



South Gosforth First School

Science – Year 4 Long Term Plan

Purpose of Study

At South Gosforth First School, we aim to give all of our pupils a strong understanding of the world around them. Pupils are able to discover 'how the world works' and our place, impact, roles and responsibilities within this world. Our pupils are encouraged to ask questions, think deeply and apply their growing scientific knowledge to investigate and learn more about the different branches of Science: Biology, Chemistry and Physics. Our skilled staff teach our children to develop a systematic and logical way of working and provide opportunities for them to reflect on investigations and apply their growing knowledge in a range of different contexts.

As part of the planning process for Science at SGFS, teaching staff give careful consideration to the delivery of 'substantive knowledge' (what we learn) running alongside 'procedural knowledge' (how we learn). The sequence of learning dictates what should be taught, when it should be taught and how it should be taught, anticipating common misconceptions and providing a rich background of detailed subject knowledge for teachers in order that all children can reach beyond core concepts. Understanding of each key block of substantive knowledge is revisited across the years to ensure genuine progression, while the curriculum details the specialist vocabulary children should be able to use to articulate their understanding accurately and precisely at each stage. Working in this way in the classroom is described as 'Working as a Scientist' to pupils – This includes the following key skills: Observing Over Time; Pattern Seeking; Identifying, Grouping and Classifying; Carrying out Research Using a Range of Sources; Comparative Testing and Fair Testing. Practical tasks are carefully considered to ensure that they promote the children's best work; are relevant to the unit studied; and make the learning journey assured.

Aims

In line with the National Curriculum for Science it is our aim to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- use the 6 areas of working scientifically to develop enquiry skills; observing over time, pattern seeking, secondary research, identifying grouping and classifying, comparative tests and fair tests.
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.



Autumn 1	States of Matter	
Character Culture Creativity Challenge	Prior Learning Year 1 and 2 objectives: • Distinguish between an object and the material from which it is made. (Y1 Everyday materials) • Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock. (Y1 Everyday materials) • Describe the simple physical properties of a variety of everyday materials (Y1 Everyday materials) • Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 Everyday materials) • Identify and compare the suitability of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. (Y2 Uses of everyday materials) • Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 Uses of everyday materials)	
	Key Learning Intentions – Subject Knowledge • 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 Learning Intentions – Working Scientifically • To ask relevant questions and use different types of scientific enquires to answer them. • To set up simple practical enquires, comparative and fair tests. • To make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. • To gather, record, classify and present data in a variety of ways to help in answering questions. • To record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. • To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • To use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. • To identify differences, similarities or changes related to simple scientific ideas and processes. • To use straightforward scientific evidence to answer questions or to support their findings.



	Overview of scientific knowledge A solid keeps its shape and has a fixed volume. A liquid has a fixed volume but changes in shape to fit the container. A liquid can be poured and keeps a level, horizontal surface. A gas fills all available space; it has no fixed shape or volume. Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid. Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0°C. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100°C. Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy. Condensation is the change back from a gas to a liquid caused by cooling. Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation. This is the water cycle.	Key Vocabulary • Solid • Liquid • Gas • State change • Melting • Freezing • Evaporation • Water cycle • Condensation • Transpiration • Precipitation
	Overview of working scientifically <u>Observing Over Time:</u> How does the level of water in a glass change when left on the windowsill? <u>Pattern Seeking:</u> Is there a pattern in how long it takes different sized ice lollies to melt? <u>Research:</u> N/A <u>Identifying & Classifying:</u> Group materials into solids, liquids and gases. <u>Comparative Test:</u> Does seawater evaporate quicker than freshwater? <u>Fair Test:</u> N/A	
	Milestones of learning	
	• Name materials as solids, liquids or gases. • Observe and describe the typical properties of solids, liquids or gases.	
	• Complete tables to show information about solids, liquids and gases.	
	• Observe and describe the effect of heating and cooling water, chocolate, butter and other everyday materials.	
	• Measure the changing temperature of materials as they are cooled and complete tables and graphs to show effects.	
	• Describe the water cycle.	



	• Observe evaporation. • Observe and describe the different rates of evaporation in different temperatures.
	Assessment State of matter picture Explain how things change from one state to another.
	Enhancements • Act out the particles in different states of matter. • Make it rain in the classroom. • Observe how the level of water in a glass changes when left on the windowsill. • Explore freezing different liquids e.g. tomato ketchup, oil, shampoo.



Autumn 2	Electricity		
Character Culture Creativity Challenge	Prior Learning Early learning goal objective: Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environments 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.		
	Key Learning Intentions – Subject Knowledge - 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.	Key Learning Intentions – Working Scientifically - To ask relevant questions and use different types of scientific enquires to answer them. - To set up simple practical enquires, comparative and fair tests. - To make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. - To gather, record, classify and present data in a variety of ways to help in answering questions. - To record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. - To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. - To use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. - To identify differences, similarities or changes related to simple scientific ideas and processes. - To use straightforward scientific evidence to answer questions or to support their findings.	
	Overview of scientific knowledge Many household devices and appliances run on electricity. Some plug in to the mains and others run on batteries. An electrical circuit consists of a cell or battery connected to a component using wires. If there is a break in the circuit, a loose connection or a short circuit, the component will not work. A switch can be added to the circuit to turn the component on and off. Metals are good conductors so they can be used as wires in a circuit. Non-metallic solids are insulators except for graphite (pencil lead). Water, if not completely pure, also conducts electricity.		Key Vocabulary - Electricity - Electrical appliance - Device - Mains - Circuit



	Overview of working scientifically Observing Over Time: N/A Pattern Seeking: Which room has the most electrical sockets in a house? Research: N/A Identifying & Classifying: How would you group these electrical devices based on where the electricity comes from? Comparative Test: Which material is the best conductor of electricity? Fair Test: How does the thickness of a conducting material affect how bright the lamp is?	• Component • Cell • Positive • Negative • Conductor • Insulator
	Milestones of learning	
	• Identify and name common appliances that run on electricity. • Label appliances that run on high and low voltage electricity. • Identify and describe sources of electricity for appliances, including mains, battery, solar and others.	
	• Follow instructions to create a series circuit. • Label the components of the circuit.	
	• Complete incomplete circuits by adding the correct components. • Answer questions about completeness of various circuits.	
	• Observe and describe the effect of using switches in a circuit. • Complete circuit diagrams, showing and labelling switches.	
	• Observe and record how different materials act as conductors or insulators of electricity.	
	• Observe the effect of some poor and good conductors and label materials as poor or good conductors.	
	Assessment Quiz – match labelled diagram of a circuit. (Wordwall)	
	Enhancements • Investigate whether materials are conductors or insulators of electricity. • Conduct your own circuit experiments.	



Spring 1 and 2		Animals Including Humans	
Character Culture Creativity Challenge	Prior Learning Year 1, 2 and 3 objectives: - Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 animals including humans) - Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 Animals including humans) - Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 Animals including humans) - 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. (Y3 Animals including humans)		
	Key Learning Intentions – Subject Knowledge - 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.		Key Learning Intentions – Working Scientifically - To ask relevant questions and use different types of scientific enquires to answer them. - To set up simple practical enquires, comparative and fair tests. - To make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. - To gather, record, classify and present data in a variety of ways to help in answering questions. - To record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. - To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. - To use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. - To identify differences, similarities or changes related to simple scientific ideas and processes. - To use straightforward scientific evidence to answer questions or to support their findings.



	Overview of scientific knowledge Food enters the body through the mouth. Digestion starts when the teeth start to break the food down. Saliva is added and the tongue rolls the food into a ball. The food is swallowed and passes down the oesophagus to the stomach. Here the food is broken further by being churned around and other chemicals are added. The food passes into the small intestine. Here nutrients are removed from the food and leave the digestive system to be used elsewhere in the body. The rest of the food then passes into the large intestine. Here the water is removed for use elsewhere in the body. What is left is then stored in the rectum until it leaves the body through the anus when you go to the toilet. Humans have four types of teeth: incisors for cutting; canines for tearing; and molars and premolars for grinding (chewing)	Key Vocabulary • Digestive system • Digestion • Saliva • Oesophagus • Stomach • Intestine • Rectum • Anus • Incisor • Canine • Molar • Premolar • Producer • Predator • Prey • Food chain
	Overview of working scientifically Observing Over Time: How does an egg shell change when it is left in cola? Pattern Seeking: N/A Research: How do dentists fix broken teeth? Identifying & Classifying: What are the names for all organs involved in the digestive system? How can we organise our teeth into groups? Comparative Test: N/A Fair Test: N/A	
	Milestones of learning	
	• Label the parts of the human digestive system.	
	• Describe the functions of the human digestive system.	
	• Label the types of adult human teeth. • Describe the functions of the different types of teeth	
	• .Describe good care of teeth.	
	• Name producers, predators and prey in a food chain. • Describe producers, predators and prey as herbivores, carnivores or omnivores.	
	• Describe energy flow in a food chain. • Draw a food chain.	



	Assessment Quiz on the digestive system, teeth and food chains.
	Enhancements • Drama – How digestion works. • Investigate if an egg shell changes when left in cola. • Create food chains. • Visit from a dentist.

Summer 1	Sound	
Character Culture Creativity Challenge	Prior Learning Year 1 objectives: • 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)	
	Key Learning Intentions – Subject Knowledge • 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. • Recognise that sounds get fainter as the distance from the sound source increases.	Key Learning Intentions – Working Scientifically • To ask relevant questions and use different types of scientific enquires to answer them. • To set up simple practical enquires, comparative and fair tests. • To make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. • To gather, record, classify and present data in a variety of ways to help in answering questions. • To record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. • To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • To use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions. • To identify differences, similarities or changes related to simple scientific ideas and processes.



		To use straightforward scientific evidence to answer questions or to support their findings.
	Overview of scientific knowledge A sound produces vibrations which travel through a medium from the source to our ears. Different mediums such as solids, liquids and gases can carry sound, but sound cannot travel through a vacuum (an area empty of matter). The vibrations cause parts of our body inside our ears to vibrate, allowing us to hear (sense) the sound. The loudness (volume) of the sound depends on the strength (size) of vibrations which decreases as they travel through the medium. Therefore, sounds decrease in volume as you move away from the source. A sound insulator is a material which blocks sound effectively. Pitch is the highness or lowness of a sound and is affected by features of objects producing the sounds. For example, smaller objects usually produce higher pitched sounds.	Key Vocabulary - Sound - Source - Vibrate - Vibration - Travel - Pitch - Volume - Eardrum - Decibel - frequency
	Overview of working scientifically Observing Over Time: N/A Pattern Seeking: Is there a link between how loud it is in school and time of day? Research: N/A Identifying & Classifying: N/A Comparative Test: Which material is best to use for muffling sound in ear defenders? Fair Test: How does the volume of a drum change as you move further away from it?	
	Milestones of learning	
	- listen to and describe a range of sounds from different sources. - Identify the source of sounds.	
	Listen to and describe sounds through a variety of mediums.	
	Draw a labelled diagram that shows how vibrations travel through a medium to the ear.	
	Experiment with stringed musical instructions to discover how high and low notes are made and explain your findings.	
	Compare and contrast the effectiveness of different mediums in transmitting sounds.	
	Assessment Hexagons showing how sound travels to the ear.	



	Enhancements • Investigate vibrations and how sound travels and present your findings. • Investigate how sounds change with distance from the source. • Make instruments.
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Summer 2	Living Things and Their Habitats	
Character Culture Creativity Challenge	Prior Learning Year 1 and 2 objectives: • Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees (Y1 Plants) • Identify and describe the basic structure of a variety of common flowering plants, including trees (Y1 Plants) • Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 animals including humans) • Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 Animals including humans) • Identify and name a variety of plants and animals in their habitats, including microhabitats. (Y2 Living things and their habitats)	
	Key Learning Intentions – Subject Knowledge • 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.	Key Learning Intentions – Working Scientifically • To ask relevant questions and use different types of scientific enquires to answer them. • To set up simple practical enquires, comparative and fair tests. • To make systematic and careful observations and where appropriate take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers. • To gather, record, classify and present data in a variety of ways to help in answering questions. • To record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts and tables. • To report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions. • To use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.



		• To identify differences, similarities or changes related to simple scientific ideas and processes. • To use straightforward scientific evidence to answer questions or to support their findings.
	Overview of scientific knowledge Living things can be grouped (classified) in different ways according to their features. Classification keys can be used to identify and name living things. Living things live in a habitat which provides an environment to which they are suited. These environments may change naturally e.g. through flooding, fire, earthquakes etc. Humans also cause the environment to change. This can be in a good way (i.e. positive human impact, such as setting up nature reserves) or in a bad way (i.e. negative impact, such as littering). These environments also change with the seasons; different living things can be found in a habitat at different times of the year.	Key Vocabulary • Classification • Environment • Habitat • Human impact • Ecology • Emission • Pesticide • Ecosystem
	Overview of working scientifically Observing Over Time: How does the variety of invertebrates change over the year on the school field? (record in September, January, April and June) Pattern Seeking: N/A Research: Can we find other animals to add complexity to our classification key? How do changes in the local environment affect the species that live there? Identifying & Classifying: N/A Comparative Test: N/A Fair Test: N/A	
	Milestones of learning	
	• Name groups of animals (and plants). • Describe the features of animals (and plants) in particular groups. • Match animals (and plants) to groups. • Complete a classification key from a list of animals (and plants).	
	• Name and describe a range of different habitats. • Identify and label specific plants and animals in these habitats.	



	Describe how a change to an environment (e.g. deforestation in a rainforest) is a danger to specific habitats.
	Assessment Create their own Venn / Carroll diagram, including deciding sorting criteria, to classify and sort a range of known living things.
	Enhancements - Deforestation debate. - Produce a campaign video.