

Science

Concepts, Knowledge and Skills

Intent:

At Longthorpe, we believe that science creates many questions about the human, physical and scientific world and we strive to evoke a curiosity about the world the children live in. We develop the skills needed by the children to draw upon and develop their own scientific awareness, using their personal experience and knowledge to do so. Children are encouraged to ask questions about the world around them and have an awareness of the impact of this; exploring, investigating and evaluating ways to solve them through the use of different apparatus and equipment. These skills will give the children the tools to tackle the ever-changing world around them. We recognise that the purpose of study elements of the National Curriculum for science are vital for our children, in order to give them a successful start in their subject learning and in the acquisition of pertinent cultural capital. We provide a high-quality science education, which will inspire in pupils a curiosity and fascination about the scientific world and natural phenomena that will remain with them for the rest of their lives. Teaching should equip pupils with the scientific knowledge required to understand the uses and implications of science today and for the future. Learning at Longthorpe happens through a 'Learning to Learn' approach, incorporating the 6Cs (Character, Citizenship, Collaboration, Communication, Critical and Creative thinking). The teaching of science at Longthorpe enables pupils to build on their 'character' and motivation competencies by encouraging them to problem solve whilst taking part in investigative work; pupils are expected to discuss and analyse problems they may encounter. At Longthorpe we believe that within our local context we should particularly consider the way that the Learning to Learn approach of teaching science can enable pupils to think critically and creatively.

Science book

How often do you carry out an experiment?

What recordings are expected?

Implementation:

At Longthorpe, we offer a rich, varied, imaginative and progressive science curriculum to all students, irrespective of their attainment. This will ensure that they are equipped with skills to be prepared for the ever-changing world. Science is taught as a key focus within a topic throughout the academic year, with a focus on the key skills and knowledge as outlined in the National Curriculum and the Science Curriculum Plan. Our entire science curriculum is designed so that key concepts are revisited with increasing complexity to ensure a deeper understanding

Key concepts: *Investigating, recording and questioning*

Identify and classify

Observation over time

Pattern seeking

Scientific awareness

In order to do this, teachers use and follow the science curriculum map, ensuring there is an equal coverage and focus on the key knowledge and key skills. Accompanying this, teachers will cover additional skills (which have been mapped out) which support and develop the key area and focus on scientific investigation. Wherever possible, science is taught through practical activities and working scientifically creating curious and inquisitive learners. Teachers will ensure that within their teaching, key vocabulary is taught within the relevant strands, children have opportunities to master and apply this within their learning. Teachers ensure that a knowledge organiser (Learning to Learn) is utilised and that a cycle of lessons clearly plans for progression.

Intended Impact:

- Children will have a secure knowledge of what science is and what skills are needed to be a successful scientist
- Children will succeed in acquiring and applying key scientific skills and knowledge
- Children will be taught to use and build upon their prior scientific skills and knowledge to deepen and progress their understanding
- Children will have a good knowledge of the key concepts covered across the school
- Children will be confident in applying their knowledge of specific scientific terms through an exposure of rich, relevant vocabulary
- All children will be provided with the opportunity to challenge their scientific understandings, as well as given support where necessary
- Children will apply their scientific knowledge within writing which is for a range of different purposes, contexts and audiences
- Children will confidently conduct experiments and investigations and be able to hypothesise and make sound conclusions
- Children will have the skill and confidence to ask further questions once they have findings from an investigation

Key Concepts

Investigating, recording and questioning

Identify and classify

Observation over time

Pattern seeking

Scientific awareness

EYFS	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Plants	<ul style="list-style-type: none"> - Know that plants change over time - Know what a plant is (simply) - give an example of a plant 	<ul style="list-style-type: none"> - Make observations of plants - Comment on changes in plants - Describe different plants - physical appearance, height, colour etc 	<ul style="list-style-type: none"> - Identify a given plant - Know what a plant needs to survive 	<ul style="list-style-type: none"> - Give a reasonable suggestion/explanation and to why changes occur
Animals including humans	<ul style="list-style-type: none"> - Know what an animal is - give an example of an animal - Identify different parts of the given animal 	<ul style="list-style-type: none"> - Make observations of animals - Comment on changes in animals - Describe an animal - physical appearance, movement etc - Share care and consideration for living things 	<ul style="list-style-type: none"> - Identify different given animals - Know what animals eat - Understand what is meant by a healthy diet 	<ul style="list-style-type: none"> - Give a reasonable suggestion/explanation and to why changes occur - Explain the impact of exercise (basically)
Materials	<ul style="list-style-type: none"> - Identify different materials of everyday items e.g. plastic, wood, rubber, metal, water etc 	<ul style="list-style-type: none"> - Describe a material - using physical appearance - Talk about similarities and differences in materials 	<ul style="list-style-type: none"> - Know that many different materials have different desirable and measurable properties 	<ul style="list-style-type: none"> - To notice changes and discuss things in their natural environment
Seasonal Changes	<ul style="list-style-type: none"> - Know the basic criteria for each season e.g. sunny, snow etc - Know changes that take place e.g. leaves falling off trees 	<ul style="list-style-type: none"> - Observe changes over time - Suggest reasons for why these changes occur 	<ul style="list-style-type: none"> - Know and describe weather changes 	<ul style="list-style-type: none"> - Observe the changes across four seasons - Describe the weather associated with different seasons
Key Vocabulary	<p>Plants: leaf, petal, colour, size, shape, trunk, roots, sun, branches, water Animals: specific animal names, water, specific food types, care, kind, look after, feed, diet, healthy, exercise, strong, grow Materials: wood, plastic, glass, metal, water, rock, brick, paper, foil, elastic, bendy, smooth, rough, hard, soft, stretchy, stiff, shiny, dull Seasonal changes: autumn, winter, spring, summer, hot, cold, dry, wet, sunny</p>			
Year 1	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Plants	<ul style="list-style-type: none"> - Know the basic structure of a variety of common flowering plants (stem, petal, root, leaves) - Understand that plants grow from seeds or bulbs - Understand that plants need sun and water to grow 	<ul style="list-style-type: none"> - Identify and describe the basic structure of a plant - To observe and explain what plants need to grow 	<ul style="list-style-type: none"> - Identify and name the trunk and branches. - Know that plants are important to the world 	<ul style="list-style-type: none"> - Explain why plants are important to the world
Animals including humans	<ul style="list-style-type: none"> - Name and identify a range of animals by amphibian, reptile, mammal, fish and birds. - Know that many different animals have many different characteristics - Know and classify animals into groups which the child chooses - Know the name and parts of the human body that can be seen. 	<ul style="list-style-type: none"> - Explain why they have classified animals in the way they have - Know that foods provide different nutrients to animals/humans and that a range is needed. - Ask questions linked to their own knowledge about diet, e.g. why do some animals eat meat and others do not? 	<ul style="list-style-type: none"> - Know and classify animals by a given grouping, e.g. what they eat (carnivore, herbivore, omnivore), what type of animal they are, how they move etc. - Know that different parts of the body do different things 	<ul style="list-style-type: none"> - Explain or offer suggestions as to why different parts of the body do different things

	- Know that all humans/animals must eat and drink to survive			
Everyday materials	-Know the name of the materials an object is made from e.g. wood, metal, class, plastic, water, rock etc - Know that many different materials have different desirable and measurable properties	- Distinguish, compare, group together and classify objects based on their materials - Describe the simple physical properties of a variety of everyday materials -Explain to someone what has been learned from an investigation they have been involved with and draw conclusions from the answers to the questions asked. -Use measures (within Y1 mathematical limits) to help find out more about the investigations undertaken.	-Know about the properties of everyday materials - Know that the properties of a material determine what its suitability for different purposes	-Set up a test to see which materials keep things warmest, know if the test has been successful and can say what has been learned
Seasonal Changes	-Name the seasons and know about the type of weather in each season.	- Observe the changes across four seasons - Describe the weather associated with different seasons	-Know that the days are longer and hotter in summer - Know the days are shorter and colder in winter	- Explain why weather changes and why we have seasons
Key Vocabulary	Plants: flower, petal, stem, leaf, root, plant, wild, garden, trunk, branch, deciduous, evergreen, blossom, fruit, bulb, seed, leaves, flower Animals including humans: fish, amphibian, bird, reptile, mammal, wild, tame, pet, head, neck, arms, elbows, shoulders, hands, legs, knees, ankles, feet, face, ears, eyes, nose, mouth, fingers, toes, carnivore, herbivore, omnivore, Everyday materials: wood, plastic, glass, metal, water, rock, brick, paper, foil, elastic, bendy, smooth, rough, hard, soft, stretchy, stiff, shiny, dull, waterproof, absorbent, opaque, transparent, warm, cold, dull, Seasonal changes: autumn, summer, spring, winter, seasons, weather, day, longer, shorter, hotter, colder, rain, wind, heat, temperature <i>Investigating, recording and questioning</i> <i>Identify and classify</i> <i>Observation over time</i> <i>Pattern seeking</i> <i>Scientific awareness</i>			
Year2	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Living things and their habitats	- Compare and classify things by living, dead or never lived - Identify that different things live in different habitats - Identify and name different living things in their habitats -Name some different sources of food for animals	- Explain how different habitats provide different 'things' for the inhabitant - Describe how different animals obtain their food from plants and other animals - food chains - Classify plants and living things by their habitats	- Environmental change can affect habitats and the living things within	- Explain how different habitats depend on each other - Use equipment such as thermometers and rain gauges to help observe changes to the local environment as the year progresses.
Plants	- Know what plants need in order to grow and stay healthy (water, light & suitable temperature) - Know that plants are essential for life (Clean air and to eat)	-Set up a fair test to find out about how seeds grow best - To explain why plants are needed and how they impact on life	-Know how seeds and bulbs grow into plants. - Know why plants grow differently in different situations e.g. in the shade - To know that flowers make seeds to make more plants - Know that different plants and parts of plants can be eaten	- Explain how seeds and bulbs grow into plants. - Investigate (using prior knowledge) as to why plants grow differently in different places -Use a thermometer to measure temperature

Animals including humans	<ul style="list-style-type: none"> - Know that animals/humans have offspring which grow into adults - Know the basic stages in a life cycle for animals (including humans) - Know the needs for survival, water, food and air - Know why exercise, a balanced diet and good hygiene are important for humans - Know that different animals have offspring in different ways: mammals give birth to live young, birds lay eggs etc 	<ul style="list-style-type: none"> - To explain why exercise is needed and boosts survival chances - Explain the features of different stages in the life cycle - Explain what food is needed in a healthy diet and why - Match which offspring is from which animal and offer reasonable explanations for this 	<ul style="list-style-type: none"> - Know that different animals move in different ways to help them survive - Know that all animals age and eventually die - Understand that animals grow until maturity and then do not grow any larger - Know that some individual's life cycles might be different 	<ul style="list-style-type: none"> - Explain why moving in different ways can help with survival
Use of everyday materials	<ul style="list-style-type: none"> - Know how solid materials can be changed by squashing, bending, twisting and stretching. 	<ul style="list-style-type: none"> - Identify and compare the suitability of a range of everyday materials including: wood, metal, plastic, glass, brick, rock, paper, cardboard for particular uses - Draw conclusions from fair tests and explain what has been found out. - Use measures (within Y2 mathematical limits) to help find out more about the investigations they are engaged with. 	<ul style="list-style-type: none"> - Compare movement on different surfaces 	<ul style="list-style-type: none"> - Identify and distinguish between solids and liquids
Key Vocabulary	<p><i>Investigating, recording and questioning</i> <i>Identify and classify</i> <i>Observation over time</i> <i>Pattern seeking</i> <i>Scientific awareness</i></p> <p>Living things and their habitats: habitat, microhabitat, food, shelter, forest, woodland, seashore, ocean, rainforest, alive, dead, food chain, living, dead, never alive, food chain, leaf litter, conditions, damp, shade, thermometer, rain gauge</p> <p>Plants: germination, growth, survival, reproduction, water, light, store, warmth, diagram, measure, predict, temperature, record, compare, grow, observe</p> <p>Animals including humans: egg, chick, chicken, caterpillar, pupa, butterfly, spawn, tadpole, frog, lamb, sheep, baby, toddler, child, teenager, adult, shade, damp, conditions, rainforest, ocean, woodland, shelter, food chain, food, habitats</p> <p>Use of everyday materials: solid, squashing, bending, twisting, stretching, observe, closely, record, identify, classify, waterproof, fabric, rock, paper, cardboard, wood, glass, brick</p>			
Year 3	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Plants	<ul style="list-style-type: none"> - Know that different parts of the plant have different functions - Know the plant life cycle, especially the importance of flowers - Know how water is transported within plants 	<ul style="list-style-type: none"> - Explain the different functions of parts of a plant (leaves = sunlight, roots = support and water, flowering plant = pollination, seed production, stem = holds flower and carries the water) - To explain what role the flower plays in a plant's life cycle 	<ul style="list-style-type: none"> - Know that plants require different 'things' depending on where they are e.g. cactus, Baobab tree etc - Know that some plants can be poisonous/dangerous 	<ul style="list-style-type: none"> - Group information according to common factors e.g. plants that grow in woodlands or plants that grow in gardens
Animals including humans	<ul style="list-style-type: none"> - Know that animals/humans cannot make their own food and get their nutrition from eating food (unlike a seed) - Know about the importance of a nutritious, balanced diet 	<ul style="list-style-type: none"> - Compare and explain the different animal skeletons - To name and categorise foods into the different food groups. - Explain the different quantities of food groups and what should be eaten when, e.g. a burst of energy would require etc. 	<ul style="list-style-type: none"> - Know about the skeletal and muscular system of a human. - Know the names of important muscles and bones in the human body - Know which foods are appropriate or inappropriate for animals 	<ul style="list-style-type: none"> - Explain how skeletons and muscles change over time - Test to see if their right hand is as efficient as their left hand

	<ul style="list-style-type: none"> - Know how nutrients, water and oxygen are transported within animals and humans - Identify that humans and some other animals have skeletons and muscles for protection and movement. 		<ul style="list-style-type: none"> - Different animals are adapted to eat different foods - Know that muscles are connected to bones and move them when they contract - Know that muscles need to be looked after and worked to stay strong 	
Rocks	<ul style="list-style-type: none"> - Compare and group rocks based on their appearance and physical properties - Know how soil is made (from organic matter and rocks) and how fossils are formed - Know that soil changes over time - Know about and explain the difference between sedimentary, metamorphic and igneous rock 	<ul style="list-style-type: none"> - Give reasons for their grouping of rocks based on their appearance and physical properties, giving reasons - Explain to a partner why a test on these rocks is a fair one 	<ul style="list-style-type: none"> - Know that there are different types of rock: igneous, metamorphic, sedimentary, anthropic - Know that there are different types of soil: clay, sandy, slity, peaty, chalky, loamy - Know that paleontologists use fossils to find out about the past - Know that different plants grow in different soils 	<ul style="list-style-type: none"> - Test to see which type of soil is most suitable when growing two similar plants - Set up a fair test with different variables
Light	<ul style="list-style-type: none"> - Know that light is needed in order to see and is reflected from a surface - Know about the danger of direct sunlight and describe how to keep protected - Know how a shadow is formed and explain how a shadow changes shape 	<ul style="list-style-type: none"> - Explain and demonstrate how a shadow is formed - Explore and observe how shadows change throughout the day/with different weathers 	<ul style="list-style-type: none"> - Transparent materials let light through them and opaque materials don't let light through - Know that light comes from a source 	<ul style="list-style-type: none"> - Observe at what time of day a shadow is likely to be at its longest and shortest - Know that dark is the absence of light - Draw conclusions and amend predictions - Be prepared to change ideas as a result of what has been found out during a scientific enquiry
Forces and Magnets	<ul style="list-style-type: none"> - Explore about and describe how objects move on different surfaces - friction - Know that pushing or pulling can make things faster, slower and stop - Know that larger masses require a bigger push/pull to move and stop them - Explore magnets to find out: - now that magnets attract and repel through non-contact forces - Know that magnets have two poles - Know that magnet forces are affected by: magnet strength, object mass, distance from object, object material 	<ul style="list-style-type: none"> - Compare and comment on how different things move on different surfaces - Explain how magnets attract and repel - Predict whether magnets will attract or repel and give a reason - Compare and group items together based on their ability to attract to magnets - identify magnetic materials - Predict what will happen if poles of the same side are near each other 	<ul style="list-style-type: none"> - Investigate how a simple pulley works and use to lift an object more simply - Know how some forces require contact and some do not, giving examples 	<ul style="list-style-type: none"> - Use bar charts and other statistical tables (in line with Y3 mathematics statistics) to record finding - Know how to use a key to help understand information presented on a chart - Present findings using written explanations and include diagrams when needed
Essential vocabulary	<p style="text-align: center;"> <i>Investigating, recording and questioning</i> <i>Identify and classify</i> <i>Observation over time</i> <i>Pattern seeking</i> <i>Scientific awareness</i> </p> <p>Plants: roots, stems, trunk, leaves, flowers, air, light, water, nutrients, pollination, seed formation, dispersal, soil, support, anchor, reproduction, transportation, energy, growth, seeding, carbon dioxide, oxygen, sugar, material, Photosynthesis, chlorophyll</p>			

	<p>Animals including humans: nutrition, skeleton, muscles, support, protection, movement, carbohydrates, proteins, fats, vitamins, minerals, water, fibre, bones, joints, tendons, vertebrate, invertebrate</p> <p>Rocks: fossil, rock, organic matter, sedimentary, metamorphic, igneous, limestone, marble, basalt, obsidian, sandy, clay, peat, chalk, loam, soil, extinct</p> <p>Light: light, dark, reflect, shadow, opaque, light source, block, transparent, opaque, reflect</p> <p>Forces and magnets: force, magnetic, attract, repel, poles, push, pull, friction, surface, magnet(ic), magnetic field, north, south, compass</p>			
Year 4	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Living things and their habitats	<ul style="list-style-type: none"> - Know that different things can be grouped in different ways - Know how changes to an environment could endanger living things - Human environment significantly impacts habitats and the environment e.g. pesticides (bees), rainforest (deforestation) 	<ul style="list-style-type: none"> - Group living things and explain why they have been grouped like this 	<ul style="list-style-type: none"> - Recognise that environments can change and this poses dangers to living things and causes different changes to different living things - Different food chains occur in different habitats 	<ul style="list-style-type: none"> - Use a classification key to help group, identify and name living things in the local and wider environment
Animals including humans	<ul style="list-style-type: none"> - Identify and name the parts of the human digestive system - Identify and know the different types of human teeth - Know the functions of different human teeth - Nutrients produced by plants moves from primary to secondary consumers through food chains - Know why different people need different diets, e.g. weight lifter, marathon runner etc 	<ul style="list-style-type: none"> - Explain the functions of the organs in the human digestive system (teeth = break down food, stomach = break down food, intestines = nutrients into blood, blood = travels around the body) - Use and construct food chains to identify producers, predators and prey 	<ul style="list-style-type: none"> - To know how food turns into excrement/urine 	<ul style="list-style-type: none"> - To plan and know what diet is needed for a given type of person (based on their activity and energy needed etc) - To investigate whether foods that are high in energy are always high in sugar - To know why specific organs such as the liver are important in the digestive system. - Research to find out how much time it takes to digest most of our food
States of matter	<ul style="list-style-type: none"> - Compare and group materials based on their state of matter (solid, liquid, gas) - Know about and explore how some materials can change state - Know the part played by evaporation and condensation in the water cycle - Identify the part played by evaporation and condensation in the water cycle - Know that heating causes solids to melt and liquids to turn into gases 	<ul style="list-style-type: none"> - Describe solids, liquids and gases based on what can be observed with eyes - Explore and explain how some materials can change state - Carry out tests to see if a glass of ice weighs the same as a glass of water - Measure carefully (taking account of mathematical knowledge up to Y4) and add to scientific learning - Use bar charts and other statistical tables to record findings - Investigate and explain how temperature impacts on evaporation 	<ul style="list-style-type: none"> - Know the temperature at which materials change state 	<ul style="list-style-type: none"> - Explain to others why a test that has been set up is a fair one e.g. discover how fast ice melts in different temperatures - Use a thermometer to measure temperature and know there are two main scales used to measure temperature

Sound	<ul style="list-style-type: none"> -Know how sound is made, associating some of them with vibration -Know how sound travels from a source to our ears -Know the correlation between pitch and the object producing a sound -Know the correlation between the volume of a sound and the strength of the vibrations that produced it 	<ul style="list-style-type: none"> - Explain how sound travels in waves - Explain and model what is meant by volume, pitch and sound 	<ul style="list-style-type: none"> -Investigate what happens to a sound as it travels away from its source 	<ul style="list-style-type: none"> -Set up a fair test with more than one variable e.g. using different materials to cut out sound -Carry out tests to see which of two instruments make the highest or lowest sounds
Electricity	<ul style="list-style-type: none"> - Identify and name appliances that require electricity to function -Predict and test whether a lamp will light within a circuit -Explore the function of a switch within a simple circuit -Investigate the difference between a conductor and an insulator, giving examples of each and know that some metals are useful for these - Know how to use electricity safely - Investigate that a source of electricity is needed for appliances to work in order to push electricity round a circuit - Investigate that a complete circuit is needed for it to work 	<ul style="list-style-type: none"> -Construct a series circuit and identify/name the parts(cells, wires, bulbs, switches, buzzers) - Identify whether a bulb will light in an incomplete circuit -Present findings using written explanations and include diagrams, when needed -Write up findings using a planning, doing and evaluating process -Make sense of findings and draw conclusions which help them understand more about the scientific information that has been learned 	<ul style="list-style-type: none"> - More batteries/power will push electricity round the circuit more quickly - Recognise the parts of a circuit from their pictorial representation 	<ul style="list-style-type: none"> -Group information according to common factors e.g. materials that make good conductors or insulators -When making predictions there are plausible reasons as to why they have done so. Able to amend predictions according to findings - To draw a circuit using pictorial representations
Key Vocabulary	<p style="text-align: center;"><i>Investigating, recording and questioning</i> <i>Identify and classify</i> <i>Observation over time</i> <i>Pattern seeking</i> <i>Scientific awareness</i></p> <p>Living things and their habitats: habitat, environment, flowering, non-flowering, grasses, ferns, mosses, vertebrate, fish, amphibians, birds, reptiles, mammals, invertebrate, slugs, worms, spiders, insects, human impact, ecological, population, development, litter, deforestation, human impact, nature reserves</p> <p>Animals including humans: digestive system, mouth, tongue, teeth, oesophagus, stomach, small intestine, large intestine, carnivore, herbivore, molars, premolars, canines, incisors, food chain, producer, predator, prey, gall bladder, small intestine, large intestine, liver, pancreas, producer, consumer</p> <p>States of matter: solid, liquid, gas, heated, cooled, celsius, evaporation, condensation, water cycle, heat, cool</p> <p>Sound: sound, vibration, pitch, volume, strength, amplitude, quiet, loud, ear, high, low, particles, wave, instrument</p> <p>Electricity: appliances, electricity, circuit, bulb, buzzer, motor, switch, device, loop, conductor, insulator, current, mains, crocodile clips, battery/cell, battery holder, component</p>			
Year 5	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Living things and their habitats	<ul style="list-style-type: none"> - Know the life cycles of different living things: mammal, amphibian, insect, bird - Know the process of reproduction in plants and animals - Know that different types of organisms have different lifecycles: study one which 	<ul style="list-style-type: none"> - Describe the differences in the lifecycle of a mammal, an amphibian, an insect and a bird - Describe the life process of reproduction in some plants and animals 	<ul style="list-style-type: none"> - Know that some organisms reproduce sexually where offspring inherit information from both parents and that some organisms reproduce asexually 	<ul style="list-style-type: none"> - Describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals -Give reasons for classifying plants and animals based on specific characteristics

	goes through metamorphosis and one that does not		- Environmental change can impact on how well an organism is suited to its environment	
Animals including humans	-Identify and describe the changes as the humans develop to an old age - Know that puberty is something all humans go through and it allows reproduction - Know that hormones impact on puberty and cause emotional and physical changes	- Explain what is different at different stages in a human's life	- Know that different animals mature at different ages and live to different ages	- Suggest reasons for why the human body changes at different stages
Properties and changes of materials	-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	- Identify and explain the part played by evaporation and condensation in the water cycle - know that heat has an impact on this -Use knowledge of solids, liquids and gases to investigate how mixtures might be separated, including through filtering, sieving and evaporating	-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 -Investigate reversible and irreversible changes of state	-Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
Earth and space	- Know and describe the movement of the Earth, and other planets, relative to the Sun in the solar system - Know and describe the movement of the Moon relative to the Earth	-Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky	-Describe the Sun, Earth and Moon as approximately spherical bodies - Know the difference between orbit and rotate	- Explain how star, planets and moons have so much mass that they attract other things
Forces	-Know that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object - Identify the effects if air and water resistance on friction between surfaces -Recognise and explore that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect - Know that friction is a force against motion caused by two surfaces rubbing together	-Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object - Explain what a force is	- Investigate that different objects require different amounts of forces to move them - Know that and how forces can be measured	- Explain how Isaac Newton discovered gravity
Key Vocabulary	<i>Investigating, recording and questioning</i> <i>Identify and classify</i> <i>Observation over time</i> <i>Pattern seeking</i> <i>Scientific awareness</i>			

Living things and their habitats: life cycle, mammal, amphibian, bird, reproduction, sexual, asexual, parents, pollination, dispersal, reproduction, cell, fertilisation, male, female, young, mammal, metamorphosis, insect, egg, embryo
 Animals including humans: puberty, development, fetus, embryo, womb, gestation, baby, toddler, teenager, child, elderly, growth, hormone, physical, emotional
 Properties and changes of materials: properties, hardness, transparency, solubility, conductivity, electrical, thermal, substance, solution, dissolve, solid, liquid, gas, filter, sieve, evaporation, burning, rusting, reversible, irreversible, process, condensation, freeze, melt, water, ice, water vapour, precipitation, energy
 Earth and space: spherical, rotation, axis, solar system, celestial, orbit, gravity, pull, force
 Forces: force, gravity, air resistance, water resistance, friction, mechanisms, lever, pulley, gravity, surface, Isaac Newton, gears, force, push, pull, opposing, streamlined, brake mechanism, cog, machine

Year 6	Essential Knowledge	Essential Skills	Additional Knowledge	Additional Skills
Living things and their habitats	<ul style="list-style-type: none"> - Know that variation exists within a population - Know that animals most suited to their environment as the most likely to survive - Know that organisms reproduce and have similar characteristics 	<ul style="list-style-type: none"> - Describe and classify living things into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals - Give reasons for classifying plants based on characteristics 	<ul style="list-style-type: none"> - Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago - Competition exists for resources and mates 	<ul style="list-style-type: none"> - To create a classification key for different animals e.g. vertebrate, invertebrate, micro-organisms
Animals including humans	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Explain that the heart pumps blood around the body, oxygen is breathed in through the lungs, muscles need oxygen to release energy to work 	<ul style="list-style-type: none"> - Recognise and investigate that exercise causes the heart rate to increase - Know that your choices affect you body 	<ul style="list-style-type: none"> - Explain the why exercise causes the heart rate to increase
Evolution and Inheritance	<ul style="list-style-type: none"> - Know that fossils can tell us about the past - Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents - Identify how animals, plants and lifecycles are adapted to suit their environment in different ways and that adaptation may lead to evolution - over time the characteristics that are most suited to the environment become increasingly common 	<ul style="list-style-type: none"> - Explain what evolution is and why the most suited features (to the environment) result in living longer and reproduction - Explain how at least one animal had evolved over time 	<ul style="list-style-type: none"> - Know that competition exists for resources and mates - Know that skeletons change over time - Know what evidence is used to show that evolution has occurred 	<ul style="list-style-type: none"> - To explain how a particular 'thing' has changed over time - using evidence

Light	<ul style="list-style-type: none"> -Recognise that light appears to travel in straight lines 	<ul style="list-style-type: none"> -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 	<ul style="list-style-type: none"> -Know how simple optical instruments work e.g. periscope, telescope, binoculars, mirror, magnifying glass etc - Light reflects off all objects - unless they are black - and know that shiny surfaces scatter the light 	<ul style="list-style-type: none"> - Explain how simple optical instruments work
Electricity	<ul style="list-style-type: none"> -Associate and investigate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit -Know that: <ul style="list-style-type: none"> - voltage = measures the push of electricity round a circuit - current = how much electricity is flowing around a circuit - Know of different renewable ways to create electricity 	<ul style="list-style-type: none"> - 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 	<ul style="list-style-type: none"> - Know that heat is released as a current going round the circuit - the greater the current, the more heat that is released 	<ul style="list-style-type: none"> - To investigate whether all batteries push the same - To explain how the voltage of a battery effects how much current is pushed - To investigate how the number of bulbs affects the brightness of a bulb
Key Vocabulary	<p style="text-align: center;"> <i>Investigating, recording and questioning</i> <i>Identify and classify</i> <i>Observation over time</i> <i>Pattern seeking</i> <i>Scientific awareness</i> </p> <p>Living things and their habitats: characteristic, micro-organism, subdivided, invertebrate, vertebrate, classification, survival, variation, organism, population, classification, characteristics, environment, flowering, non-flowering, plants, animals, fish, amphibian, reptiles, mammals, human impact, deforestation, compare, bacteria</p> <p>Animals including humans: circulatory system, vessels, veins, arteries, plasma, blood cells, nutrients, transported, heart, oxygen, carbon dioxide, oxygenated, deoxygenated, valve, exercise, respiration, lungs, blood, pulmonary, alveoli, capillary, digestive, transport, nutrients, water, alcohol, drugs, tobacco</p> <p>Evolution and inheritance: evolution, inheritance, fossils, offspring, adaptation, advantage, disadvantage, characteristics, variation, reproduction, genetics, inherited, environmental, mutation, competition, survival of the fittest, evidence</p> <p>Light: light source, shadow, object, reflect, dark, reflect, ray, bounce, visible, beam, sun, glare, travel, straight, opaque, block, transparent, translucent, absorb, emitted, scattered, refraction</p> <p>Electricity: voltage, cell, buzzer, switch, series circuit, symbol, diagram, electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, wires, bulbs, batteries, conductor, insulator</p>			

Many of the children in our local context are not used to being thrown into the 'pit' and struggle when the answer to a question/investigation is not black and white. Our method of teaching and learning encourages our pupils to generate more than one idea and option for problem solving or for predictions in their science lessons. Science experiments and investigations are often based on real world/life issues and children are encouraged to explore others' ideas. By the end of KS2, pupils are expected to pose questions that are not straightforward, seek out problems to solve and challenge the routine method. Pupils will begin to see opportunities in mistakes and failures of themselves/peers and will often question what they are being told, especially by their peers and can suggest their own ideas.

Many parents/carers of the pupils at Longthorpe work within professions with a STEM focus e.g. doctors, nurses, dentists, vets, engineers and at Longthorpe we utilise such resources and regularly invite parents/carers into the classroom to discuss their roles and findings with the pupils. We have also been fortunate enough to visit a few workplaces of parents with a STEM focus.

Engagement and attainment of female pupils in STEM subjects has often been lower than that of male pupils at Longthorpe, so over the last few years we have taken UKS2 pupils on Girls4Tech days at the MasterCard head office to attempt to raise engagement and motivate these pupils and show them the opportunities available to pupils who study STEM in secondary/graduate settings.

In KS1 pupils will 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. Pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content: asking simple questions and recognising that they can be answered in different ways. Pupils will observe closely, using simple equipment and perform simple tests. They will become competent in identifying and classifying and will use their observations and ideas to suggest answers to questions. Pupils will become confident in gathering and recording data to help in answering questions

In LKS2 pupils will 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.

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

In UKS2, the principal focus of science teaching 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.

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

Science planning is taught with cross-curricular links following the 'Learning to Learn' approach where possible. Teachers are encouraged to use the PIXL planning and teaching resources if needed and all year groups follow the NC expectations and have been provided with a term by term timetable to use as a guideline.

SEND and PP pupils are to be considered during planning – are the activities/trips appropriate to their needs? 1:1 support to be used when necessary.