

Programme of Study for Science

We base our programmes of study on the National Curriculum for Science.

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

Our science curriculum 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.

By the end of each key stage, pupils are expected to know, apply and understand the knowledge, skills and processes specified in the programmes of study and the Skills Progression Framework.

Progression in Science Units

	Year 1	Year 2	Year 3	Year 4	UKS2	
					2021-22	2022-23
Physics	The Seasons and the weather (What is the Weather?) Electric torches (Light) Floating and sinking (Saving Lives)		Electricity Light	Sound Forces and magnetism Rocks and fossils	Earth and Space Light	Electricity Forces
Chemistry	Materials (Rubbish)	Burning (Fire, Fire!) Materials (Castles and Cathedrals)	States of matter		Properties and changes of matter	
Biology	The human body- parts of the body, basic needs and good health (This is me!)	Animals and their habitats (Endangered)	Muscles and skeletons	The digestive system and teeth Rocks and fossils	The circulatory system	Evolution and Inheritance

	Introduction to biodiversity in: woodland habitats; gardens and hedgerows; fresh water habitats	Habitats: woodland, gardens and hedgerows; freshwater habitats	Birds Flowering Plants The School Pond	Life in the woods Pollinators and pollination Biodiversity on the Norfolk Broads	Raptors Classifying life in the school grounds- Linnaeus Conservation	British Mammals Biodiversity on the beach at West Runton Get close to wildlife- wildlife photography
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In Upper Key Stage 2 in Autumn 2022, the children are taught a study unit 'Significant Scientists', which builds on learning about individual scientists in other units.

Natural Science Curriculum Map

	Autumn	Summer 1	Summer 2			
Year 1	Introduction to biodiversity in woodland habitats	Introduction to biodiversity in gardens and hedgerows	Introduction to biodiversity in fresh water habitats			
Year 2	Woodland	Fresh water habitats	Gardens and hedgerows			
Year 3	Birds	Flowering plants	2021-22 Biodiversity at How Hill on the Norfolk Broads			
Year4	Life in the woods	Pollinators and pollination	2022-23 The school pond			
	2020-21			2021-22		
				Autumn	Summer 1	Summer 2
Upper KS2	British Mammals	Classifying life in the school grounds- Linnaeus	Conservation	Raptors	Biodiversity on the beach at West Runton	Get close to wildlife- wildlife photography

Progression in science skills and processes

Aspect of learning	EYFS	Key Stage 1	Lower Key Stage 2	Upper Key Stage 2
Ask and answer questions	Make comments about what they have heard and ask questions to clarify their understanding.	Ask simple questions and recognise that they can be answered in different ways.	Ask relevant questions and suggest different types of scientific enquiries to answer them.	
Plan and set up different types of enquiries		Perform simple tests to answer questions.	Set up simple practical enquiries, comparative and fair tests.	Plan different types of scientific enquiries to answer questions. Recognise and control variables where necessary.
Observing and measuring	Explore the natural world around them, making observations and drawing pictures of animals and plants.	Observe closely using simple equipment. Observe changes over time. Compare and classify different objects, materials and living things.	Make systematic and careful observations. Take accurate measurements using standard units. Use a range of equipment, including thermometers and data loggers.	Take measurements, using a range of scientific equipment, with increasing accuracy and precision. Take repeat readings when appropriate to increase reliability of results.
Gathering and recording data	Write simple phrases and sentences that can be read by others.	Gather and record data to help answer questions.	Gather, record, classify and present data in a variety of ways to help answer questions. Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables.	Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
Interpreting results and drawing conclusions	Offer explanations for why things might happen, making use of recently introduced vocabulary when appropriate.	Begin to notice changes over time, patterns and relationships.	Use results to draw simple conclusions and make predictions for new values. Suggest improvements and raise further questions. Use straightforward scientific evidence to answer questions or support findings.	Look for different causal relationships in data and identify evidence that refutes or supports ideas Make predictions using results and identify when further observations, comparative and fair tests might be needed.

Reporting and communicating findings	Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary.	Record and communicate findings in a range of different ways using simple scientific language.	Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.	Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in a variety of forms and presentations.
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Year 7 destinations

Our children transfer to three high schools, all with different content in Year 7 science. We are confident that the content that our children learn at Gresham Village will equip them with the knowledge and skills required for whichever high school they transfer to.

Sheringham High School	Cromer Academy	Aylsham High School
Biology topics: cells and movement, interdependence and plant reproduction, variation and human reproduction. Chemistry topics: particles and separation, metals and acids, Earth and the Universe, Physics topics: Speed and gravity, voltage and current, energy costs and transfers, sound and light.	Classification Substances and Particles and the Atom, Forces, Isotopes and Electronic Structure Isotopes and Electronic Structure, Force and Motion Ecology 1, Periodic Table Newton's laws Ecology 2, Particles Particles, Speed Humans and health 1, Physical properties, Hooke's law Humans and Health 2, Chemical Formulae and Pressure	Cells and Body Systems Respiration Genetics Atoms and The Periodic Table Particle Theory Chemical Reactions Forces Motion Energy

Programme of Study for Key Stage 1

Most of the natural science and biology that we teach in Key Stage 1 is taught discretely through our natural science programme, which you can find below. Other aspects of science, including human biology is taught in the context of the cross-curricular topics explained in the Key Stage 1 Curriculum Overview. This overview details the scientific knowledge, concepts, skills and understanding that we teach in each unit and the investigations used to develop children's scientific skills.

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. They should be encouraged to be curious and ask questions about what they notice. They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information. They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

In Key Stage 1, science is taught as part of each cross-curricular theme, which is detailed in the **Key Stage 1 Curriculum Overview**. The scientific element of these units are set out below. Natural science units are taught as discrete units and are also set out below.

Year 1

Autumn Term

Introduction to biodiversity in woodland habitats (natural science unit)

Knowledge and understanding:

- 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.
- 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)

Summary of learning:

Using the school woods, children learn to discover the natural world safely and with respect to the natural life they discover. Through the use of a key question for each lesson, the children explore different aspects of this habitat. They use simple identification sheets and simple books to identify some of the trees and animals they find. They learn to identify the trees of the woods, including oak, beech and silver birch and plant seeds in the tree nursery. Through careful observation, including the use of pooters and magnifying glasses, they observe their discoveries carefully, and use the names of the main body and plant parts to describe them. The children begin to compare and contrast what they find, grouping them according to what they eat, number of legs, deciduous/ evergreen etc. The children begin to record what they learn, including the changes to the woodland as the seasons change, in a Nature Journal with short notes, photographs and drawings.

Vocabulary:**From the Y1 theme: This is me.**

The science learning in this theme focuses on the importance of exercise and diet to keep healthy. The children learn about the different parts of the human body and how their bodies grow and carry out different investigations into their senses.

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: - Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. Skills: - Perform simple tests to answer questions. - Gather and record data to help answer questions. - Record and communicate findings in a range of different ways using simple scientific language. Vocabulary to teach: head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth	EYFS: Oral health. Effect of exercise and need for good health. This leads on to the KS2 human biology units, the first of which is Y3 'Muscles and skeletons'.

From the Y1 theme: Light

The science learning focuses on finding out about how a torch works and using simple electrical components to make their own working torch.

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: - distinguish between an object and the material from which it is made - identify and name a variety of everyday materials, including wood, plastic and metal - understand that electricity is a source of energy Skills: - Record and communicate findings in a range of different ways using simple scientific language. Vocabulary to teach: Material, wood, plastic, metal, energy, battery, wire, light bulb, switch, circuit	EYFS: Materials and recycling. Learning about materials continues in the Y1 units 'Rubbish' and 'Saving Lives'. Children are also given more opportunities to use simple scientific language when communicating their findings.

Year 1 Spring Term

From the Y1 theme: Rubbish

In the science element of this unit, the children investigate some of the materials that they will be using for their artwork, sorting them and testing their properties, such as the effect of submersing in water, magnetism, crushing, cutting and scratching.

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: - 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. Skills: - Compare and classify different materials	Learning about materials builds on the previous unit 'Light'. Learning about materials continues in the Y1 unit 'Saving Lives'. This learning then continues in the Y2 units 'Fire! Fire' and 'Castles and Cathedrals'. Children are also given more opportunities to use simple

• Ask simple questions and recognise they can be answered in a variety of ways • Perform simple tests to answer questions • Observe changes over time • Record and communicate findings in a range of different ways using simple scientific language Vocabulary to teach: Material, properties, test, observe, wood, plastic, glass, metal, magnet, magnetic, rust, crush, scratch	scientific language when communicating their findings.
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Year 1 Summer Term

From the Y1 theme: What is the weather?

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: • observe changes across the four seasons • observe and describe weather associated with the seasons and how day length varies Skills and concepts: • Observe closely using simple equipment. • Observe changes over time. • Gather and record data to help answer questions. • Begin to notice changes over time, patterns and relationships. • Record and communicate findings in a range of different ways using simple scientific language. Vocabulary to teach: Weather, seasons, spring, summer, autumn, winter, record, measure, temperature	EYFS: The seasons. Learning about the seasons and weather is built on in the geography aspect of the Y2 unit 'Climates around the World' and subsequent KS2 geography units.

Introduction to biodiversity in fresh water habitats (natural science unit)

Knowledge and understanding:

- 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.
- 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)

Summary of learning

Using the school garden and hedgerows, the children learn to discover the natural world safely and with respect to the natural life they discover. Through the use of a key question for each lesson, the children explore different aspects of this habitat. They use simple identification sheets and simple books to identify some of the plants and animals they find, including common flowering plants, butterflies and bees. Through careful observation, including the use of magnifying glasses, they observe different flowering plants carefully, identifying stem, roots, flower, petals and seeds. The children plant their own flowers and vegetables and observe their plants as they grow. The children begin to record what they learn in a Nature Journal with short notes, photographs and drawings.

From the Y1 theme: Saving Lives

In this unit the children learn about the seasons and how seasonal change affects the weather in the United Kingdom, comparing and contrasting the weather throughout the year. They learn how meteorologists measure different aspects of the weather and how they use this data to create weather forecasts. They set up their own weather station to monitor the weather over a period of time and produce their own weather forecasts.

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: • 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 Skills and concepts: • Ask simple questions and recognise that they can be answered in different ways • Perform simple tests to answer questions. • Gather and record data to help answer questions. • Record and communicate findings in a range of different ways using simple scientific language.	Previous Y1 work on materials and their properties and on testing materials in Light! and Rubbish? Learning in this unit about materials leads on to the Y2 units 'Fire! Fire!' and 'Castles and Cathedrals'.

Vocabulary to teach:	
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Floating, sinking, volume, materials, properties.	
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Introduction to biodiversity in fresh water habitats (natural science unit)

Knowledge and understanding:

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| <ul style="list-style-type: none">• 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.• 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) |
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Summary of learning

Using the school pond, children learn to pond dip safely and with respect to the natural life they discover. Through the use of a key question for each lesson, the children explore different aspects of the pond habitat. They use simple identification sheets and simple books to identify some of the animals they find. Using magnifying glasses, they observe their discoveries carefully, and use the names of the main body parts to describe their characteristics. The children begin to compare and contrast what they find, grouping them according to what they eat (learning the terms carnivore, herbivore and omnivore), number of legs etc. They learn about a variety of common animals that live in or around water and group them as bird, mammal, fish, amphibian and reptile and begin to recognise the characteristics of each group of animals. The children will keep frog spawn in the classroom and use this to find out about the life cycle of a Common Frog, before releasing the young frogs into the school pond. The children begin to record what they learn in a Nature Journal with short notes, photographs and drawings.

Year 2

Autumn Term

Woodland- trees, plant growth and lifecycles (natural science unit)

Knowledge and understanding

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| <ul style="list-style-type: none">• identify and name a variety of plants in their habitats, including microhabitats• observe and describe how seeds and bulbs grow into mature plants |
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- identify and name a variety of animals in their habitats, including microhabitats
- find out about and describe the basic needs of animals for survival (water, food and air)
- 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
- 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

Summary of learning

Using the school woods, children will investigate a key question for every lesson.

They will recap on their learning from their study of the school woods in year 1 and extend their knowledge of British trees on a walk along Fairy Lane, using leaves and bark to identify sweet chestnut and ash. They will make observations and annotated sketches, as well as leaf rubbings for their Nature Journal. They will collect seeds from these trees and plant them in the tree nursery at school, using this as a stimulus for learning about the life cycle of a tree.

The children will be introduced to the term 'habitat' (a natural environment or home of a variety of plants and animals) and 'microhabitat' (a very small habitat, e.g. for woodlice under stones, logs or leaf litter. They will locate and identify vertebrates and invertebrates in the school woods and use tables to record their findings in their Nature Journals. They will begin to construct simple food chains to describe how animals and plants depend on each other to survive and use the terms 'predator' and 'prey' to describe them.

The children will research the conditions in different habitats in the school grounds (under log, on stony path, under bushes) and find out how the conditions affect the number and type(s) of plants and animals that live there.

From the Y2 theme: Fire Fire!

In the context of learning about the Great Fire of London, the children learn about the properties of the different materials that were used in the seventeenth century to build houses. They then use the knowledge they have gained to build their own model of London, which they spectacularly set alight in the school woods. The children use this opportunity not only to understand how the Great Fire spread, but also to understand how different materials react to fire and heat.

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: • Understand that some materials burn and that this process is irreversible • Know that for a material to burn, it requires oxygen	Previous Y1 units on conducting a scientific test and materials in

Skills and concepts: • Ask simple questions and recognise that they can be answered in different ways • Compare and classify different objects and materials according to combustibility • Perform simple tests to answer questions. • Gather and record data to help answer questions. Vocabulary to teach: Fire, burn, oxygen, combustible, non-combustible, irreversible	'Saving Lives' and 'What is the weather?' This leads on to further scientific testing and learning about materials in 'Castles and Cathedrals' and the Y3 unit 'States of Matter'.
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Year 2 Summer Term

Fresh water habitats- food chains and life cycles (natural science unit)

Knowledge and understanding • explore and compare the differences between things that are living, dead, and things that have never been alive • identify and name a variety of animals in their habitats, including microhabitats • notice that animals have offspring which grow into adults • 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 • 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 Summary of learning Using the school pond, the children will investigate a key question for every lesson. They will recap and extend their knowledge of life in the school pond by making observations of the animals that they find in the pond, using identification keys and books to help them. They will learn about predators and prey in the school pond and construct simple food chain diagrams to show what they have learned. The children will classify and group different pond animals into vertebrates/ invertebrates, carnivore/ herbivore and omnivore.
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The children will find out about the life cycle of the Common Newt, learning the word 'metamorphosis' and compare and contrast with the life cycle of a frog. They will learn about conservation and create features that support the habitats required for different pond vertebrates, such as frogs, toads and newts.

From the Y2 theme: Castles and Cathedrals

In the context of a visit to Norwich Cathedral, the children find out about how the cathedral was built and the craftspeople who built it, specifically stone masons, metal workers and carpenters. Using this knowledge, the children learn about the specific properties of metal, stone and wood and how it is used to make modern day products. For example, how metal can be melted and molded to make cans, coins, cars etc. They use the knowledge gained to work scientifically to investigate how the shape of different materials can be changed through squashing, bending, twisting, stretching and melting.

Subject knowledge, skills and concepts	Prior and future learning
Knowledge and understanding: - 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 Skills and concepts: - Ask simple questions and recognise that they can be answered in different ways - Perform simple tests to answer questions. - Gather and record data to help answer questions. - Record and communicate findings in a range of different ways using simple scientific language. Vocabulary to teach: Floating, sinking, volume, materials, properties.	Previous Y1 work on materials and their properties and on testing materials in Light! and Rubbish? Learning in this unit about materials leads on to the Y2 units 'Fire! Fire!' and 'Castles and Cathedrals'.

Gardens and hedgerows- growing plants, life cycles of plants (natural science unit)

Knowledge and understanding: - identify and name a variety of plants in their habitats, including microhabitats - 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.

Summary of learning

Using the school garden and meadow and a visit to Fairy Lane, the children will investigate a key question every week.

The children will find different flowering plants in the school grounds and on a walk down Fairy Lane and use identification keys and books to identify common flowers, such as dandelion, cornflower and buttercup. They will make observational sketches and labelled diagrams and collect small plants to press and record in their nature journals.

They will grow flowers and vegetables from seeds, observing them grow over a period of weeks. They will conduct experiments to find out how plants need water and light to remain healthy. They will revisit the structure of flowering plants learnt in year 1 and learn about the importance of pollination in the reproduction of flowering plants. This will be applied to their learning about different flowers and plants found in the school garden and meadow.

The children will find out about the importance of worms in the decomposition of leaf material and creation of soil and compost. They will make a wormery in the school garden as a conservation project.

From the Y2 theme: Endangered

Subject knowledge, skills and concepts	Prior and future learning
Science Knowledge and understanding: • 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 Skills and concepts: • Ask simple questions and recognise that they can be answered in different ways • Compare and classify living things • Record and communicate findings in a range of different ways using simple scientific language	Previous Y2 unit on 'Climates around the World'. Y1 and 2 natural science units on different animals and their habitats. This unit leads on to the natural science study units in Key Stage 2 and specifically the years 4 and 6 units on biodiversity and the Year 5 unit on 'Conservation'.

Vocabulary to teach:	
Habitat, microhabitat, variety, endangered, extinction, climate, adapt, species	

Programme of study for Key Stage 2

As with Key Stage 1, the majority of natural science and biology is taught through our natural science programme, which is detailed in its own programme of study. In Key Stage 2, all science is taught discretely through specific study units that are based on the National Curriculum, with planning supported by the Engaging Science programme. The study units detail the scientific knowledge, concepts and understanding that we teach in each unit and the investigations used to develop children's scientific skills. Progression in these skills can be found in the Skills Progression Framework.

Lower Key Stage 2

The principal focus of science teaching in lower key stage 2 is to enable pupils to broaden their scientific view of the world around them. They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions. They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information. They should draw simple conclusions and use some scientific language; first to talk about, and later, to write about what they have found out.

Pupils in years 3 and 4 should be given a range of scientific experiences to enable them to raise their own questions about the world around them. They should start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; recognise when a simple fair test is necessary and help to decide how to set it up; talk about criteria for grouping, sorting and classifying; and use simple keys. They should begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. They should help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used.

Lower Key Stage 2 Study Units

Year 3

Autumn Term

Birds- identification, classification, life cycles and migration

Pupils should be taught to:

- 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
- construct and interpret a variety of food chains, identifying producers, predators and prey

Summary of learning

The children will study birds in the school grounds and on a trip to the Norfolk Wildlife Trust bird reserve at Cley. While at Cley, the children should explore the positive impact of humans on their environment and contrast this with the destruction of many natural habitats.

At Cley, the children will use identification keys, books and charts to identify birds on the marshes. They will learn to use binoculars to observe the different birds and make notes about their behaviour and find out about the migratory habits of many of the birds there, charting their different migrations on a map of the Atlantic, North European and Arctic regions. They will make a simple guide to the birds that can be found on Cley marshes.

At school, the children will study the life cycle of a bird by making a diary of a bird's nest via a nest cam. They will watch how adult birds care for their eggs and young to the point of fledging. The children will find out about predatory birds such as kestrels, sparrowhawks, barn owls, magpies and herons and other birds that are predated, either for their eggs, young or adult birds. They will construct simple food chains to show producers, prey and predators.

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 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.

Summary of learning:

Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers and motors, and including switches, and use their circuits to create simple devices. Pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage; these will be introduced in Upper Key Stage 2. Note: Pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. Pupils should be taught about precautions for working safely with electricity.

Pupils might work scientifically by: observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit. Children could predict and carry out conductivity tests on materials.

Vocabulary to be used and understood: electricity, circuit, cells, wires, bulbs, switch, buzzer, battery, conductor, insulator

Links to other units: Geography: Where does our electricity come from?; Electricity (UKS2)

LIGHT

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.

Summary of learning:

Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. They should think about why it is important to protect their eyes from bright lights. They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change. Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

Pupils might work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes. They might construct a simple sundial or shadow clock in the playground to demonstrate how shadows change as the sun appears to travel across the sky.

Vocabulary to be used and understood:

Shadow, reflect, light source,

Year 3 Spring Term**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 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.

Summary of learning:

Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). Pupils should observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled. Note: Teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning.

Pupils might work scientifically by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. They might observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting. Children could investigate the effect of variables such as temperature, size of container, wind (use a fan for constant wind speed indoors), on the evaporation of water.

Vocabulary to be used and understood:

Evaporate, condense, vapour, gas, liquid, solid, melt, atmosphere, molecules, vibration, container, capacity

Links to other units:

Geography –water cycle, Upper KS2 Properties and Changes of Materials

MUSCLES AND SKELETONS

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.

Summary of learning:

Pupils should continue to learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions and how muscles work to make

us move. The children research different food groups and how they keep us healthy and design simple meals based on what they find out.

Pupils might work scientifically by: identifying and grouping animals with and without skeletons and observing and comparing their movement; exploring ideas about what would happen if humans did not have skeletons. They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat.

Pupils could investigate the importance of calcium in our bones by soaking a chicken bone (or similar) in vinegar to dissolve the calcium, rendering the bone rubbery and flexible.

Vocabulary to be used and understood:

Vertebrate, invertebrate, muscles, joints, scientific names for key bones e.g femur, patella, ribs, cranium, tibia, fibula, pelvis, radius, ulna, humerus, sternum, clavicle, scapula, carnivore, herbivore, omnivore

Year 3 Summer Term

Flowering plants- classification, structure and pollination

Pupils will 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

Summary of learning

Using the school garden, the children will grow and study garden and wild flowers and grasses. On a local walk, they will use books and identification sheets and keys to identify common wildflowers, building on their learning in year 2, including campion, poppies, wild daisies, shepherd's purse, white, dead and stinking nettles and common grasses. They will conduct a survey to find out what flowers grow in our local environment and record their findings through drawings and on a simple map.

At school, the children will dissect different flowering plants and grasses to identify the roots, stem or stalk, leaves and flowers and learn about their functions. By putting cut flowers, such as carnations, in a coloured dye, the children will observe how a plant transports water within its structure.

They will collect seeds from wild flowers and try to grow these and other flowering plants and vegetables at school, experimenting with different conditions for growing, such as light, water and nutrients.

Throughout, the children will keep their nature journal to record what they have learnt.

Year 4

Autumn Term

Life in the woods- classification, life cycles and food chains

Pupils will 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
- construct and interpret a variety of food chains, identifying producers, predators and prey
- explore seed formation and seed dispersal in trees

Summary of learning

Based on studies at school in our school wood and through a visit to the woods at Felbrigg Hall, the children will deepen and extend their knowledge and understanding of woodland habitats. Through use of identification books, keys and charts, they will gain an understanding of creatures that live on and under the woodland floor and in the woodland canopy. This will include making lists and observational drawings. The children will conduct a survey of a square metre of the woods at Felbrigg and then compare and contrast this with a similar survey in the school woods.

Whilst on the visit to Felbrigg, the children will find out about species of woodpecker that are native to Britain and begin to understand how their anatomy and behaviours have adapted to the woodland environment that they live in.

The children will learn about seed dispersal in trees, for example by studying animal dispersal for oaks, sweet chestnut, cherry and hawthorn; and wind dispersal in sycamores. They will conduct experiments into seed dispersal. The children will also check and tend to their tree nursery that they planted in Key Stage 1.

DIGESTION AND TEETH

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

Summary of learning:

Pupils are introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach, small and large intestine and rectum and explore questions that help them to understand their special functions. The children compare the teeth of carnivores and herbivores, and suggesting reasons for differences. They also learn about what damages teeth and how to look after them.

Pupils might work scientifically by: They might draw and discuss their ideas about the digestive system and compare them with models or images. Pupils might investigate the importance of dental hygiene and compare the effects of sugar on teeth by leaving milk teeth in cups of orange juice, cola, milk and a control container of water.

Vocabulary to be used and understood:

Teeth, (incisors, canines, pre-molars, molars) gums, enamel, dentine, pulp, root, nerve, decay, plaque, saliva, digest, nutrients, waste

Links to other units: The human body- parts of the body, basic needs and good health (This is me!) KS1; Dental hygiene in PSHE Physical health and mental well-being

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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 • 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. Summary of learning: Pupils should explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways. Pupils might work scientifically by: finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. They might make earmuffs from a variety of different materials to investigate which provides the best insulation against sound. They could make and play their own instruments by using what they have found out about pitch and volume. They could demonstrate the vibration of sound waves by banging a metal tray next to a cling-film covered bowl with a few grains of rice on it. Vocabulary to be used and understood: Sound wave, vibration, pitch, volume, sound insulation, amplification Links to other units:

Year 4 Spring Term

FORCES AND MAGNETISM
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.
- give a brief explanation on the Earth's magnetic field and how compasses work.

Summary of learning:

Pupils should observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). They should explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe).

Pupils might work scientifically by: comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces and gathering and recording data to find answers their questions; exploring the strengths of different magnets and finding a fair way to compare them; sorting materials into those that are magnetic and those that are not; looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets. Children could make their own compass using a magnetized needle, shallow dish of water and a slice of cork.

Vocabulary to be used and understood:

Magnetic, repel, attract, poles, magnetized

ROCKS AND FOSSILS

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.

Summary of learning:

The children explore different kinds of rocks and soils, including those in the local environment. They will identify rocks as being either sedimentary, igneous or metamorphic and learn how these different types of rock are formed. The children will research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. They will visit the Deep History Coast exhibition at West Runton and go fossil hunting on the beach, using an identification guide to identify their finds.

They will work scientifically by: observing rocks, including those used in the school and church buildings and graveyard, and exploring how and why they might have changed over time; using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them.

They will also explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They raise and answer questions about the way soils are formed. Children could make their own compost heap to observe the decay plant matter turn into compost over time, or they could make observations using the school garden.

Vocabulary to be used and understood:

Year 4 Summer Term

Pollinators and pollination

Pupils will be taught to:

- explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal
- explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- describe the life cycles of different insects

Summary of learning

On a local nature walk, the children will spot different flying insects, such as butterflies, bees, flies and beetles. They will use identification sheets, books and keys to identify what they have spotted and make scientific notes in their nature journals to draw and record what they have seen and how it was behaving. They will observe specifically the behaviour of flying insects around flowers and learn how they are pollinators of flowering plants.

Back at school, the children will learn about the life cycles of butterflies and ladybirds through butterfly and ladybird breeding kits.

At school, the children will dissect different flowers to identify the petals, stamen, stigma and ovary and understand their function. They will observe and draw/ photograph a poppy or similar flowering plant over time to see how a flower changes after pollination and how seeds are produced. The children then apply what they have learned by observing the changes in other flowering plants.

The children will find out about seed dispersal in flowering plants, conducting experiments to find out about wind dispersal in dandelions and poppies and animal dispersal in teasles and goose grass.

Years 3 and 4 Summer Term, 2022**Biodiversity on the Norfolk Broads****Pupils will 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
- construct and interpret a variety of food chains, identifying producers, predators and prey

Summary of learning

Through a visit to How Hill or a similar location on the Norfolk Broads, such as Ranworth Broad, the children find out about the biodiversity of this habitat. Using identification guides and keys, they will examine what lives in the water in this environment and compare and contrast this with what they find in the pond at school. They will construct food chains, identifying producers, prey

and predators in the Broads environment. They will also group the animals they find according to whether they are vertebrate or invertebrate; carnivore, herbivore or omnivore. They will further group vertebrates into fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects.

The children will find out about the Swallowtail butterfly, learning about its life cycle and why it is particular to the Norfolk Broads and how it is vulnerable to changes in the Broads habitat.

Years 3 and 4 Summer Term 2023

The school pond- identification, classification, life cycles and food chains

Pupils will 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
- construct and interpret a variety of food chains, identifying producers, predators and prey

Summary of learning

Based on pond dipping in the school pond, the children will further extend their knowledge of freshwater ecosystems from Key Stage 1. They will use more complex identification charts and keys to identify the whole range of life in the pond, including different fly larvae. They will explore the life cycles of different larvae, including that of the dragonfly and compare and contrast this with the life cycles of other creatures they have studied, such as frogs and toads, butterflies and newts. The children will construct food chains and extend this to investigate food webs, that show the interdependence of life in the pond.

The children will also consider how human activity might disturb a freshwater ecosystem through the release of pesticides, other chemicals and rubbish.

Throughout, the children will record their findings and learning in their Nature Journals.

Upper Key Stage 2

The principal focus of science teaching in upper key stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

Pupils in years 5 and 6 should use their science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. They should use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment. They should make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; choose the most appropriate equipment to make measurements and explain how to use it accurately. They should decide how to record data from a choice of familiar approaches; look for different causal relationships in their data and identify evidence that refutes or supports their ideas. They should use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. They should use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time.

Upper Key Stage 2 Study Units, 2021-22

Autumn Term 2021

Raptors- life cycles, food chains and adaptation

Pupils will 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
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

Summary of learning

Pupils build on their learning in Key Stage 1 and Lower Key Stage 2 about animal life cycles and food chains and their knowledge and understanding of birds through a study of raptors.

The children will get up close to different raptors from the UK and compare and contrast their feeding and hunting habits and look at how different raptors have evolved and adapted to their environments. They will study the feathers of various raptors, learning the shape and function of different feathers.

They will look specifically at how Barn Owls have asymmetrical ears and non-waterproof feathers, learning how these adaptations enable the barn owl to survive in its habitat. In their study of Barn Owls, the children will dissect an owl pellet in order to find out what it eats. The children will learn about the decline in Barn Owl numbers and the reasons for this.

The children will learn how humans have impacted on raptor populations over decades and centuries.

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

Summary of learning:

Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones). Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

Pupils might work scientifically by: comparing the time of day at different places on the Earth through internet links and direct communication; creating simple models of the solar system; constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day; finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks; creating models or drawing diagrams to show how the rotation of the earth and its orbit round the sun create day, night and the seasons.

Vocabulary to be used and understood:

Solar system, orbit, rotation, satellite, moon, planet, axis, terrestrial planet, gas giant, dwarf planet, goldilocks zone, Kuiper belt, Oort cloud, comet, asteroid.

Links to other units:

Light – change in shadows as the earth rotates and sun appears to move across the sky.

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

- 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.

Summary of learning:

Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in year 3 and about electricity in year 4. They should explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes. Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials.

Pupils might work scientifically by: carrying out tests to answer questions, for example, ‘Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?’ They might compare materials in order to make a switch in a circuit. They could observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes. They might research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials. Children should predict and investigate whether a change is reversible or irreversible.

Vocabulary to be used and understood:

Solid, liquid, gas, insulator, conductor, dissolve, solution, evaporate, condense, filter, sieve, melt, solidify

Links to other units: States of Matter LKS2

Upper Key Stage 2, Spring Term 2022

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
- 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.

Summary of learning:

Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions. Children should learn the anatomy of the human eye and create labelled diagrams to show how light enters the eye and how the image is received.

Pupils might work scientifically by: deciding where to place rear-view mirrors on cars; designing and making a periscope and using the idea that light appears to travel in straight lines to explain how it works. They could investigate where to place mirrors to send light around a 'track' made from straight lines joined at various angles. They might investigate the relationship between light sources, objects and shadows by using shadow puppets or creating a shadow theatre. They could extend their experience of light by looking a range of phenomena including rainbows, colours on soap bubbles, prisms, objects looking bent in water, and coloured filters (they do not need to explain why these phenomena occur).

Vocabulary to be used and understood:

Image, pupil, iris, lens, cornea, retina, optic nerve

Links to other units: Earth and Space

The circulatory system.

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.

Summary of learning:

Pupils should build on their learning from years 3 and 4 about the main body parts and internal organs (skeletal, muscular and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function.

Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.

Pupils might work scientifically by: exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health. They could research how professional athletes use exercise and nutrition to maintain their performance, health and physique. Pupils might investigate the effect of exercise on their heart rate.

Vocabulary to be used and understood:

Blood vessels, arteries, veins, heart, chambers, aorta, lungs, gas exchange, respiration, pulse, carbohydrate, protein, fats, vitamins, minerals.

Links to other units:

LKS2 Digestion and Teeth, Muscles and Skeletons. Cross-curricular links with PE and PSHE.

Upper Key Stage 2, Summer Term 2022

Classifying life in the school grounds- The Linnaeus system of classification

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

Summary of learning

In this unit of work, the children build on their learning about grouping living things in Lower Key Stage 2, by looking at the classification system in more detail. They are introduced to the idea that broad groupings, such as micro-organisms, plants and animals can be subdivided. The children find out about the work of Karl Linnaeus and how he divided living things into five kingdoms, then subdivided them into phyla, class, order, family, genus and species. The children investigate the classification of minibeasts with exoskeletons (arthropoda) in the school woods, identifying arachnids, crustaceans, hexapoda (insects and springtails) and myriapoda (millipedes and centipedes). The children also learn about the binominal system of naming genus and species using Latin words and conduct an investigation into the Latin names of common animals and plants in the local area.

Conservation

Pupils should be taught to:

- understand the impact of changes in the environment to the balance of nature in the local environment
- understand that humans can have a positive impact on the environment and natural world through conservation and 'rewilding'.

Summary of learning

In this study unit, the children explore different ways in which they can make space for nature at home and in the school grounds through the RSPB Wild Challenge, Gold Award. Challenges include:

- Plant safari
- Bioblitz
- Biodiversity action plan
- Homes for mammals
- Fund raising
- Pond dipping

Some challenges will have been achieved through other Upper Key Stage 2 activities, such as Homes for Mammals and Plant Safari.

Upper Key Stage 2, 2022-23

Autumn Term 2022

British mammals- life cycles, food chains and adaptation

Pupils will 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
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution

Summary of learning

In this unit of learning, the children learn about the life cycles and life processes of British mammals, both terrestrial and marine. They learn about the particular features of mammals and compare and contrast mammals with amphibians, insects and birds. They also compare the mammals found in the United Kingdom with mammals across the world, such as in Africa and South America, identifying predators, prey and producers in food chains and the life processes of some of these mammals, including gestation periods for larger mammals such as elephants and rhinosaurs.

Through a visit from the Norfolk Wildlife Service, the children learn specifically about British bats. They find out how bats have adapted to hunt at night through echolocation and how human activity has led to a decline in the numbers of bats and the extinction of some species in the United Kingdom. They also learn what conservationists have done to help to protect bats.

FORCES

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.

Summary of learning:

Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Pupils should explore the effects of levers, pulleys and simple machines on movement. Pupils might find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Pupils might work scientifically by: exploring falling paper cones or cup-cake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. They might explore resistance in water by making and testing boats of different shapes. They might design and make products that use levers, pulleys, gears and/or springs and explore their effects. They might investigate the effectiveness of a cardboard-box air cannon on paper cups.

Vocabulary to be used and understood:

Gravity, newtons, mass, weight, buoyancy, friction, resistance

Links to other units: DT: Pulleys and Mechanisms

Significant Scientists

Summary of learning:

In this unit, children will find out about the work of significant scientists throughout history to present day. They will learn about the inventions, discoveries, theories and studies of eminent scientists. Children should be exposed to a diverse range of scientists across a variety of fields. Children will gain a broad understanding of scientific discoveries and inventions over the centuries then focus their studies on one or two scientists.

Teachers may choose scientists who fit in with other units of work or compare and contrast scientists in the same field of study e.g Robert Koch and Edward Jenner. Children will present their research and findings in written form as a non-chronological report or a biography.

Pupils might work scientifically by: replicating the work of the scientist they have studied e.g. after studying naturalists such Darwin, Attenborough or Goodall, children could make observations on the variety and behaviour of animal species in the local environment.

Vocabulary to be used and understood:

Invention, discovery, study, theory, naturalist, biologist, zoologist, chemist, physicist.

Links to other units: This will depend on the unit e.g Tesla would link to electricity, Darwin to living things and their habitats etc. There are strong cross-curricular links to history and English due to nature of the research and presentation of findings.

Upper Key Stage 2, Spring Term 2023**ELECTRICITY****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.

Summary of learning:

Building on their work in year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols.

Note: Pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity.

Pupils might work scientifically by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm or some other useful circuit. They could investigate other sources of energy that can be converted to power cells by making potato clocks or similar fruit/veg based device.

Vocabulary to be used and understood:

electricity, circuit, cells, wires, bulbs, switch, buzzer, battery, conductor, insulator

Links to other units:

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
- 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.

Summary of learning:

Building on what they learned about fossils in the topic on rocks in year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution. Pupils could research how planter breeders select desirable traits in plants/crops then cross pollinate or graft species to respond to consumer demand.

Note: At this stage, pupils are not expected to understand how genes and chromosomes work.

Pupils might work scientifically by: observing and raising questions about local animals and how they are adapted to their environment; comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins and camels. They might analyse the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, brightly coloured and scented flowers. They could design their own animal species that has the required adaptations for certain environments.

Vocabulary to be used and understood:

Habitat, environment, adaptation, evolution, fossil, inherit, offspring, hybrid, natural selection,

Links to other units:

Biodiversity on the beach at West Runton- identification, food chains and adaptation

Pupils will be taught to:

- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution
- 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

Summary of learning

Through a visit to a local rocky beach, such as East or West Runton, the children learn about the biodiversity that exists on the shore edge through an investigation of rock pools. They construct complex food chains and investigate the life cycles of the creatures they find, including fish, molluscs and salt water crustaceans. They investigate the different life processes of the local Brown Crab, cormorant and mackerel and compare and contrast this with what they have learnt about other classifications of animals.

Drawing on their prior knowledge of birds using binoculars and identification keys, the children investigate the variety of birds found at the beach, their habits and behaviours and how birds in this environment have adapted. They consider particularly the different beaks of coastal birds such as the oyster catcher, sandpiper and spoonbill and how these different birds have evolved to forage for different foods. They learn about how this makes them vulnerable as a species and contrast this with the success of different species of gull in the local area.

Get close to wildlife- wildlife photography

Pupils will be taught to:

- understand that humans can have a positive impact on the environment and natural world through conservation

Summary of learning

This is a cross-curricular art, science and conservation project in which the children study a specific aspect of the local natural world through photography. The children learn about the work of famous international wildlife photographers, such as Cristina Mittermeier, Marina Cano and Tin Man Lee, learning about the process of composing a photograph 'in the wild' and how

photographers often use a photograph, not only to show the beauty and interest of nature, but also to relay a message about conservation.

The children then plan and carry out their own photography 'expeditions' in the school grounds and local area, select and edit their photographs and put on their own wildlife photography exhibition at school and online.