Dunnington Primary School

Science Long Term Plan

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School Values: We care, we believe, we succeed - TOGETHER!

Intent

At Dunnington C of E Primary School, our aim is to nurture our children's passion and enthusiasm for science and the world around us. Our science curriculum develops the natural curiosity of each child no matter their demographic, encourages them to have respect for living organisms, and instils in pupils the importance of caring for the natural environment.

Using the requirements of the Science National Curriculum as our guide, our science lessons offer opportunities for children to:

- Develop scientific knowledge and understanding of the disciplines of Physics, Chemistry and Biology.
- Formulate their own questions about the natural world.
- Foster the confidence to 'be wrong' when it comes to making predictions and postulating their own theories.
- Promote an awareness of the importance of teamwork in scientific experimentation.
- Practically investigate their questions using various methods of enquiry.
- Gain competence in the science skills of planning scientific investigations, gathering and analysing data and critical evaluation of investigations across the disciplines.
- Use a range of methods to gather data from investigations and secondary sources including computing, drawings, diagrams and photographs.
- Present data in a variety of methods including tables, bar charts, line graphs and pictograms.
- Gain a knowledge of important scientists through history and present-day careers that have science at the heart of them.
- Develop an enthusiasm and enjoyment of scientific learning and discovery.

Implementation

Following the Kapow Science Schemes of Work as our starting point, we deliver a rich science curriculum that allows children to learn new knowledge, both substantive and disciplinary, along with recapping prior knowledge and making sure that it is committed to their long-term memory.

Impact

The engaging science curriculum at Dunnington C of E Primary School results in a fun, high-quality science education, that provides the children with the foundations for understanding the natural world. Children build on their knowledge, year on year, making links between what they already know and what they are currently learning. Through enrichment activities, such as STEM clubs, parent scientists, science trips and whole school science days, children develop an enjoyment for science and become motivated learners.

Science - Long Term Planning Cycle at Dunnington CofE Primary School

Note: Science in Reception is taught through play-based learning and exploration within the Early Years Foundation Stage (EYFS) framework, specifically under the "Understanding of the World" area of learning. Children develop scientific skills by asking questions, observing, predicting, and using their senses to investigate the natural world and everyday phenomena. Children will cover three main topics, while learning about Seasons through the year.

	Cycle	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Reception		Animal adventures Seasons		I am a Scientist Seasons		Our Beautiful Planet Seasons	
KS1 Year 1 and 2	**A**	Forces and space: Seasonal changes (Kapow A)	Plants: Introduction to plants (Kapow A)	Materials: Everyday materials (Kapow B)	Materials: Uses of everyday materials (Kapow B)	Plants: Plant growth (Kapow A)	Making connections: Fairy tale science (Kapow B)
	B	Animals, including humans: Sensitive bodies (Kapow B)	Animals, including humans: Life cycles and health (Kapow A)	Animals, including humans: Comparing animals (Kapow B)	Living things: Habitats (Kapow A)	Living things: Microhabitats (Kapow B)	Making connections: Ocean protectors (Kapow A)
LKS2 Year 3 and 4	**A**	Materials: States of matter (Kapow B)	Animals, including humans: Movement and nutrition (Kapow A)	Materials: Rocks and soil (Kapow A)	Animals, including humans: Digestion and Food (Kapow A)	Living things: Classification and habitats (Kapow B)	Making connections: How does food affect muscle fatigue? (Kapow A)
	B	Forces and space: Forces and magnets (Kapow B)	Energy: Light and shadows (Kapow A)	Energy: Sound and vibrations (Kapow B)	Energy: Electricity and circuits (Kapow A)	Plants: Plant reproduction (Kapow B)	Making connections: How does wind force affect seed dispersal? (Kapow B)
UKS2 Year 5 and 6	**A**	Materials: Mixtures and separation (Kapow A)	Materials: Properties and changes (Kapow A)	Animals, including humans: Circulation and health (Kapow A)	Living things: Life cycles and reproduction (Kapow B)	Energy: Circuits batteries and switches (Kapow B)	Animals, including humans: Human timeline (Kapow B) Making connections: How does light affect the direction of plant growth? (Kapow B)
	B	Forces and space: Earth and space (Kapow A)	Forces and space: Unbalanced forces (Kapow B)	Living things: Classifying big and small (Kapow B)	Energy: Light and reflection (Kapow A)	Living things: Evolution and inheritance (Kapow B)	Making connections: How reflective are space blankets? (Kapow A)

Progression in Science Knowledge

Plants	
Reception	• To know the name for the basic plant parts (leaves, flowers, stem and roots.) • To know the names of some familiar flowering plants (e.g. daisy, rose, sunflower, daffodil) • To know plants are alive. • To know that seeds need water to grow. • To know that seeds grow into plants if taken care of.
Year 1 & 2	• To know a variety of common plants, and how they differ. • To know that deciduous trees lose their leaves seasonally, but evergreen trees do not. • To know the basic structure (including leaves, flowers (blossom), fruit, roots, bulb, seed, trunk, branches, stem) of a variety of common plants, including flowering plants and trees. • To begin to understand how plants grow and change over time. • To know that seeds and bulbs grow into seedlings by producing roots and shoots. • To know that seedlings grow into mature plants by developing parts such as roots, stems, leaves and flowers. • To know that seeds need water and warmth to germinate. • To know that plants need water, light and a suitable temperature for growth and health.
Year 3 & 4	• To understand the functions of the basic parts of a plant and the relationship between structure and function. • To know that water is transported within a plant from the root, through the stem, to the leaves. • To know that plants need water, light, air, nutrients and a suitable temperature for growth and health. • To understand that the needs for growth and health vary from plant to plant. • To know the life cycle of a plant from seed to mature plant. • To know that flowers are the reproductive organ of a plant. • To know that the process of pollination is the transfer of pollen to the female (part of the) flower. • To know that the process of seed formation is the growth of a seed after pollination. • To know some different methods of seed dispersal and the benefits of each.

Animals, Including Humans	
Reception	• To know the names of familiar animals (e.g. farm animals, pets and animals seen in storybooks.)

	• To know the main body parts of common animals (number of legs, wings, fur, tail). • To know that animals, including humans use their senses to explore the world. • To know that animals need food.
Year 1 & 2	• To know a variety of common animals (including fish, amphibians, reptiles, birds and mammals). • To understand how living things change, and that animals have offspring that grow into adults. • To know which offspring comes from which parent animal. • To know the stages in some animal life cycles. • To know the main body parts of common animals (arms, legs, wings, tails, fins, head, trunk, horns/tusks, shell) • To know key parts of the human body (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth). • To know the five main senses: sight, smell, hearing, taste and touch. • To know that the skin is used for touch, the tongue is used for taste, the nose is used for smell, the eyes are used for sight and the ears are used for hearing. • To know that a carnivore is an animal that eats other animals and give some examples. • To know that a herbivore is an animal that eats only plants and give some examples. • To know that an omnivore is an animal that eats both animals and plants, and to give some examples. • To know that animals, including humans, need water, food and air to survive. • To understand the importance of exercise, a balanced diet and hygiene for humans.
Year 3 & 4	• To know that animals can be grouped based on the presence of a skeleton. • To know that the skeleton in humans and some animals is used for movement, protection and support. • To know that the muscular system in humans and some animals works with the skeleton for movement. • To know the main bones in the body. • To know the main organs of the human digestive system (mouth, teeth, tongue, oesophagus, stomach, small and large intestines) and describe their simple functions. • To know the different types of human teeth (incisor, canine, premolar and molar) and their simple functions. • To know that animals, including humans, need the right types and amount of nutrition. • To understand that humans cannot make their own food and therefore eat to get the nutrition needed. • To know the main food groups (carbohydrates, protein, fats, fibre, vitamins, minerals and water) and their simple functions.

	• To know that a balanced diet should include all food groups. • To describe the diets of different animals. • To know that teeth can be damaged, including the effect of sugary and acidic food. • To know that it is important to brush teeth twice a day, make good food choices and visit the dentist regularly. • To describe the teeth of carnivores and herbivores, and understand why they are different. • To know that predators hunt for their food and prey are the animals being hunted. • To know that producers make their own food. • To know that food chains begin with a producer followed by consumers, and arrows to show the energy passed on.
Year 5 & 6	• To describe the human life cycle, including the stages of growth and development (baby, toddler, child, teenager, adult, elderly). • To describe changes that occur during puberty (in boys and girls). • To know that gestation periods vary across mammals. • To know the main parts of the human circulatory system (heart, blood vessels and blood). • To know that the heart pumps blood around the body. • To know that the blood vessels transport blood around the body. • To know that the blood transports vital substances around the body, including oxygen and nutrients. • To understand the relationships between different organ systems. • To understand the impact of diet, exercise, drugs and lifestyle on the way a body functions. • To know that the heart rate is the number of beats per minute. • To know that exercise increases heart rate.

Living things and their habitats	
Reception	• To know that animals and plants move, grow and feed. • To know the difference between things that are living and things that have never been alive. • To know that some animals hibernate or store food in winter. • To know the names of familiar animals (e.g. farm animals, pets and animals seen in storybooks.) • To know the names of some familiar flowering plants (e.g. daisy, rose, sunflower, daffodil). • To know that plants and animals live in a range of different places (land, sea, air). • To name some different places where animals live on the school site.

Year 1 & 2	• To begin to understand some of the life processes, including movement, reproduction, sensitivity, growth, excretion and nutrition. • To know the difference between things that are living, dead, and things that have never been alive, using some of the life processes. • To know a variety of plants and animals and describe some differences. • To name a variety of habitats, including woodland, ocean, rainforest and seashore. • To know that a habitat is the environment where an animal or plant lives/ grows, because it provides what they need to survive. • To know that a micro-habitat is a very small habitat (e.g. stones, logs and leaf litter). • To know that living things depend upon each other (e.g. for food, shelter.) • To understand that a food chain can be used to show how animals obtain food from eating either plants and/or other animals.
Year 3 & 4	• To know that living things can be grouped in different ways. • To know that a classification key can be used to group and identify plants and animals. • To know that vertebrates are animals which have a backbone and invertebrates are animals which do not have a backbone. • To know that plants can be grouped into flowering or non-flowering varieties. • To know that flowering plants include grasses and non-flowering plants includes ferns and mosses. • To know that there are five main vertebrate groups: birds, mammals, reptiles, amphibians and fish. • To know that invertebrate groups include snails, slugs, worms, spiders and insects. • To know that habitats can change throughout the year and this can be dangerous for living things. • To know that humans can have both a positive and negative impact on the environment.
Year 5 & 6	• To know that 'organism' is a term used to refer to an individual living thing. • To know that micro-organisms are incredibly small and cannot usually be seen by the naked eye. • To know the characteristics of the different groups of vertebrates and commonly found invertebrates. • To know that a life cycle shows the changes an animal or plant goes through until the reproduction of a new generation when the cycle starts again. • To know that all living things must reproduce for the species to survive. • To know that sexual reproduction requires two parents, whereas asexual reproduction only requires one parent. • To know that there are different processes plants and animals use to reproduce (asexual and sexual reproduction).

	• To know that living things have changed over time. • To know that fossils provide us with information about living things that inhabited the Earth millions of years ago. • To know that characteristics are passed from parents to their offspring, but that all offspring vary from their parents. • To know that over time, variation in offspring can affect animals' chances of survival in particular environments. • To know that animals and plants have adapted to suit their environment over many millions of years and that this process can be called evolution.

Materials	
Reception	• To recognise that things around us are made from different materials. • To know objects float or sink. • To know some objects move when pushed or pulled. • To know some objects freeze or melt.
Year 1 & 2	• To know that objects are items or things. • To know that a material is what an object is made from. • To identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock. • To know that property refers to how a material can be described. • To describe the physical properties of a variety of everyday materials. • To understand that materials can be grouped based on their physical properties. • To know why objects are made from particular materials and to give examples of their suitability. • To know that one material can be used for a range of purposes (and to give examples.) • To know that different materials can be used for the same purpose (and to give examples.) • To know why certain materials are unsuitable for particular objects. • To know that a push or pull must be applied to change the shape of a solid object. • To know that solid objects can be squashed, bent, twisted or stretched. • To know that different solid objects may take a different amount of force to change shape.
Year 3 & 4	• To know that rocks can be grouped based on their appearance or properties, (e.g. colour, texture, hardness, permeability.) • To know that rocks may contain grains, crystals or fossils. • To know that grains and crystals appear differently and can be used to classify rocks.

	• To know that soils are made from rocks and dead matter. • To know that all substances around us can exist as solids, liquids and gases. • To understand the relationship between the properties of rocks and their uses. • To know that a property of a solid is that it keeps its shape unless a force is applied to it. • To know that a property of a liquid can flow freely and take on the shape of a container. • To know that a property of a gas does not have a fixed shape and can escape from an unsealed container. • To know that fossils can form from the remains of living things. • To know that rocks can change over time (e.g. erosion, weathering). • To know that heating causes solids to turn into liquids (melting) and liquids to turn into gases (evaporating). • To know that cooling causes gases to turn into liquids (condensing) and liquids to turn into solids (freezing). • To know that water can exist as a solid, a liquid or a gas. • To know that the melting point of water is zero degrees Celsius and the boiling point of water is 100 degrees Celsius. • To know that water flows around the world in a continuous process called the water cycle. • To know that in the water cycle, evaporation is when bodies of water are heated and turn into water vapour. • To know that in the water cycle, condensation is the process of water vapour cooling to form water droplets in clouds, which can result in precipitation. • To know that the rate of evaporation increases as temperature rises.
Year 5 & 6	• To describe a broader range of materials and their properties, including hardness, solubility, transparency, conductivity and response to magnets. • To know that some substances will dissolve in a liquid to form a solution. • To know the factors that affect the time taken to dissolve, including temperature and stirring. • To understand that dissolving, mixing and changes of state are reversible changes. • To know that some liquids and solids can be separated using sieving, filtering and evaporation and to describe these processes. • To understand that some changes result in the formation of new materials and that these are usually irreversible. (e.g. burning, rusting, the action of acid on bicarbonate of soda.)

Energy	
Reception	• To know day is light because the sun is in the sky. • To know night is dark because the sun is not in the sky.

	• To know shadows are created when something blocks the light. • To know about differences in sounds.

Year 3 & 4	• To know that light travels from a source (e.g. the Sun, light bulbs and torches).
	• To know that light is needed to see things and that dark is the absence of light.
	• To know that light from the Sun can be dangerous and how to protect their eyes.
	• To know that all materials reflect light.
	• To know that shadows are formed when the light from a light source is blocked by an opaque object.
	• To know that shadows change as a result of different factors:
	  ○ Changing the position of the light source.
	  ○ Changing the distances between the light source, object and surface.
	• To know that shadows change position and length throughout the day as the Sun changes position in the sky.
	• To understand that sound is a result of vibrations.
	• To know that vibrations from sounds travel through mediums to the ear.
	• To know that an insulating material reduces the amount of vibrations that pass through it and this can be used to protect the ears from damaging sounds.
	• To know that different materials provide different amounts of insulation against sound.
	• To know a variety of ways to change the pitch or volume of a sound.
	• To know that quicker vibrations cause higher-pitched sounds and slower vibrations cause lower-pitched sounds.
	• To know that stronger vibrations cause louder sounds and weaker vibrations cause quieter sounds.
	• To know that sounds get fainter as the distance from the sound source increases.
	• To know that all electrical appliances need a power source, including batteries or mains electricity.
	• To know that an electrical circuit needs a complete path for the electrical charge to flow through.
	• To know the main components in a simple series circuit.
	• To know the precautions for working safely with electricity.
	• To know that some materials allow electrical charge to pass through them quickly and these are known as electrical conductors (e.g. metals).
	• To know that some materials do not allow electrical charge to pass through them easily and these are known as electrical insulators (e.g wood and plastic).
	• To know that metals are used for cables and wires because they are good conductors of electricity.
	• To know that plastic is used to cover cables and wires because it is a good insulator.

	• To understand that an open switch breaks a series circuit so the components will be off. • To understand that a closed switch completes a series circuit so the components will be on. • To understand the relationship between bulb brightness and the number of bulbs in a circuit.
Year 5 & 6	• To know that light travels in a straight line from a light source. • To understand that luminous objects are seen as a result of light directly entering the eye, whereas non-luminous objects reflect light into the eye. • To know that shiny surfaces reflect light uniformly. • To know that when light is reflected off a surface, its direction changes. • To know that mirrors and periscopes work using reflection of light on smooth surfaces. • To understand why shadows have the same shape as the objects that cast them as a result of light travelling in straight lines. • To understand relationships between light sources, objects and shadows. • To understand how and why the distance between the object and the screen affects the size of the shadow. • To understand how the angle of a reflected ray is affected by the angle of the incoming ray on a smooth surface. • To know a wider variety of components in a series circuit (including buzzer and motor). • To know the conventions used to draw circuit diagrams, including the recognised symbols for common components and using straight lines. • To know that the voltage of a circuit can be changed and how this affects bulb brightness (or buzzer volume).

Forces, Earth and Space	
Reception	• To know that some trees change in the four seasons. • To know some signs of each season (leaves on the ground, cold weather, daffodils growing and sunny • weather.) • To know that some animals hibernate or store food in winter. • To know that the weather changes throughout the year. • To know and compare weather types (rain, sun, snow, wind).
Year 1 & 2	• To know the name and order of the four seasons; spring, summer, autumn and winter. • To know that it is unsafe to look directly at the Sun. • To know weather associated with the four seasons and how it changes (in the UK).

	• To understand that day length varies across the four seasons, with fewer daylight hours in the winter and more in the summer.
Year 3 & 4	• To know some examples of contact and non-contact forces. • To know that some forces are a result of contact between two surfaces, but some forces can act at a distance (e.g. magnetism). • To know the North and South poles of a magnet. • To know some examples of magnetic materials, including iron and nickel, and how they react to a magnet and each other. • To know some different examples of magnets, including bar, horseshoe, button and ring. • To know some uses of magnets. • To know that friction is a contact force that acts between two surfaces to slow an object down. • To know that magnetism is a non-contact force that affects objects containing magnetic metal. • To understand that the opposite poles of a magnet attract one another and like poles repel one another. • To know that rougher surfaces have more friction between them than smoother surfaces. • To understand that the strength of different magnets may vary.
Year 5 & 6	• To know that the Sun is a star at the centre of our solar system. • To know that the Sun, Earth and Moon are approximately spherical bodies. • To know the names, order and relative positions of the planets and other main celestial bodies. • To know that a moon is a celestial body that orbits a planet and give examples of moons that orbit other planets. • To know that the Earth and other planets orbit around the Sun. • To know that the tilt of the Earth and its orbit around the Sun causes the seasons. • To know that the Moon orbits around the Earth. • To understand how the Earth's rotation causes day and night and the apparent movement of the Sun across the sky. • To know that gravity is a non-contact force that pulls objects together. • To know that air resistance and water resistance are both types of friction. • To know that unsupported objects fall towards the Earth because of gravity. • To know that friction, air resistance and water resistance act in the opposite direction to a moving object. • To know that when forces are imbalanced, the speed, shape or direction of an object changes. • To know that when forces are balanced the speed, shape or direction of an object stays the same. • To know that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect.

	• To know that rougher surfaces have more friction between them than smoother surfaces and how that may affect movement. • To know that the larger the surface area of an object the greater the air or water resistance it creates.

Science in Action - REAL Curriculum	
Reception	• To know some different job roles.
Year 1 & 2	• To know about famous scientists throughout history. • To know about a range of jobs and careers that use scientific knowledge and methods. • To know about the work of modern-day scientists. • To know about science in the news and recent discoveries. • To know there are spiritual, moral, social and cultural links with Science.
Year 3 & 4	• To know about the methods and equipment used by scientists throughout history and how these have led to modern methods. • To know how scientific knowledge has changed over time, leading to the current understanding of Science. • To know about current scientific research and what it aims to achieve in the future. • To know that collaboration and peer reviewing is essential for effective scientific progress.
Year 5 & 6	• To know how scientific evidence is used to support or refute ideas or arguments. • To know that mistakes can lead to new discoveries.

Progression of Science Skills - Working Scientifically

Working Scientifically	
Reception	• Describing their discoveries when working practically.
Year 1 & 2	• Representing data using pictograms and block graphs. • Using their results to answer simple questions. • Beginning to recognise when results or observations do not match their predictions.
Year 3 & 4	• Representing data using bar charts. • Drawing bars with greater accuracy. • Reading the value of bars with greater accuracy. • Writing a conclusion to summarise findings using simple scientific vocabulary.

	• Beginning to suggest how one variable may have affected another.
	• Beginning to quote results as evidence of relationships.
	• Identifying data that does not fit a pattern (anomalous data).
	• Recognising when results or observations do not match their predictions.
	• Beginning to use identified patterns to predict new values or trends.
	• Beginning to identify steps in the method that need changing and suggest improvements.
	• Beginning to identify which variables were difficult to control and suggesting how to better control them.
	• Commenting on the degree of trust by reflecting on:
	  ○ Results that do not fit a pattern (anomalies).
	  ○ The quality of results (accurate measurements and maintaining control variables).
	• Beginning to identify new questions that would further the enquiry.

Year 5 & 6	• Representing data by using line graphs and scatter graphs.
	• Plotting points with greater accuracy.
	• Reading the value of plotted points with greater accuracy.
	• Writing a conclusion to summarise findings using increasingly complex scientific vocabulary.
	• Suggesting with increasing independence how one variable may have affected another.
	• Quoting relevant data as evidence of relationships.
	• Identifying anomalies in repeat data and excluding results where appropriate.
	• Comparing individual, class and/or model data to the prediction and recognising when they do not match.
	• Using identified patterns to predict new values or trends.
	• Identifying steps in the method that need changing and suggesting improvements.
	• Identifying which variables were difficult to control and suggesting how to control them better.
	• Commenting on the degree of trust by also reflecting on:
	  ○ Accuracy (human error with equipment).
	  ○ Reliability (repeating results).
	  ○ Sources of information (e.g. websites, books).
	• Posing new questions in response to the data that would extend the enquiry.
	• Deciding what data to collect to further test direct relationships.