habitat. - Animals get their food from plants and other animals. This can be shown in a food chain. - A food chain begins with a producer. This is often a green plant because plants can make their own food. - A living thing that eats other plants is called a consumer.	<u>Year 2 Living things and their habitats</u> 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 micro-habitats - 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. <u>Year 2 Animals, including humans</u> Pupils should be taught to: - notice that animals, including humans, have offspring which grow into adults - describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.

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Year 3	<u>Animals, skeletons and movement</u> Knowledge Block 1- Skeletons protect vital organs • All vertebrates have internal skeletons that protect vital organs. • Invertebrates have exoskeletons that protect vital organs. Knowledge Block 2- Skeletons support weight • Skeletons support the weight of land animals. • Stronger bones can support a greater mass. Knowledge Block 3- Skeletons support movement • Bones are connected (but can move relative to each other) at joints. • Muscles connect to bones and move them when they contract. • Stronger bones can anchor stronger muscles.	<u>Year 3 Animals, including humans</u> <i>Pupils should be taught to:</i> • <i>identify that humans and some other animals have skeletons and muscles for support, protection and movement.</i>
Year 4		

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Year 5	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Digestion</u> Knowledge Block 1- Food groups ○ Animals need a variety of foods to help them grow and survive. The main food groups are: • Meat, dairy and pulses provide protein for muscles. • Grains and root vegetables provide carbohydrates for energy. • Fat for insulation and energy. • Fruit and vegetables for minerals, vitamins and fibre. These are essential to keep our bodies working well and protect us from illnesses. Knowledge Block 2- Variation in animals' diet • Different animals require different foods to survive. • Animals get their food from plants and other animals. This can be shown in a food chain. (From Year 2) • A food chain begins with a producer. This is often a green plant because plants can make their own food. (From Year 2) • A living thing that eats other plants is called a consumer. (From Year 2) • Humans require a balanced diet to remain healthy but healthy diets vary depending upon the type of activity that humans do. • Humans have 2 sets of teeth in their lifetimes • Humans have three main types of teeth- incisors, canines and molars. • Incisors help to bite off and chew pieces of food. • Canines are used for tearing and ripping food. • Molars help to crush and grind food. Knowledge Block 3- How humans digest food • The nutrients in food have to get to every part of the body. The blood transports them. • The role of digestion is to get the nutrients in food to dissolve in the blood, if it doesn't dissolve it can't enter the blood and be transported.	<u>Year 3 Animals, including humans</u> Pupils should be taught to: • <i>identify that animal, 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</i> <u>Year 4 Animals, including humans</u> Pupils should be taught to: • <i>describe the simple functions of the basic parts of the digestive system in humans</i> • <i>identify the different types of teeth in humans and their simple functions</i> • <i>construct and interpret a variety of food chains, identifying producers, predators and prey.</i>

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Year 6	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Circulation</u> Knowledge Block 1: Getting oxygen into the blood - All animals need oxygen to survive. - Air is breathed into the lungs where the oxygen in the air is passed into the blood. - Every part of animals' bodies need oxygen, especially muscles. - Muscles need a supply of oxygen and sugar (glucose) to make them work, they are supplied by the blood. Knowledge Block 2: The blood circulation model - The heart is a vital organ pumps blood through the blood vessels. - Blood Vessels are the tubes that blood flows through. - The blood circulates around the body in a way that ensures all muscles in the body get a supply of oxygen and sugar. - The heart pumps blood to every muscle in the body. The circulatory route must allow the blood to collect oxygen from the lungs, sugar from the intestines and visit muscles. - The blood then returns to the heart where it is pumped again. - Exercise helps the heart to work more efficiently. - Eating a healthy diet helps to keep the blood vessels from getting blocked. - Avoiding smoking and alcohol puts less stress on the whole system and keeps it healthier.	<u>Year 6 Animals, including humans</u> 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.
	<u>Year 5 Animals, including humans</u> describe the changes as humans develop to old age. <u>Relationships Education, Relationships and Sex Education (RSE) and Health Education</u> 66. The content set out in this guidance covers everything that primary schools should teach about relationships and health, including puberty. The national curriculum for science also includes subject content in related areas, such as the main external body parts, the human body as it grows from birth to old age (including puberty) and reproduction in some plants and animals. It will be for primary schools to determine whether they need to cover any additional content on sex education to meet the needs of their pupils. Many primary schools already choose to teach some aspects of sex education and will continue to do so, although it is not a requirement. 104. Relationships Education, RSE and Health Education complement several national curriculum subjects. Where schools are teaching the national curriculum, they should look for opportunities to draw links between the subjects and integrate teaching where appropriate. There continues to be no right of withdrawal from any part of the national curriculum.	

Plants



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BIOLOGY Plants		
	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
Year 1	<u>Plants</u> Knowledge Block 1- Where do plants come from • A seed contains a miniature plant that can develop into a fully grown plant. • A bulb has underground vertical shoots which already has modified leaves • Seeds and bulbs need water to grow but most do not need light (germination) • Seeds and bulbs have food stores inside them to help the plant start to grow. Knowledge Block 2- Plant survival • To survive plants, need to get water, light, and avoid being eaten Knowledge Block 3- How plants get what they need to survive • A seed produces roots to allow water to get into the plant. • A seed produces shoots to produce leaves to collect the sunlight. • A basic plant structure can include leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem	<u>Year 1 Plants</u> Notes and guidance (non-statutory) <i>Pupils should use the local environment throughout the year to explore and answer questions about plants growing in their habitat. Where possible, they should observe the growth of flowers and vegetables that they have planted. They should become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, <u>bulb, seed</u>, trunk, branches, stem).</i> From Year 2 <i>Note: Seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them.</i>
	<u>New Plants</u> Knowledge Block 1- What flowers are for • All flowering plants make seeds (reproduction) that can grow (germinate) into new plants • Plants need water, light and a suitable temperature to grow and stay healthy Knowledge Block 2- What happens after a plant has produced seeds • Some plants die after it has produced its seed and sometimes the plant lives for many generations producing seeds each year	<u>Year 2 Plants</u> Pupils should be taught to: • 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. Notes and guidance (non-statutory) <i>Pupils should use the local environment throughout the year to observe how different plants grow. Pupils should be introduced to the requirements of plants for <u>germination</u>, growth and survival, as well as to the processes of <u>reproduction</u> and growth in plants.</i>

Science Knowledge progression document.



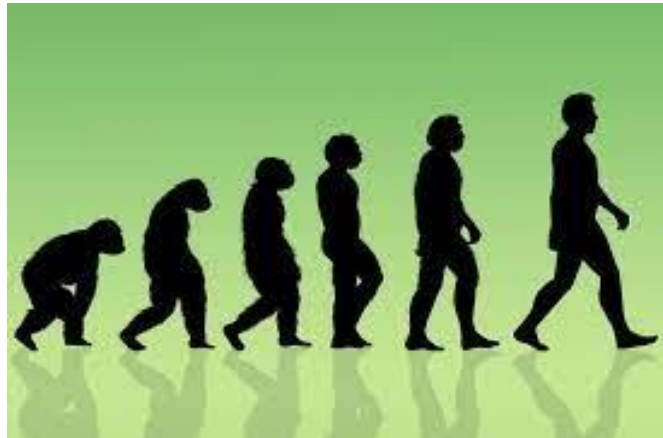
Year 3	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Plants and their food production</u> Knowledge Block 1- Plants don't go to McDonalds - Plants do not eat food so have to make their own. - This food provides them with energy, and materials to grow - To make the food (sugar) plants need water from the ground, carbon dioxide from the air and light from the sun. - The water is taken up through the roots from the soil - The carbon dioxide is taken in through the leaves - As well as food, plants also make oxygen which is given out back into the air through the leaves	<u>Year 3 Plants</u> <i>Pupils should be taught to:</i> <i>identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers</i> <i>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</i> <i>investigate the way in which water is transported within plants</i>

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Year 4	<u>Plant reproduction</u> Knowledge Block 1- The reproductive parts of a flowering plant - Flowering plants reproduce by the process of pollination - Pollination leads to the formation of a seed which can grow into a new plant - Flowering plants have evolved specific parts to carry out pollination and seed growth - Those parts are stamen where pollen is produced, stigma where pollen is collected, and the ovaries which contains the eggs that become a seed when the pollen travels down the stigma and meets the egg - Flowers have petals also are a range of colours, patterns, and smells to attract insects Knowledge Block 2- All flowers are similar but different - Plants and flowers look different because they pollinate in different ways. - There are two types of pollination Insect and wind - Insect pollinated flowers are usually bright coloured and strong scents - Wind pollinated flowers have less colourful petals and much less scent Knowledge Block 3- Seed dispersal - Plants have evolved many different ways to disperse their seeds - Seed dispersal increases the chances of seeds germinating and growing into a mature plant Knowledge Block 4- What a seed does - A seed contains a miniature, undeveloped version of the plant - They contain a food store for the first stage of growth (until the plant can make its own food) - They are surrounded with a protective coat.	<u>Year 3 Plants</u> <i>Pupils should be taught to:</i> <i>explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.</i>
Year 5		
Year 6		

Variation and Evolution



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Science Knowledge progression document.



Year 2		
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Science Knowledge progression document.



Year 3	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
Year 4	<u>Living things</u> Knowledge Block 1- Classifying living things - Living things can be divided into groups based upon their characteristics Classification keys help group, identify and name living things - Animals can be classified as vertebrates (having a spine) or invertebrates (lacking a spine) - In any habitat there are food chains and webs where nutrients are passed from one organism to another when it is eaten - If the population of one organism in the chain or web is affected, it has a knock-on effect to all the others Knowledge Block 2- Life cycles - Mammals, amphibians, insects and birds have different life cycles. - Lifecycles vary in time depending on the species of animal- it can be as short as just a few weeks for insects, to up to 200 years for sea urchins. Larger animals often have longer life cycles but not always. - All animal life cycles begin with growth and development followed by reproduction. - Some animals undergo a complete metamorphosis as they grow. Metamorphosis is a process where animals undergo an abrupt and obvious change in the structure of their body and their behaviour. - Some animals are eusocial. This means they live in colonies (groups) with one animal or group producing young and the others working to care for them. Knowledge Block 2- Environmental change Environmental change affects different habitats differently - Human activity significantly affects the environment - Different organisms are affected differently by environmental change	<u>Year 4 Living things and their habitats</u> 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. <u>Year 5 Living things and their habitats</u> 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.

Year 5	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
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Science Knowledge progression document.

Fossils, geological time and classification

Knowledge Block 1- What is evolution and how do we know it happened?

- The Earth is very old. Around 4.2 **billion** years. We know this from dating rocks
- Life first appeared on Earth around 3.8 billion years ago.
- Life was, at first, very simple but over **millions** and millions of years life became more complex through the process of **evolution**

Knowledge Block 2- Evidence for evolution

- There are many sources of evidence for evolution
- **Fossils** are one of the main sources of evidence for evolution. They show when new organisms appear and when they go **extinct**.
- Due to the nature of fossil formation and discovery, fossils only provide an incomplete record of evolution.
- Scientists use fossils along with other pieces of evidence (*DNA, Embryology, comparative anatomy, artificial selection*) to work out how organisms have evolved
- Fossils form when dead organisms are rapidly buried or leave an imprint and are turned to stone over a long period of time. If they survive in the Earth, they then have to be found by a **palaeontologist** who will study them.

Knowledge Block 3: Classification of life

- All living (and **extinct**) **organisms** are classified into groups based upon their physical features.
- This includes animals, plants, fungi, and **microorganisms** like **bacteria**.
- Within each of these broad groups, organisms are classified into small subgroups. Animals- invertebrates, mammals, birds, amphibians, reptiles and fish, Plants- flowering plants, ferns, conifers, moss.
- Bacteria are a group of organisms that are not visible to the naked eye but are very abundant and have distinct physical features we can only see under powerful **microscopes**.

Year 5 Evolution and inheritance

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 ago*

Year 6 Living things and their habitats

Pupils should be taught to:

- *describe how 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.*

Science Knowledge progression document.



Year 6	Substantive Knowledge from Learning Journeys	National Curriculum Statutory Requirement
	<u>Classification and Evolution</u> Knowledge Block 1: Natural selection 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 <i>Theory of Evolution by Natural Selection</i> and was developed by Charles Darwin in 1859 Knowledge Block 2: How Charles Darwin discovered the process of Evolution by Natural selection - 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	<u>Year 5 Evolution and inheritance</u> Pupils should be taught to: <i>recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</i> <i>identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution</i>