Science – Animals, including humans – Years 1-6

Rationale

In the Spring term, the children in Year 1 learn about animals, including humans. The topic of this term is Percy the Park Keeper and we use Percy's animal friends to make links with our science work. As the weather is getting warm, we start to notice more animals around the school grounds and local area and use this to help identify common animals.

In Year 2 animals, including humans is taught in Autumn, alongside living things and their habitats, as this is the longest term and this topic has the most curriculum links to cover. During this term, the topic the children will be looking at is 'The Gruffalo', which lends itself to the children learning about different habitats and animals within each habitat.

As the children have covered many aspects of this topic in Year 1 and 2, the children in year 3 work in order to gain a deeper understanding of food knowledge and nutrition. They will examine in more detail the nutritional information provided on packaging and this aspect will be linked to our Health and Fitness work which takes place in the Summer Term. Following on from this the children will have a look at the impact of good nutrition on their bodies and we then look in more detail at bones for protection in both animals and humans.

In Year 4 the children carry on with their prior learning from Year 2 (Living Things) and they will now be able to describe how animals obtain their food from plants and other animals using the idea of a simple food chain. They investigate and discover these things within the Summer term when we are focusing on Health and Fitness week where we are examining the impact of food and our bodies.

During the Autumn term, the driver for work in Year 5 is 'The Rainforest'. The children visit the Botanical Gardens and study plants and insects, they look at different habitats thus supporting learning within the topic.

During the Spring term, the driver for Year 6 is the book 'Pig Heart Boy' by Malorie Blackman. Understanding about how the heart works was a natural link that supports the book, enabling the children to have a greater understanding of how the heart works and the importance of it for the human body.

Learning

EYFS Prior Knowledge	Year 1	**Year 3**
ELG2 – Understanding They answer 'how' and 'why' questions. ELG14 – The world Children know about similarities and differences in relation to places, objects, materials and living things They talk about the features of their own immediate environment and how environments might vary from one another They make observations of animals and plants and explain why some things occur, and talk about changes ELG16 – Exploring and using media and materials	Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	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. **Year 4** Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions Construct and interpret a variety of food chains, identifying producers, predators and prey. **Year 5** Describe the changes as humans develop to old age. Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. (Living things and their habitats)

They safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. ELG 17 – Being imaginative Children use what they have learnt about media and materials in original ways, thinking about uses and purposes	**Year 2** Notice that animals, including humans, have offspring which grow into adults. Find out and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.	Describe the life process of reproduction in some plants and animals. (Living things and their habitats) **Year 6** 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. 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. (Living things and their habitats) Give reasons for classifying plants and animals based on specific characteristics. (Living things and their habitats)

Key Vocabulary

Year 1
Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves
Names of animals experienced first-hand from each vertebrate group
Parts of the body
Senses – touch, see, smell, taste, hear, fingers (skin), eyes, nose, ear and tongue
Year 2
Offspring, reproduction, growth, child, young/old stages (examples - chick/hen, baby/child/adult, caterpillar/butterfly), exercise, heartbeat, breathing, hygiene, germs, disease, food types (examples – meat, fish, vegetables, bread, rice, pasta)
Year 3
Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, move, skull, ribs, spine, muscles, joints
Year 4
Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, teeth, incisor, canine, molar, premolars, herbivore, carnivore, omnivore, producer, predator, prey, food chain
Year 5
Puberty
Year 6
Heart, pulse, rate, pumps, blood, blood vessels, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle

Misconceptions

Year 1 - Some children may think:

- only four-legged mammals, such as pets, are animals
- humans are not animals
- insects are not animals

- all ‘bugs’ or ‘creepy crawlies’, such as spiders, are part of the insect group
- amphibians and reptiles are the same.

Year 2 - Some children may think:

- an animal’s habitat is like its ‘home’
- all animals that live in the sea are fish
- respiration is breathing
- breathing is respiration.

Year 3 - Some children may think:

- certain whole food groups like fats are ‘bad’ for you
- certain specific foods, like cheese are also ‘bad’ for you
- diet and fruit drinks are ‘good’ for you
- snakes are similar to worms, so they must also be invertebrates
- invertebrates have no form of skeleton.

Year 4 - Some children may think:

- arrows in a food chains mean ‘eats’
- the death of one of the parts of a food chain or web has no, or limited, consequences on the rest of the chain
- there is always plenty of food for wild animals
- your stomach is where your belly button is
- food is digested only in the stomach
- when you have a meal, your food goes down one tube and your drink down another
- the food you eat becomes “poo” and the drink becomes “wee”.

Year 5 - Some children may think:

- a baby grows in a mother’s tummy
- a baby is “made”.

Year 6 - Some children may think:

- your heart is on the left side of your chest
- the heart makes blood
- the blood travels in one loop from the heart to the lungs and around the body
- when we exercise, our heart beats faster to work the muscles more
- some blood in our bodies is blue and some blood is red
- we just eat food for energy
- all fat is bad for you
- all dairy is good for you
- protein is good for you, so you can eat as much as you want
- foods only contain fat if you can see it
- all drugs are bad for you.

Science – Everyday materials – Years 1&2

Rationale

During the Autumn term, Year 1 children will be learning about George Stephenson and the Rocket. Teaching materials in this term will allow children to deepen their understanding of the world around them and the use of materials in it. It will also allow them to work practically by conducting experiments to find the best material for a waterproof coat for George Stephenson and which material would make the best curtains for the Rocket etc. It will also give the children a hands on approach to their learning and will hopefully ignite a passion for learning science that will be maintained within the other areas of study.
During the Spring term, Year 2 children will be focussing on working scientifically. They will be learning about Charlie and the Chocolate Factory and will use this opportunity to experiment with sweets as Willy Wonka does. As the focus of materials in Year 2 is the suitability of materials and changing of shape it seems ideal to fit this in with Charlie and the Chocolate Factory as experimenting with what is known is how Willy Wonka creates new inventions.

Learning

EYFS - Prior Knowledge

ELG2 – Understanding
They answer 'how' and 'why' questions.
ELG14 – The world
Children know about similarities and differences in relation to places, objects, materials and living things
They talk about the features of their own immediate environment and how environments might vary from one another
They make observations of animals and plants and explain why some things occur, and talk about changes
ELG16 – Exploring and using media and materials
They safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function.
ELG 17 – Being imaginative
Children use what they have learnt about media and materials in original ways, thinking about uses and purposes

Year 1

Distinguish between an object and the material from which it is made.
Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.
Describe the simple physical properties of a variety of everyday materials.
Compare and group together a variety of everyday materials on the basis of their simple physical properties.

Year 2

Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Year 3

Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Rocks)
Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Rocks)
Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Forces and magnets)

Year 4 (States of matter)

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.

Year 5 (Properties and changes of materials)

Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity 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.

Key Vocabulary
Year 1 Object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through **Year 2** Names of materials – wood, metal, plastic, glass, brick, rock, paper, cardboard Properties of materials – As for Year 1 (object, material, wood, plastic, glass, metal, water, rock, brick, paper, fabric, elastic, foil, card/cardboard, rubber, wool, clay, hard, soft, stretchy, stiff, bendy, floppy, waterproof, absorbent, breaks/tears, rough, smooth, shiny, dull, see-through, not see-through), plus opaque, transparent and translucent, reflective, non- reflective, flexible, rigid Shape, push/pushing, pull/puling, twist/twisting, squash/squashing, bend/bending, stretch/stretching
Misconceptions
Year 1 - Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word 'rock' describes an object rather than a material • 'solid' is another word for hard. Year 2 - Some children may think: • only fabrics are materials • only building materials are materials • only writing materials are materials • the word rock describes an object rather than a material • solid is another word for hard.

Science – Living things and their habitats – Years 2, 4, 5 & 6		
Rationale		
In Year 2 Living things and their habitats is taught in Autumn, alongside animals, including humans, as this is the longest term and this topic has the most curriculum links to cover. During this term, the topic the children will be looking at is 'The Gruffalo', which lends itself to the children learning about different habitats and animals within each habitat. Year 4 complete this unit within the Summer term as the weather allows more outside investigations and the schools outdoor environment can be accessed. This unit becomes an outdoor classroom as it allows opportunities for living things to grow and flourish. During the Autumn term, the driver for work in Year 5 is 'The Rainforest'. The children visit the Botanical Gardens and study plants and insects, they look at different habitats thus supporting learning within the topic. During Autumn 1 the Year 6 children studied Evolution and Inheritance, the work of Darwin was a natural progression to learning more about Living things and their Habitats. The revisit of this topic will allow children to deepen their understanding of Living things. The children will be aware of the importance of classification.		
Learning		
Year 1: Prior Knowledge	Year 2	**Year 3** Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. (Plants)

Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. (Plants) Identify and describe the basic structure of a variety of common flowering plants, including trees. (Plants) Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Animals, including humans) Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Animals, including humans) Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Animals, including humans) Observe changes across the four seasons. (Seasonal changes)	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.	**Year 4** 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. (Animals, including humans) **Year 5** 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 6** 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.

Key Vocabulary

Year 2

Living, dead, never been alive, suited, suitable, basic needs, food, food chain, shelter, move, feed

Names of local habitats e.g. pond, woodland etc.

Names of micro-habitats e.g. under logs, in bushes etc.

Year 4

Classification, classification keys, environment, habitat, human impact, positive, negative, migrate, hibernate

Year 5

Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings

Year 6

Vertebrates, fish, amphibians, reptiles, birds, mammals, invertebrates, insects, spiders, snails, worms, flowering, non-flowering

Misconceptions

Year 2 - some children may think:

- an animal's habitat is like its 'home'
- plants and seeds are not alive as they cannot be seen to move
- fire is living
- arrows in a food chain mean 'eats'.

Year 4 - some children may think:

- the death of one of the parts of a food chain or web has no or limited consequences on the rest of the chain
- there is always plenty of food for wild animals
- animals are only land-living creatures
- animals and plants can adapt to their habitats, however they change
- all changes to habitats are negative.

Year 5 - some children may think:

- all plants start out as seeds
- all plants have flowers
- plants that grow from bulbs do not have seeds
- only birds lay eggs.

Year 6 - some children may think:

- all micro-organisms are harmful
- mushrooms are plants.

Science – Plants – Years 1,2 & 3

Rationale

We teach plants in the summer term in Year 1 as it is generally warmer and dryer. It allows the children the practical experiences of looking at plants that have grown in their local area and growing their own. It also builds on their knowledge of living things from the previous topic as we start to explore plants. At the end of this topic we use plants and trees as the main focus of seasonal changes but gather the knowledge they have acquired over our seasonal walks and discuss the changes. We do this in Summer as they will have experienced each season by then.

During the Summer term, Year 2 children will be learning about the requirements for plant growth and observing changes over time. The warmer temperatures support the planting of sunflowers and allows children to investigate the different variables for growing plants with ease. They will also have better access to the outdoor learning environment for nature walks and seasonal observations. Links are also made to plants through the Captain James Cook topic as children are introduced to Joseph Banks and his work as a botanist on Captain Cook's 1766 voyage.

Within the Autumn term in Year 3 the children are introduced to the idea of rocks and soil and experience looking at samples of soil using a wormery and identifying the various layers of soil. Following this within the Spring Term, the children begin to look at and explore the requirements of plants for life and growth and the warmer spring months are an excellent time to explore this concept. This is then linked to our Art topic of printing using pressed flowers alongside sketching and drawing of the leaves and plants collected.

Learning

EYFS - Prior Knowledge	Year 1	**Year 3**
ELG2 – Understanding They answer 'how' and 'why' questions. ELG14 – The world Children know about similarities and differences in relation to places, objects, materials and living things They talk about the features of their own immediate environment and how environments might vary from one another They make observations of animals and plants and explain why some things occur, and talk about changes ELG16 – Exploring and using media and materials	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 describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant. Investigate the way in which water is transported within plants. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. **Year 4** Recognise that living things can be grouped in a variety of ways. (Living things and their habitats) Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment. (Living things and their habitats) Recognise that environments can change and that this can sometimes pose dangers to living things. (Living things and their habitats)

They safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. ELG 17 – Being imaginative Children use what they have learnt about media and materials in original ways, thinking about uses and purposes	**Year 2** 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, and describe the impact of changing these. Identify and name a variety of plants and animals in their habitats, including micro-habitats. (Living things and their habitats)	**Year 5** Describe the life process of reproduction in some plants and animals. (Living things and their habitats) **Year 6** 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. (Living things and their habitats) Give reasons for classifying plants and animals based on specific characteristics. (Living things and their habitats)

Key Vocabulary

Year 1
Leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud Names of trees in the local area
Names of garden and wild flowering plants in the local area
Year 2
As for Year 1 (leaf, flower, blossom, petal, fruit, berry, root, seed, trunk, branch, stem, bark, stalk, bud Names of trees in the local area
Names of garden and wild flowering plants in the local area) plus light, shade, sun, warm, cool, water, grow, healthy
Year 3
Photosynthesis, pollen, insect/wind pollination, seed formation, seed dispersal (wind dispersal, animal dispersal, water dispersal)

Misconceptions

Year 1 - Some children may think:

- plants are flowering plants grown in pots with coloured petals and leaves and a stem
- trees are not plants
- all leaves are green
- all stems are green
- a trunk is not a stem
- blossom is not a flower.

Year 2 - Some children may think:

- plants are not alive as they cannot be seen to move
- seeds are not alive
- all plants start out as seeds
- seeds and bulbs need sunlight to germinate.

Year 3 - Some children may think:

- plants eat food
- food comes from the soil via the roots
- flowers are merely decorative rather than a vital part of the life cycle in reproduction

- plants only need sunlight to keep them warm
- roots suck in water which is then sucked up the stem.

Science – Seasonal Changes – Year 1

Rationale

Seasonal changes are taught throughout the year in Year 1 so that the children can experience each season practically. The children are given a chance to go out and explore each season and take pictures/notes of what they can see, feel, smell etc. This happens over 2 lessons each term and then in Summer we look at the changes between each season. We also make notes on when it starts to get light/dark and talk about the changes over the different seasons.

Learning

EYFS – Prior Knowledge

ELG2 – Understanding
They answer 'how' and 'why' questions.
ELG14 – The world
Children know about similarities and differences in relation to places, objects, materials and living things
They talk about the features of their own immediate environment and how environments might vary from one another
They make observations of animals and plants and explain why some things occur, and talk about changes
ELG16 – Exploring and using media and materials
They safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function.
ELG 17 – Being imaginative
Children use what they have learnt about media and materials in original ways, thinking about uses and purposes

Year 1

Observe changes across the four seasons
Observe and describe weather associated with the seasons and how day length varies.

Year 3

Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. (Light)

Year 5

Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. (Earth and space)

Key Vocabulary

Weather (sunny, rainy, windy, snowy etc.)
Seasons (winter, summer, spring, autumn)
Sun, sunrise, sunset, day length

Misconceptions

Some children may think:

- it always snows in winter

- it is always sunny in the summer
- there are only flowers in spring and summer
- it rains most in the winter.

Science – Forces and magnets – Years 3 & 5

Rationale

In the summer term, Year 3 children will extend their understanding of materials of how they can use 'pushes' and 'pulls' to change the shape of objects to a deeper appreciation of friction and magnetic forces in Year 3. This links with the local history topic based around the production of Iron and the impact on our local community and in particular the history and importance of The Transporter Bridge. As a link to forces and magnets the children will work under the scenario of 'The Better Bridge' company who need to develop their role in designing, investigating and suggesting modifications to the bridge using their knowledge of forces and magnets.
Forces and Magnets are studied in the Spring term of Y5 as part of the topic Ancient Greeks. It is believed that magnetism was most probably first observed in a form of the mineral magnetite called lodestone. The ancient Greeks were the first known to have used this mineral, which they called a magnet because of its ability to attract other pieces of the same material and iron.

Learning

Year 2 – Prior Knowledge	Year 3	Year 5
Describe how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Materials)	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.	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.

Key Vocabulary

Year 3
Force, push, pull, twist, contact force, non-contact force, magnetic force, magnet, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, attract, repel, magnetic material, metal, iron, steel, poles, north pole, south pole
Year 5
Force, gravity, Earth, air resistance, water resistance, friction, mechanisms, simple machines, levers, pulleys, gears

Misconceptions

Year 3 - Some children may think:
- the bigger the magnet the stronger it is
- all metals are magnetic.

Year 5 – Some children may think:

- the heavier the object the faster it falls, because it has more gravity acting on it
- forces always act in pairs which are equal and opposite
- smooth surfaces have no friction
- objects always travel better on smooth surfaces
- a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
- a non-moving object has no forces acting on it
- heavy objects sink and light objects float.

Science – Light – Years 3 & 6

Rationale

Children will, in previous years, have worked on materials topics such as how to find the best material for certain jobs and how to identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock but in Year 3 this is the first time the children will be asked to consider what light is, how it travels and how it can be reflected and blocked. This topic of Light is covered in the Spring term as the days are becoming brighter and shadows can be easily identified in the playground. The children also link this topic with the DT topic of periscopes which allow the children to discuss the angles of mirrors and use measurement skills whilst investigating.

Light is taught in the Summer term of Year 6, alongside the science topic of Electricity. It is taught in the Summer term as the days are usually bright and this allows the children to investigate natural light and shadows. As it is a small topic, it gives the children more time to adopt a more independent approach to their learning and carry out complete investigations.

Learning

Year 1 – Prior Knowledge	Year 3	Year 6
Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Animals, including humans)	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.	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.

Key Vocabulary

Year 3

Light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous

Year 6

As for Year 3 (light, light source, dark, absence of light, transparent, translucent, opaque, shiny, matt, surface, shadow, reflect, mirror, sunlight, dangerous) plus straight lines, light rays

Misconceptions

Year 3 - Some children may think:

- we can still see even where there is an absence of any light
- our eyes 'get used to' the dark
- the moon and reflective surfaces are light sources
- a transparent object is a light source
- shadows contain details of the object, such as facial features on their own shadow
- shadows result from objects giving off darkness.

Year 6 – Some children may think:

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

Science – Rocks – Year 3

Rationale

During the Autumn term the children within this year will have many opportunities to discover, handle and investigate for themselves, rocks, fossils and soil. They will have creative links to our History topic of Stone Age where we also read texts such as Stone Age boy and Ug. They will also link this work to their Art work which will allow the children compare and recreate form of natural and manmade objects using a variety of rocks and tools in order to create cave art paintings.

Learning

Prior Knowledge	In this year pupils are taught to	Future Learning
Year 1 Distinguish between an object and the material from which it is made. (Everyday materials) Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Everyday materials) Describe the simple physical properties of a variety of everyday materials. (Everyday materials) Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Everyday materials)	Year 3 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.	**Year 6** Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Evolution and inheritance)
Year 2 Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Uses of everyday materials)		

Key Vocabulary

Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil

Misconceptions

Some children may think:

- rocks are all hard in nature
- rock-like, man-made substances such as concrete or brick are rocks
- materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'
- certain found artefacts, like old bits of pottery or coins, are fossils
- a fossil is an actual piece of the extinct animal or plant
- soil and compost are the same thing.

Science – Electricity – Years 4 & 6

Rationale

This topic in Year 4 is the first opportunity for our children to learn about appliances and circuits in Science. It is not revisited until Year 6 and so we make sure that there are plenty of opportunities for many hands on activities which the children are able to experience as they first enter Year 4 in the Autumn term. We allow the children to explore and investigate practically using trial and error to advance their learning.
With Electricity being one of the last science topics using materials, it is taught in the Summer term in Year 6 to help the children consolidate all their learning about materials. With the Summer term being quite long, It gives the children plenty of time to take a more independent approach to their learning by allowing them to carry out complete investigations. It is also taught alongside the science topic of Light due to the similarities.

Learning

Year 4	Year 6
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.	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.

Key Vocabulary

Year 4
Electricity, electrical appliance/device, mains, plug, electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, loose connection, short circuit, crocodile clip, bulb, switch, buzzer, motor, conductor, insulator, metal, non-metal, symbol
Year 6
Circuit, complete circuit, circuit diagram, circuit symbol, cell, battery, bulb, buzzer, motor, switch, voltage
N.B.
Children do not need to understand what voltage is, but will use volts and voltage to describe different batteries. The words "cells" and "batteries" are now used interchangeably.

Misconceptions

In Year 4 - Some children may think:

- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- electricity works by simply coming out of one end of a battery into the component.

In Year 6 - Some children may think:

- larger-sized batteries make bulbs brighter
- a complete circuit uses up electricity
- components in a circuit that are closer to the battery get more electricity.

Science – Sound – Year 4

Rationale

This topic only appears once within our Science Plans at Ingleby Mill. We link this topic heavily with our Music curriculum where we listen to live and recorded music as well as our IT links with 'Garage Band' This helps the children to understand the science behind how sounds are made as well as how to vary volume and pitch and this is always reinforced throughout our music lessons. The children within Year 4 are also given the opportunity to take part in concert performances and samba drumming constantly referring back to the science behind it.

Learning

Year 1- Prior Knowledge	Year 4
Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Animals, including humans)	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.

Key Vocabulary

Sound, source, vibrate, vibration, travel, pitch (high, low), volume, faint, loud, insulation

Misconceptions

In Year 4 - Some children may think:

- sound is only heard by the listener
- sound only travels in one direction from the source
- sound can't travel through solids and liquids
- high sounds are load and low sounds are quiet.
- Pitch and volume are frequently confused as both can be described as high and low.

Science – States of matter – Year 4

Rationale

As the children have been exposed in previous year groups to a range of experiences involving materials, it is the obvious next stage to then move on to states of matter with regards to various materials. They will have been taught in previous year groups how to compare and group materials and so they will then be asked to group according to solids, liquids or gases.

Learning

Year 1 - Prior Knowledge

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.

Year 2 - Prior Knowledge

Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Year 3 - Prior Knowledge

Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Rocks)
Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Rocks)
Notice that some forces need contact between two object, but magnetic forces can act at a distance. (Forces and magnets)

Year 4

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.

Year 5 (Properties and changes of materials)

Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity 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.

Key Vocabulary

Solid, liquid, gas, state change, melting, freezing, melting point, boiling point, evaporation, temperature, water cycle

Misconceptions

Some children may think:

- 'solid' is another word for hard or opaque
- solids are hard and cannot break or change shape easily and are often in one piece
- substances made of very small particles like sugar or sand cannot be solids
- particles in liquids are further apart than in solids and they take up more space
- when air is pumped into balloons, they become lighter
- water in different forms – steam, water, ice – are all different substances

- all liquids boil at the same temperature as water (100 degrees)
- melting, as a change of state, is the same as dissolving
- steam is visible water vapour (only the condensing water droplets can be seen)

Science – Earth and Space – Year 5

Rationale

Earth and Space is studied during the Spring Term in Year 5 because the topic for this term is the Ancient Greeks. The ancient Greeks were some of the first people to study the sky and understand astronomy. They realized the Earth was a sphere and tried to measure its size. This theme crosses the curriculum with particularly strong links in DT and Music.

Learning

Year 1 - Prior Knowledge	Year 5
Observe changes across the four seasons. (Seasonal changes) Observe and describe weather associated with the seasons and how day length varies. (Seasonal changes)	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.

Key Vocabulary

Solar, orbit, axis, rotating, gravitational, Earth, Moon, Sun, solar system, Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune, lighter, darker, day, night.

Misconceptions

In Year 5 - Some children may think:

- the Earth is flat
- the Sun is a planet
- the Sun rotates around the Earth
- the Sun moves across the sky during the day
- the Sun rises in the morning and sets in the evening
- the Moon appears only at night
- night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.

Science – Properties and changes of materials – Year 5

Rationale

This topic is taught in year 5 in the summer term as some lessons link to the warmer weather and the investigations are more successful e.g. Evaporation

Learning

Year 1 – Prior Knowledge	Year 5

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.	Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity 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.
Year 2 – Prior Knowledge Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.	
Year 3 – Prior Knowledge Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. (Rocks) Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Rocks) Notice that some forces need contact between two objects, but magnetic forces can act at a distance. (Forces and magnets)	
Year 4 Prior Knowledge (States of matter) 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.	

Key Vocabulary

Thermal/electrical insulator/conductor, change of state, mixture, dissolve, solution, soluble, insoluble, filter, sieve, reversible/non-reversible change, burning, rusting, new material

Misconceptions

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

In Year 5 - Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

Science – Evolution and inheritance – Year 6

Rationale

During the Autumn term the children in year 6 will be learning about the Victorians. Teaching Evolution and Inheritance in this term will allow children to deepen their understanding of the world during this period. The children will be aware of changes in the world, how explorers and what they discovered impacted on world beliefs.

Learning

Year 2 – Prior Knowledge

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. (Living things and their habitats)

Year 3 – Prior Knowledge

Describe in simple terms how fossils are formed when things that have lived are trapped within rock. (Rocks)

Year 4 – Prior Knowledge

Recognise that environments can change and that this can sometimes pose dangers to living things. (Living things and their habitats.

Year 6

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.

Key Vocabulary

Offspring, sexual reproduction, vary, characteristics, suited, adapted, environment, inherited, species, fossils

Misconceptions

In Year 6 - Some children may think:

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