St Walburga's Catholic Primary School
Whole School Science Scheme of Work

YEAR 3

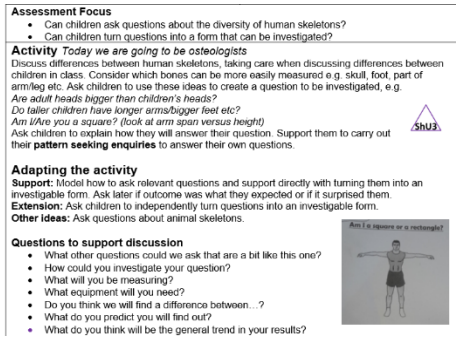
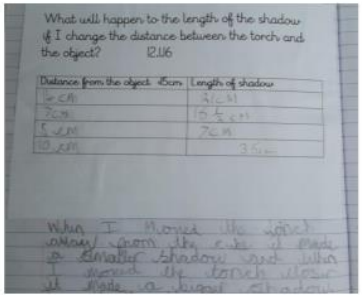
Subject Content Key Stage 2

The Working Scientifically skills listed below will be taught **through** the science content in each topic.

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

	AUTUMN 1	AUTUMN 2	SPRING 1
Topic	Stone Age and Bronze Age	Bronze Age, Iron Age and Changes in Britain	World Geography
Subject Content	**Rocks and Soils**	**Animals including Humans**	**Light**
Addressing stereotypes	Contribution of Mary Anning to palaeontology Inge Lehman- seismologist- discovery of Earth's solid core.	Marie Curie-how her work on X-rays helped us identify bones.	Female physicist Donna Strickland and her contribution in development of lasers in laser eye surgery.
Key questions	What are rocks? Where do they come from? How are fossils formed? Why do we have fossils for some animals and not others? What is soil and how is it formed? What lives in soil and how do these things survive?	What foods do we eat and why? What is a balanced diet? How are nutrients, water and oxygen transported within humans? Where is our skeleton and what is its function? How are the bones from different animals the same or different? Where are our muscles and what do they do?	How do we see things? How does light travel? How are shadows formed? Which surfaces and materials reflect light well? Are all shadows the same? Is it easy to work out the object by looking at the shadow?

Content			
	In this unit of learning, children will investigate the physical characteristics of rocks and soils including their appearance, texture and permeability. Children will explore and investigate rocks to see which is the hardest, permeable or impermeable. They will explore the process of fossilisation including looking at the contribution of Mary Anning. • **Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.** Rock detectives walk – identifying how materials from rocks are use in and around school. Practical rock sorting activity. Use secondary sources to find out where rocks come from. Devise mini tests (permeability, durability and density) to find out more about rocks and decide how they will record their observations/ results. Make observations based on the properties of different rocks http://www.bbc.co.uk/bitesize/ks2/science/materials/rocks_soils/play/ • **Describe in simple terms how fossils are formed when things that have lived are trapped within rock.** Explore fossilisation process. Describe Mary Anning's contribution to palaeontology. • **Recognise that soils are made from rocks and organic matter.** Observe different soil samples using hand lenses. Discuss soil types and use sieves to separate large soil particles. Mix the soil samples with water, watch them settle and observe the layers.	*In this unit, children will identify that animals, including humans, need the right types of food groups and amount of nutrition. Children will identify that humans and some other animals have skeletons and will explore the endoskeletons, exoskeletons. Children will investigate muscle power - where our muscles are and what do they do.* • **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.** Revisit prior knowledge of the importance of eating the right amounts of different types of food from Year 2. Investigate food groups, how they benefit our bodies and in which foods they can be found. Explore a balanced diet as well as people who have different diets due to preferences, intolerances to certain foods and allergies. Discuss what 'going on a diet' means. Why some people do this and how they can ensure they are still eating a balanced diet. http://www.foodafactoflife.org.uk/Activity.aspx?contentId=56& Rebecca's story at http://www.bbc.co.uk/learningzone/clips/nut-allergy-rebeccas-story/13704.html • **Explore how nutrients, water and oxygen are transported within our bodies.** Explore what our circulatory system is and what our blood does? Research transport and circulatory systems in other animals. • **Identify that humans and some animals have skeletons and muscles for support, protection and movement.** Compare similarities and differences between human skeletons and other animals. BBC Learning zone clips – Skeletons and 'Skeleton of a fish', 'Animals and their skeletons'	*Children will explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. They will think about why it is important to protect their eyes from bright lights. They will look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.* • **Recognise that they need light in order to see things and that dark is the absence of light.** Identify light sources and sort statements about light. Describe experiences of darkness. Create a dark box for children to use and make observations. Record findings in annotated drawings. Relate to the concept of the earth turning away from the sun creating night. http://www.bbc.co.uk/schools/scienceclips/ages/10_11/see_things.shtml • **Notice that light is reflected from surfaces.** Demonstrate how we see things. Discuss which materials are most suitable when reflecting light. Link to Year 2 investigation on reflective materials. • **Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.** Share examples of items that protect us from Investigate effect of sunlight on different items. Share findings about how the Sun can affect our skin and remind about sun safety rules and effects the sun can have. • **Recognise that shadows are formed when the light from a light source is blocked by a solid object.** Shadow hunt to record shape, size, darkness of shadows. Create own shadows with

		http://www.bbc.co.uk/science/humanbody/body/interactives/3djigsaw_02/index.shtml?skeleton Explore where our muscles are and what they do. The importance of muscles moving in order to make bones move	torches, draw objects, direction of light from the torch and shadows formed. • **Find patterns in the way that the size of shadows change.** Discuss shadows formed when walking towards, underneath and away from a street light. Show BBC clip 'Where do shadows and light come from?' to compare answers.
Working Scientifically Focus	• **To make and record measurements using standard units.** Investigate which soil is the most permeable/ can water flow through the most easily? Demonstrate unfair testing initially. Test 3 different types of soil or sand/ soil mixtures by pouring water through soil in a filter and funnel. Record timed results. • **To present scientific data in more than one way- bar charts and tables** • **Using results to draw simple conclusions** Are some house bricks more permeable than others? How could you test different bricks to see which holds the most water? Plan and carry out an investigation where they measure the weight of house bricks before the test and after immersion in water. Consider fair testing. Draw a bar graph for results and interpret results to draw conclusions.	• **Gather, record, classify and present data in a variety of ways to help in answering questions.** • **Use straightforward scientific evidence to answer questions or support findings- pattern seeking enquiry.** To explore the effects of exercise on muscles Pattern seeking – Do people have stronger muscles because they use them more? https://www.hamilton-trust.org.uk/science/year-3-science/animals-including-humans-keeping-healthy/ • **Ask relevant questions and use different types of scientific enquiries to answer them** TAPS Investigating the human skeleton Model turning relevant questions into an investigable form.  **Assessment Focus** • Can children ask questions about the diversity of human skeletons? • Can children turn questions into a form that can be investigated? **Activity** *Today we are going to be osteologists* Discuss differences between human skeletons, taking care when discussing differences between children in class. Consider which bones can be more easily measured e.g. skull, foot, part of arm/leg etc. Ask children to use these ideas to create a question to be investigated, e.g. *Are adult heads bigger than children's heads?* *Do taller children have longer arms/bigger feet etc?* *Am I/Are you a square? (look at arm span versus height)* Ask children to explain how they will answer their question. Support them to carry out their **pattern seeking enquiries** to answer their own questions. ShU3. **Adapting the activity** **Support:** Model how to ask relevant questions and support directly with turning them into an investigable form. Ask later if outcome was what they expected or if it surprised them. **Extension:** Ask children to independently turn questions into an investigable form. **Other ideas:** Ask questions about animal skeletons. Am I a square or a rectangle? **Questions to support discussion** • What other questions could we ask that are a bit like this one? • How could you investigate your question? • What will you be measuring? • What equipment will you need? • Do you think we will find a difference between…? • What do you predict you will find out? • What do you think will be the general trend in your results?	• **Gather and record data to answer questions.** How much light passes through different objects? Does light pass through any objects? Which types of material are good at blocking light? Use data loggers before the investigation to discover places with the most and least amounts of light. Use chosen materials in a box which the torch shines through to reduce interfering light. Data loggers placed at the other end to detect the amount of light. Record results in a table. Explain what has happened to the light using scientific vocabulary. • **Report on findings from enquiries** TAPS Shadow investigation What happens to the size of a shadow when the distance between the torch and object is changed?  What will happen to the length of the shadow if I change the distance between the torch and the object? 12.1.16 Distance from the object /5cm Length of shadow When I moved the torch away from the cube it made a smaller shadow and when I moved the torch closer it made a bigger shadow.
	Pupils should read, spell and pronounce scientific vocabulary correctly		

Subject specific Vocabulary	igneous sedimentary metamorphic rocks durable, buoyancy	properties permeable impermeable hard soft	herbivore carnivore omnivore nutrition/ nutrients energy un/ saturated fats in/vertebrate	endo/exo skeleton muscles tendons joints	pupil retina shadow opaque translucent	transparent reflection reflective ray

	SPRING 2	**SUMMER 1**	**SUMMER 2**
Topic	Italy	Victorians	Victorians
Subject Content	**Forces and Magnets**	**Plants**	**Scientists and Inventors**
Addressing stereotypes	Mary Somerville- experiments into magnetism		George Washington Carver, William Smith, Joseph Banks
Key questions	What are forces? What is a magnet? Are all metals attracted to magnets? What are magnets used for? Are all magnets the same strength?	What do plants need in order to grow? What are the stem/ roots/ leaves and why do plants need them? How is water transported in plants?	What do plants need in order to grow well? How do convex and concave mirrors change images? What do bones do?
Content	*In this unit of learning children will explore and discuss how a push or a pull is exerted by something and acts on something else and describe how some forces are made by contact (pushing, pulling) while others act at a distance (e.g. gravity and magnets). Children will investigate and explain how gravity pulls things down, and that on the Earth's surface, we are supported by a contact force with the ground. They will describe the use of magnets in familiar objects and explain that magnets attract magnetic materials.* • **Compare how things move on different surfaces.** Introduce vocabulary and pictures of forces in action. Children investigate forces collaboratively using equipment eg. observing what happens when they push e.g. scooters, toy cars or putting objects in water and seeing what happens when they try to immerse a floating object.	*In this unit of learning children will use their prior learning to explore and investigate the relationship between structure and function: the idea that every part has a job to do. Children will explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction*. Revisit knowledge and understanding of how plants need water, light and a suitable temperature for growth from Year 2. • **Identify and describe the functions of different parts of flowering plants: roots, stem/ trunk, leaves and flowers.** Group things into living, never lived and once lived before. Discuss what things need in order to grow. Dissecting plants and flowering plants, Identify parts of a plant and their functions.Roots, stem. leaves and flowers. Find a range of plants outside the	*In this unit, the children will learn about famous scientists and inventors linked to the Y3 science curriculum. They will learn about Joseph Banks and his work in finding new plants, Marie Curie and her work on radiation and consider what plants need to grow well through exploring the life and discoveries of George Washington Carver. They will find out about William Smith and how his discoveries have helped determine the age of rocks. They will alsol learn about Inge Lehmann, the woman who discovered that the Earth's core is solid. The children will have chance to investigate how images change in convex and concave mirrors and will hear about the inventions and devices that use convex and concave mirrors.* • **To explore how new plants arrived in our country.** Identify plants in the locality and distinguish between native and non-native species. Use secondary sources to find out about the work of Joseph Banks in bringing new plants to our country. Research David Douglas,

	Which forces can make things move? Kick, throw, shove, roll. Slow things down, stop them or change their direction? Catch, deflect, tap and stop. Change the shape of something? Squash, stretch, press and squidge are examples. Group forces into pushes and pulls. • **Notice that some forces need contact between two objects but magnetic forces can act at a distance.** Model gravity not needing contact. Can you make a paperclip move without touching it? Introduce magnets. • **Observe how magnets attract or repel each other and attract some materials and not others.** • **Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet and identify some magnetic materials.** Predict and test a variety of materials for magnetic properties. Record results in simple tables and compare to predictions. • **Describe some magnets as having two poles.** • **Predict whether two magnets will attract or repel each other depending on which poles are facing.** Practically explore and investigate how magnets behave towards each other. Introduce North and South poles and link to the earth's poles.	classroom to observe, group, identify using secondary sources such as www.naturedetectives.org.uk) • **Explore the requirements of plants for life and growth (air, light, water, nutrients from the soil and room to grow) and how they vary from plant to plant.** Investigation over time. Discuss what plants need to grow and why. Investigate one of the following factors: amount of sunlight, water. materials in which they are growing, PH level. Emphasise need for fair testing and only changing one variable. Record results in a table and produce a graph. Assign a specific lesson to demonstrate summing up observations in a conclusion which answers the initial question. Create Good Plant Growing Guide to explain what they have found out. Investigation over time. What do the leaves do? Children to plan their own investigation to find out the function of leaves. For example, using seedlings to remove leaves, cover them, paint them etc. Decide which measurements to take over a period of time. • **Explore the part flowers play in the life cycle of a flowering plant including pollination, seed formation and seed dispersal.** Matching flower parts with their functions. Explore pollination and fertilisation process. Act our different methods of seed dispersal and order different stages of life cycle of flowering plant.	Jean Baret and Tom Hart Dyke's contributions. • **To explore the requirements of plants for life and growth.** Linked to knowledge of what plants need to grow well, explore how George Washington Carver helped farmers grow crops. • **To explain how fossils can be used to find the age of rocks.** Explore William Smith's principles of fossil succession. Take part in a geological challenge to set up and observe sedimentary rocks bottle. • **To notice that light is reflected from surfaces** by investigating concave and convex mirrors. Investigation below. • **To explain how the work of Marie Curie on x-rays helped to identify bones.** Research the work of Marie Curie and how her scientific ideas changed health and medicine. To research and describe what Inge Lehman discovered about the earth's core and the significance of her findings for geologists.

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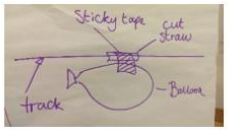
Develop prediction and conclusion drawing
TAPS- Balloon Rocket and Car Ramp
Plan and carry out a fair test comparing how vehicles move on different surfaces.



Plan and carry out fair tests
Are big magnets more powerful than small ones? Which materials are magnetic?
What predictions can they make and <u>why</u>. Children to write up results, tables and observations focusing on their conclusion. What would we keep the same? (fair test). Use findings to draw conclusions.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Using results to draw simple conclusions and suggest improvement.
Requirements of plants investigation above.
Make careful observations.
TAPS- Function of a Plant stem
How is water transported in plants. What is the function of the stem- investigation over time? Investigate celery stem, white tulips or white carnation standing in food dye and water. Make observations.


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Ask relevant questions and using different types of scientific enquiries to answer them.
Ask questions about the size of images in convex and concave mirrors. Make predictions about the size of images in each mirror. Explain how they change images recording answers in annotated diagrams and find examples of how both are used in real life.

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<td>Subject specific Vocabulary</td>
<td colspan="4">Pupils should read, spell and pronounce scientific vocabulary correctly
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<td>forces
friction
surface
magnet
magnetic
magnetic field
poles
repel</td>
<td>attract
push
pull
theory
investigate</td>
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carpel
sepal
pollination
pollinator
germination
seed dispersal</td>
<td>botanist
native
palaeontologist
physicist
chemist
concave/convex/ plane
mirror
distorted</td>
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YEAR 4

Subject Content Key Stage 2

The Working Scientifically skills listed below will be taught **through** the science content in each topic.

Working Scientifically

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

	AUTUMN 1	AUTUMN 2	SPRING 1
Topic	The Romans	The Egyptians	Egyptians
Subject Content	**Living things and Habitats**	**Animals including humans -Digestive System**	**Water Cycle**
Addressing stereotypes			
Key questions	How can living things be grouped? How can changes in the environment pose dangers to living things?	Why are our teeth different shapes? How can we keep our teeth healthy? What organs are involved in the digestive system? What does our digestive system do when we are unwell? Why is each part of a food chain important?	Where do evaporation and condensation take place in the water cycle? What factors speed up evaporation?
Content	*In this unit of learning children will investigate a range of living things, exploring what animals and plants need in order to survive; how important plants are for all living things and the conditions that plants need so that they will grow. They will find out about the life cycles of animals that could be found in the school grounds and the conditions that animals need in order to survive. Children will also explore how an animal is suited to its environment and investigate some feeding relationships between animals and plants.*	In this unit of learning children will investigate animals including humans. They will be introduced to the main body parts associated with the digestive system and how they have special functions including: mouth, tongue, teeth, oesophagus, stomach and intestine and understand how the digestive system digests the food eaten and (with oxygen) gives the body energy process of digestion. They will explore different types of teeth including milk and permanent teeth; incisors, canines and molars. Children will find out about food groups and healthy balanced diets and	*In this unit, children will investigate the different stages of the water cycle and the processes involved in this.* *They will recreate the water cycle using actions and make a model water cycle to observe the process in action. They will explore the process of transpiration in plants and will carry out investigations into water in its three states.* • **Identify the part played by evaporation and condensation in the water cycle and**

	• **To recognise that living things can be grouped in a variety of ways by sorting living things into a range of groups.** Generate criteria to sort living things. Understand the 7 characteristics- MRS NERG. using the PowerPoint in resource folder. Discuss which living things they would expect to find locally and why. Sort living things into a Venn and Carroll diagrams and branching databases. Watch clip https://www.bbc.co.uk/teach/class-clips-video/what-is-an-ecosystem/zdrtscw Record examples of animal groups and their characteristics using Top Trumps cards. Features to include: lifespan, weight, height and number of young. Play 'Sort it' game in resource folder.  • **Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.** Observe microhabitats in school grounds to record/ collect/ take photos of the different living things they can see (animals and plants) Use classification keys such as Woodland Trust below for leaf identification or free Tree ID app on ipads. https://www.woodlandtrust.org.uk/blog/2020/03/tree-id-kids/ https://www.forestryengland.uk/sites/default/files/documents/MiniBeasts%20in%20the%20Forest_lesson%20plan.pdf Sort animals/identify invertebrates by looking at their characteristics. Emphasise care when handling and observing living creatures.	compare diets of herbivores, carnivores and omnivores. Investigate teeth and what causes decay and look closely at food chains/webs. • **Identify the different types of teeth in humans and their simple functions.** Introduce teeth as the first part of the digestive system. Name the different types of teeth and their functions in humans. Use mirrors to see inside mouths/ tongues to feel the different shapes of teeth. Show teeth of different animals and discuss what they know about what animals need their teeth for and the diet of those animals. Link to omnivores/herbivores/ carnivores. https://kidshealth.org/en/kids/teeth-movie.html. https://www.bbc.co.uk/animalsteach/class-clips-video/teeth/zr8ygwx • **Describe the simple functions of the basic parts of the digestive system in humans.** Watch the video clip below in advance and practically demonstrate the digestive system at work using the suggested resources: crackers, orange, banana, tights, water. Explain what each object represents in the digestive system using PowerPoint in the resources folder. Children to label a picture of the human body to draw what happens to their lunch. https://www.stem.org.uk/resources/elibrary/resource/35396/digestive-system-experiment https://www.dkfindout.com/uk/human-body/digestion/ Watch the clip and introduce new organs: gall bladder, appendix and their functions and discuss the stomach's ability to expel food that is harmful. https://kidshealth.org/en/kids/dsmovie.html	**associate the rate of evaporation with temperature.** Show the water cycle through watching clip below with water moving in a cycle due to changes in temperature causing the water to change from one state to another. https://www.bbc.co.uk/bitesize/clips/z8qtfg8 https://www.metoffice.gov.uk/weather/learn-about/met-office-for-schools/other-content/other-resources/water-cycle Use the resource Water Aid to recreate the cycle through drama and to make a model water cycle file:///C:/Users/chris/Downloads/water-cycle-ks2-lesson-plans.pdf Explain that plants release water into the air in a process called transpiration. Show a practical example of transpiration using a pot plant with a plastic bag over the top. Show that water has condensed on the inside of the bag showing that transpiration has taken place. • **Explore water in its three states** Rotation of activities: ice cube investigation, reversing changes, salt and ice to demonstrate the three states of water including evaporation and condensation and the temperature at which water changes state. Explain what happens to water at the different stages of the water cycle. Make observations and conclusions.

	 Watch the clip below of the process of zoomed in photographs of insects. http://microsculpture.net/ Make accurate observational drawings of insects found using hand lenses and use these to create larger scale drawings showing features more clearly. Use How to expand an image resource in folder. CROSS CURRICULAR LINK TO ART-SKETCHING SKILLS • **Recognise that environments can change and that this can sometimes pose dangers to living things.** Identify dangers to wildlife in the local and wider environment and record observations in a table or write a report and present findings to the class.	Use children's bodies to act out parts of the digestive system in a large space. Show the shape of incisors, canines and molars (pointed, flat) small intestine (long line lying head to toe), large intestine (row of bridges with partners), stomach (bubbly movement to show gases and acid working to break up food), oesophagus (stand up straight and drop a ball to the floor). • **Construct and interpret a variety of food chains identifying producers, predators and prey.** Recall prior knowledge of food chains from KS1. https://www.bbc.co.uk/teach/class-clips-video/food-chains-and-food-webs-in-animals/zn7g92p Construct food chains using the correct scientific terminology: predator, producer, prey. Make links between plants and animals in the form of food chains and discuss the impact of a break in the food chain. Consider the over fishing of cod in a simple food chain and the impact on seals, wolves being hunted to extinction. Watch the clip below 'How wolves change Rivers' https://www.theguardian.com/science/grrlscientist/2014/mar/03/how-wolves-change-rivers https://www.bbc.co.uk/news/uk-scotland-33533035	

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Classifying data in a variety of ways to help in answering questions.
TAPS Investigation – Animal Key
Choose up to six animals to sort and ask yes/ no questions to split the animals in the form of a branching database. Children to then try each other’s keys and return to improve the questions/ layout.
Recording findings using simple scientific language and keys
TAPS Investigation – Leaf key
Using leaves collected from the school grounds, children create questions to give yes/no answers to split the leaves in half each time to make a key.

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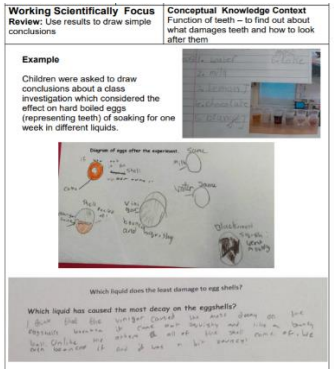
To set up simple practical enquiries, comparative and fair tests.
To make careful observations, recording results and using them to develop further investigations.
Use results to draw simple conclusions.
TAPS Investigation -Teeth in liquids
Discuss tooth decay and its causes. Children to generate questions to investigate tooth decay. Focus on the need to change one variable in fair and comparative tests. Use tooth decay enquiry sheets in resource folder.



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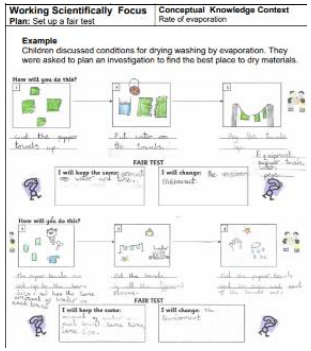
Set up a fair test
To make systematic, careful and accurate observations and measurements.
Report on findings from enquiries by displaying results and conclusions.
TAPS – Drying materials - Evaporation investigation Discuss conditions for drying washing and discuss where is the best place to dry your washing. Which conditions are the best to dry materials? Does temperature affect how fast towels dry? Decide types of materials, quantity of water, locations to test and how often to check as well as criteria for dryness (dry to touch).



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<td>Subject specific Vocabulary</td>
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life processes
respiration
sensitivity
reproduction
excretion
nutrition
movement
habitat</td>
<td>environment
endangered species
extinct
classification
vertebrates
invertebrates
specimen
characteristics</td>
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incisors
canines
digest
oesophagus
stomach
small/large intestine
rectum
herbivore</td>
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omnivore
produce
predator
prey</td>
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condensation
run off
evaporation
transpiration
water vapour
liquids
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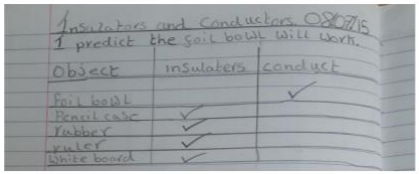
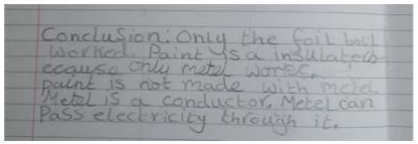
	SPRING 2	SUMMER 1	SUMMER 2
Topic		World War 2	Bridges Electricity
Subject Content		**States of Matter**	**Electricity**
Addressing stereotypes			Edith Clarke – Electrical engineer Evelyn Glennie – musician.
Key questions		What are the properties of particles in solids, liquids and gases? Do gases weigh anything? How do solids, liquids and gases change state?	Where does electricity come from? What is electric current? Which materials are conductors/ insulators of electricity? How do switches open and close a circuit? What are renewable and non – renewable sources of electricity? How do we hear sound? How does sound travel? Can sound travel through anything? How do our ears help us to hear sounds?
Content		*In this unit, children will reinforce their understanding of solids and liquids and states of matter. They find out how solids and liquids can be separated when they become mixed and explore reversible changes. They learn how to filter a solution. Children will set up and carry out their own lines of enquiry to explore the freezing of different liquids and to find out if different materials melt at different temperatures?* • **Compare and group materials together according to whether they are solids, liquids or gases.** Discuss and explore the properties that make a material a solid or liquid. https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/zsgwwxs Children to take part in practical tasks, sorting and describing materials (sand, sugar, salt, oil etc) as solids, liquids or gases based on their properties. Clarify that although sand can be poured and take the shape of a container, it is a solid. It is made	*In this unit, the children will have first-hand investigative opportunities using a range of circuit components and developing new knowledge. Children will construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. Children will explore and investigate how switches in a circuit work as well as electrical insulators and conductors* • **Identify common appliances that run on electricity.** Create a mind map of what the children already know and what they would like to know. https://www.bbc.com/bitesize/articles/zcwnv9q Explore games that use electricity and understand that electrical items in our homes are powered from mains electricity or batteries. Brainstorm appliances around the home that use batteries or are connected to mains electricity.

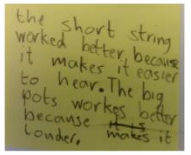
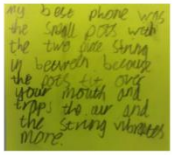
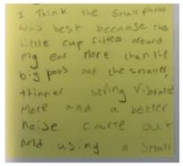
		of many grains, each of which is a solid. Liquids always have a flat top when they settle and tiny solids make a mound when poured. Show jelly and discuss whether it is a solid or liquid, sharing that it has elements of both states. Repeat with shaving foam and discuss. Do gases weigh anything? Weigh an empty balloon, then inflate it and reweigh. Discuss why the inflated balloon is heavier. How do smells travel? Use aromatherapy oils on a tissue hidden in the room. Children to use sense of smell to locate the tissue. Discuss the movement of gas particles to explain how smell travels. • **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.** • **To read the temperature from a thermometer.** • **Working Scientifically Objective: Take accurate measurements in standard units using a range of equipment.** https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/z9ck9qt Give examples of changes that happen by adding or taking away heat. Children to act out the behaviour of particles modelling that a change in temperature will result in a change in state. Use scientific language to explain that when the temperature rises, the solid is melting. The temperature continues to rise so the liquid is evaporating. Practise reading thermometers accurately prior to practical investigations. Use two different coloured ice cubes to predict and observe changes over time and	Discuss renewable and non- renewable sources of electricity: burning fossil fuels producing heat which can be used to generate electricity, wind and solar power. Recognise electrical dangers around the home. Watch the clip and play the game identifying dangers. Create a safety poster. https://www.bbc.co.uk/bitesize/clips/zyxd7ty https://www.switchedonkids.org.uk/electrical-safety-in-your-home • **Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.** https://www.bbc.co.uk/bitesize/clips/zxrb4wx Demonstrate what is needed in a circuit - (a power source and a simple appliance). Distinguish between a cell (single unit that converts chemical energy to electrical energy) and a battery (a collection of cells) and what happens to the electrical flow when there is a break in the circuit. Use children to hold the 'Explaining Electricity' cards (in resource folder) to create the circuit with free electrons moving in the same direction which creates an electric current and allows the bulb to light. When the free electrons are moving in opposite directions, no current is produced so the bulb will not light. Model making a bulb light practically and children to work in groups to create a circuit where the bulb lights up. • **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.**

		record observations and conclusions using scientific language of solids and liquids. Use the thermometers to take the temperature.  Practical activity using thermometers to take the temperature of different beakers of water (iced, hot and tap) Discuss the temperature of the classroom over the course of the day and night. Show a line graph generated by a data logger, this needs to have been set up in advance to measure the changing temperature of a room over the course of a day. Notice increases and decreases and try to give reasons for them. Children to complete the 'What's the temperature?' sheet and to match key temperatures. (Resource folder)	• **Recognise that a switch opens or closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.** Children use the Circuit cards in the resource folder, predict whether the bulb will light and then test. Create a working circuit using a buzzer or motor Show a diagram of a simple circuit. Children to draw a diagram of the circuit for a motor or buzzer and explain what is happening using the correct scientific language. Investigate different types of switches around school and match switches to their names and specific uses. • **Recognise some common conductors and insulators and associate metals with being good conductors.** Recap on the need for the circuit to be complete for electricity to flow. Introduce a switch to the circuit and think about appliances around us which use switches. Discuss the importance of switches so that lights are not left on all the time and doorbells stop ringing. Understand that a break in the circuit will stop the flow of electricity. Elicit understanding of materials that are electrical insulators (materials that prevent electrical energy passing through them) and electrical conductors (those which allow electrical energy to pass through them). . *In this unit of learning, children will investigate how sounds are made associating some of them with something vibrating and recognise that vibrations from sounds travel through a medium to the ear. They will investigate different*

			patterns between the pitch of a sound and features of the object that produce it. They will find patterns between the volume of a sound and the strength of the vibrations that produce it as well as recognise that sounds get fainter as the distance from the sound source increases. • **Identify how sounds are made associating some of them with something vibrating.** Go on a sound walk around the school, identifying noisy and quiet places and begin to consider how sounds are made. Use instruments in class to experiment and explain how its sound is made. https://www.bbc.co.uk/bitesize/topics/zgffr82/articles/zstr2nb#z84xb82 Explain that sounds are made when an object vibrates. We hear a sound when the vibrations travel through a medium to our ears. Listen to the compilation clip of sounds to identify the sound and the thing that is vibrating. https://www.bbc.co.uk/bitesize/clips/zwx2tfr • **Recognise that vibrations from sounds travel through a medium to the ear.** Look at pictures of objects and describe what is vibrating and creating a sound in each. Explain how the ear works and how it allows us to hear sound. Know that sound travels through different mediums, air, water, solids. Watch the clip of musician Evelyn Glennie experiencing sound through vibrations despite being deaf. https://www.bbc.co.uk/bitesize/clips/z47w2hv Investigate ways to absorb sound. Discuss reasons people may have for needing to absorb sound. In the context of a band needing a material to soundproof their studio, children carry out soundproofing

			investigation to investigate the best material for absorbing sound. Use data loggers to test different materials for the loudness of sound produced. • **Find patterns between the volume of a sound and the strength of the vibrations that produced it.** Children carry out mini investigation to find a link between the size of vibrations and loudness of a sound. Children to explain that the bigger the vibration, the louder the sound and vice versa. • **Find patterns between the pitch of a sound and features of the object that produced it.** Children try to make high /low sounds to a partner or identify high/low sounds in a piece of music. Watch clip to identify high and low sounds https://www.bbc.co.uk/bitesize/clips/zsqw2hv Explain what pitch is. Look at different instruments and the sound they produce. Can the children observe and make connections between the pitch of a sound and the features of an instrument that makes that sound? https://www.bbc.co.uk/bitesize/clips/ztptsbk Children to complete the Pan Pipe challenge using paper art straws. Demonstrate how to cut the straws to make a sound and make each straw create a different pitch by cutting the straws to different lengths. Write an explanation for the different length straws making different sounds. • **Recognise that sounds get fainter as the distance from the sound increases.**

			See string telephone investigation below to explore how sounds change over distance.
Working Scientifically Focus		• **Use straightforward scientific evidence to answer questions** • **Make systematic and careful observations, taking accurate measurements.** Melting chocolate investigation. Observe how long different types of chocolate takes to melt. Use stopwatches to measure length of time. Use the video to see the experiment being carried out. You will need to login for free to STEM for this video. https://www.stem.org.uk/resources/elibrary/resource/315591/what-temperature-does-chocolate-melt	• **Set up simple practical enquiries and fair tests** • **Report on findings from enquiries, including oral and written explanations.** TAPS- Conductors and Insulators Construct a working circuit and test items to see which will let electricity pass through. Create own table, diagram or written explanation. Reminder about working safely with electricity.   • **Ask relevant questions and use different types of scientific enquiries to answer them.** • **Use results to draw simple conclusions and suggest improvements.** TAPS – String telephones conclusions Children follow the instructions to create string telephones over a large distance. Use PowerPoint to explain how the telephones make the sound of the children's voices audible. Children to explain how sound travels through the string telephone and why sounds can be heard better through the string than over the same distance through air. Draw conclusions about which phone worked best and why.

				  	
Subject specific Vocabulary	Pupils should read, spell and pronounce scientific vocabulary correctly					
			evaporate condense melt freeze precipitation water vapour solids particle	liquids gases	generate renewable / non renewable appliances battery circuit energy flow vibration sound wave volume amplitude pitch absorb noise pollution transmit medium air water	switches: slide switch, push button switch, pull switch, selector switch, key switch, paddle switch, toggle switch, dimmer switch electrical conductors/insulators current lightning static electricity eardrum particles distance soundproof .

YEAR 5

Subject Content Key Stage 2

The Working Scientifically skills listed below will be taught **through** the science content in each topic.

Working Scientifically

This is a focus on the key aspects of Scientific Enquiry so that pupils are able to use varied approaches to answer scientific questions.

These enquiries include: **observing over time, pattern seeking, identifying, classifying and grouping, comparative and fair testing and researching using secondary sources.**

During Year 5, 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.

	AUTUMN 1	AUTUMN 2	SPRING 1
Topic	Earth and Space	Ancient Greece	China and the Winter Olympics
Subject Content	**Earth and Space**	**Forces**	**Properties and Changes of Materials**
Addressing stereotypes	**Margaret Hamilton, Space Expert Hannah, Katharine Johnson** https://classroom.thenational.academy/lessons/who-is-katherine-johnson-61gpar		**Ruth Benerito- inventor of wrinkle free cotton**
Key questions	What is the solar system? How does the earth move in relation to the sun and other planets? What are stars and star constellations?	What are contact and non- contact forces? How can we measure the size of forces? What impact do gears, levers and pulleys have on forces? Which factors affect an object's ability to float?	What makes something a mixture? How can we separate mixtures? What are reversible changes? What is the difference between physical and chemical changes?
Content	*In this unit, children will investigate the movement of the Earth, and other planets, relative to the Sun in the solar system. Pupils will explore the movement of the Moon relative to the Earth. They will use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. They will investigate the phases of the moon. They will investigate at what times does the Sun set and rise at different points in the year?* • **Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.**	*In this unit of learning, children will investigate forces in action (gravity, air resistance, up thrust, friction) and make links to these forces in everyday life. They will investigate impact of variables upon these forces. The main focus is investigative learning where children will be: asking questions that can be answered by different types of investigative activity and decide the best approach to use; making predictions based on scientific knowledge; carrying out fair tests; making measurements and repeating them and finding averages to test accuracy of results; presenting findings in graphs, charts and tables and drawing conclusions that utilise more than one piece of supporting evidence, including numerical data and line graphs. They*	*In this unit, children will investigate changes of state which can be reversed, evaporation and condensation. They use their understanding to explain a range of familiar phenomena. This unit of study will mostly concentrate on mixing materials together to form mixtures – substances that are physically not chemically combined.* Check prior knowledge of materials as solids, liquids or gases and changes to materials including heating or cooling from Y4 States of Matter topic. • **Compare and group together everyday materials on the basis of their properties, including their hardness, solubility,**

	Practically demonstrate the earth's orbit around the sun. Demonstrate change from geocentric model to heliocentric model using children to act out changes through periods in history. Research facts about the planets using secondary sources: orbit, order and features. Explain Neil deGrasse Tyson's classification system of the planets: terrestrial planets, ice giants and dwarf planets. • **Describe the movement of the Moon, relative to the Earth.** Home Learning Opportunity – Keep a moon diary. • **Describe the Sun, Earth and Moon as approximately spherical bodies.** Flat earth v spherical earth discussion. Consider and sort evidence cards for and against the sun, moon and earth as spherical bodies. • **Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.** Discuss evidence for the sun appearing to move. Children work in pairs to act out earth's orbit. Write explanations using scientific language. • **To describe how scientific ideas have changed over time.** Research the significance of the contribution of Margaret Hamilton to the Apollo 11 mission through coding.	*will devise criteria to evaluate their approaches, products and outcomes.* Check prior understanding of forces are from Year 3 unit. • **Explain that unsupported objects fall towards the Earth because of the force of gravity acting between Earth and the falling object.** Identify and explain the different forces acting on objects through pictures and practical demonstrations. Create labelled diagrams showing the forces and their effects. Discuss use of arrows to show size of the force. Introduce Isaac Newton and his discovery of the force of gravity. Measure the force of gravity acting on objects. Using Newton meters to answer the question 'Is there a link between the weight and mass of an object?' **Identify the effects of air resistance, water resistance and friction that act between moving substances.** See water resistance investigation below. Friction investigation using bikes and measuring the best materials for a brake pad. • **Recognise that some mechanisms, including levers, pulleys and gears allow a smaller force to have a greater effect.** Watch video of Great Piano Pull challenge https://vimeo.com/149920900. Practically demonstrate the effect of different gears on bikes travelling uphill. Investigate the effect of moving the pivot in simple levers.	**transparency, conductivity (electrical and thermal) and response to magnets.** Practical work testing a variety of materials and recording results in a table. • **Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.** Concept cartoons stimulus for discussion. https://www.bbc.co.uk/bitesize/topics/zjty4wx/articles/zpbdpbk • **Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating** Demonstrate process of separating materials. Children to practically experience separating mixed materials including: sand and water, raisins and flour, salt and water and paper clips and rice. Justify choice of separating referring to size of particles. • **Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.** • **Demonstrate that dissolving, mixing and changes of state are reversible changes and 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.** Discuss understanding of reversible and irreversible changes. Demonstrate chemical reactions created from vinegar and bicarbonate of soda and casein. Children to

<table>
<tr><td></td><td></td><td></td><td colspan="3">record observations carefully using scientific language.</td></tr>
<tr><td>Working Scientifically Focus</td><td>

Identifying scientific evidence that has been used to support or refute ideas or arguments.
Identify and sort evidence for and against the earth as a spherical body. See spherical body lesson above.
Taking measurements with accuracy and precision.
Shadow investigation to support the idea that the Earth moves on its axis. Observe, measure and identify patterns in changing shadows throughout the day.

TAPS - Orbit Explanations


Reporting and presenting findings from enquiries.
Use research from secondary sources to orally present an explanation of how we have day and night, as part of Class Planetarium.

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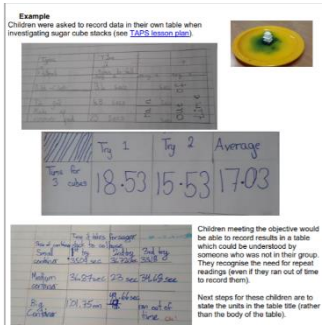
Explain the degree of trust in the results
TAPS -Aquadynamics
Investigating the effects of water resistance by timing various shapes of plasticine travelling through water.



</td><td colspan="3">

Plan a scientific enquiry to answer a question, recognising and controlling variables.
TAPS - Dissolving
Can children plan a fair test to investigate factors affecting the speed at which solids dissolve in water? Ensure variables are controlled and recognised. Emphasise how taking repeat readings makes results more reliable.



</td></tr>
<tr><td>Subject specific Vocabulary</td><td colspan="5">Pupils should read, spell and pronounce scientific vocabulary correctly</td></tr>
<tr><td>heliocentric
geocentric
constellation
orbit
rotate
axis
astronomer</td><td>solar
celestial
spherical
support
refute
telescope
eclipse
satellite</td><td>air and water resistance
friction
gravity
upthrust
Newton
pulleys
lever and gears
mechanisms</td><td>variables
degree of trust</td><td>solubility
transparency
conductivity
soluble
solute
solvent
filtering
sieving</td><td>evaporating
reversible/irreversible
suspension</td></tr>
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	SPRING 2	SUMMER 1	SUMMER 2
Topic	Anglo Saxons and Vikings	Rivers	Tudors
Topic	**Living things and habitats**	**Animals including humans**	**Scientists and Inventors** **(Taught as a block or alongside previous units)**
Addressing stereotypes	**Eva Crane- life cycle of bees.**	**Rachel Carson** https://classroom.thenational.academy/lessons/who-is-rachel-carson-crup6e	**Stephanie Kwolek- inventor of Kevlar, David Attenborough- naturalist,**
Key questions	Why do plants have flowers? Why do birds lay eggs? How do plants reproduce? How do lifecycles compare across the animal kingdom?	At which stage of life are humans strongest? At which stage of life is the fastest development? What doesn't change as humans grow up? In what ways are children different from babies?	What is the contribution of Eva Crane, David Attenborough, Stephanie Kwolek to Science? How is evidence used to solve crimes? How have scientific ideas about space changed over time?
Content	*In this unit of learning children will investigate how plants and animals reproduce as part of their life cycle and that in every life cycle there are distinct processes and stages. They should begin to understand how reproduction is important to the survival of the species.* Build on knowledge of classification of living things from Y4 • **Describe the life process of reproduction in some plants and animals.** Describe sexual and asexual (one parent and two parent) reproduction in plants. Name the reproductive parts of a plant and their function in reproduction. Describe the different ways pollination takes place in plants. Home Learning Opportunity- Find and draw annotated diagrams of examples of plants in local environment. Revisit in following weeks to look for evidence of reproduction such as pollination or seed dispersal taking place. • **Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird**	*Children will learn about the life cycle of a human being. They will investigate the development of babies and compare the gestation period of humans and other animals. They will learn about the changes experienced during puberty and why these occur. The final investigation will be about the changes to the body as humans get older, as well as comparing the life expectancy of different animals.* • **Describe the changes as humans develop from birth to old age.** Create a timeline of the changes within human development. Describe ways humans are different at various stages: baby to child. https://www.bbc.co.uk/teach/class-clips-video/growing/zd7rkmn Learn about foetal development in humans and represent this as labelled diagrams and growth chart. https://www.dkfindout.com/uk/human-body/life-cycle/growing-in-womb/ Recognise and explore key milestones in baby and child development. Share a 'red	*In this unit, children will learn about famous scientists and inventors linked to the Y5 science curriculum including the life and work of David Attenborough, Eva Crane, Margaret Hamilton and her invention of the software and computer code that enabled Apollo 11 to go the Moon. They will investigate the hardness of materials. considering Stephanie Kwolek's invention of Kevlar. They will also learn about Leonardo da Vinci's ideas about the proportions of the human body seen in his work The Vitruvian Man. The children will measure their height, arm span and other measurements to see whether da Vinci's theories about proportion were accurate.* • **To find out about the work of naturalists and animal behaviourists.** Research the contribution of David Attenborough • **Identifying scientific evidence that has been used to refute or support ideas or arguments.** Introduce the work of CSI technicians using evidence to solve crimes. Identify different types of evidence and how it is used to support or refute ideas.

	• Elicit prior knowledge of life cycles. Watch Espresso clips for dragonfly and butterfly life cycles, identify stages and specific terms eg nymph. Compare number of stages and metamorphosis and incomplete metamorphosis. • Research life cycles of insects, birds and mammals.	book' and explore baby growth through statistics https://www.rcpch.ac.uk/resources/uk-who-growth-charts-0-4-years https://www.dkfindout.com/uk/human-body/life-cycle/childhood/ Create growth charts. See WS lesson below. Identify and understand the changes in the adolescent human body during puberty. Explore the key physical and emotional changes during puberty in boys and girls. This objective is covered in PHRE Growing and Changing unit. Watch clip below of the Brown sisters ageing video https://www.youtube.com/watch?v=LG1cGp5wW-E https://www.theguardian.com/uk-news/2016/apr/21/the-queen-at-90-across-the-decades Identify the changes that take place in old age. Sort True/False statement cards. Describe how to stay healthy and active in old age. Complete ageing challenge cards.	• **To describe the life process of reproduction in some plants and animals.** Explore the work of Eva Crane into the lifecycle of bees. • **To compare and group together everyday materials on the basis of their properties in the context of finding materials appropriate for a particular use.** Research Stephanie Kwolek, her work with materials and the invention of Kevlar.
Working Scientifically Focus	• **Report on findings from enquiries** TAPS - Life Cycle Research Research the life cycle of one other group of animals eg. reptiles and compare to a known animal. Present findings to the class including: correct order of stages, similarities, differences, use of scientific language.	• **Record data and results of increasing complexity using bar and line graphs.** Distinguish between data and information. In the context of growth in height/weight of babies in first year, use data to select appropriate graph for data presentation. Create line and bar graphs for the same information and explain which is the most appropriate and what they show about the growth of a foetus. (See Resource Folder) • **Report findings from enquiries** In the context of the gestation period for animals, predict and then research the different gestation periods of types of vertebrates. Create a visual comparison of	• **To plan different types of enquiries to answer questions.** Investigate Da Vinci's theory about the proportions of the human body by accurately measuring parts of the human body in relation to height. Use test results to make predictions about height and length.

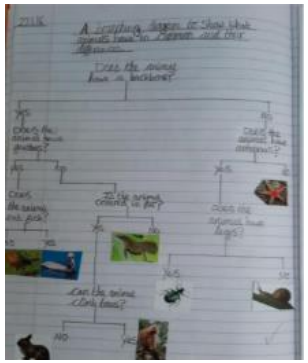
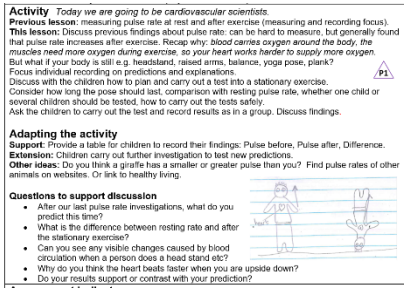
		gestation periods. Present orally or in writing. Look for patterns and draw conclusions. https://www.bbc.co.uk/bitesize/clips/zpmqxnb (See Resource Folder)	

Subject specific Vocabulary	Pupils should read, spell and pronounce scientific vocabulary correctly					
	reproduction complete/incomplete metamorphosis mammal insect amphibian	sepal stamen anther filament ovule pollen pollination pollinator	prenatal adolescence puberty foetus infancy gestation fertilisation	vertebrates outliers	naturalists botanists	

YEAR 6			
	Working Scientifically This is a focus on the key aspects of Scientific Enquiry so that pupils are able to use varied approaches to answer scientific questions. These include: **observing over time, pattern seeking, identifying, classifying and grouping, comparative and fair testing and researching using secondary sources.** During Year 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.		
	AUTUMN 1	**AUTUMN 2**	**SPRING 1**
Topic	World War 1	Natural Disasters	Mission Mysterious
Science Topic	**Living Things and Habitats**	**Animals including Humans**	**Electricity**
Addressing stereotypes	Libbie Hyman's work on classification	Explore the findings of Mary Maynard Daly on diet and heart health	Edith Clarke – electrical engineer
Key questions	How do scientists classify living things? How can I compare different groups of living things? Why are plants and animals classified based on specific characteristics? What are microorganisms? How are some microorganisms beneficial to humans?	How are blood/ water/ nutrients transported around the body? What are the effects of drugs, alcohol and smoking on the body? How does a healthy diet and regular exercise help our bodies?	Where does our electricity come from? How many ways can electricity be created? How are components in a circuit represented by symbols? What will make a bulb dimmer or a buzzer quieter? What is a series circuit?
Content	*In this unit of learning, pupils are introduced to the importance of classification, to the term kingdom, the five kingdoms of all living things (bacteria, protists, animals, plants and fungi); vertebrates (reptiles, fish, amphibians, birds and mammals) and their similarities and differences; invertebrates; and ways of splitting these large groups into smaller groups e.g. mammals can be divided into three groups according to how their young develop: placental (live/ fully formed babies at birth); marsupial (pouched); and monotreme (egg laying) mammals.* Build on prior knowledge from Year 4 • **Describe how living things are classified into broad groups according to common**	*In this unit, children will explore blood, the structure of the heart and lungs, the double circulation through the lungs and the rest of the body. How does exercise affect pulse rate? Why exercise is good for us and what can harm the heart and lungs?* • **Identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood.** Watch 'What's in your blood?'https://www.bbc.co.uk/bitesize/topics/zwdr6yc/articles/zqv4cwx#z2g8k7h	*In this unit, the children consolidate their knowledge of materials which are electrical conductors, extend understanding of ways in which the brightness of bulbs or speed of motors in a circuit can be changed and develop children's understanding of the value of using conventional symbols for communication. This unit provides opportunities for children to carry out a complete investigation relating to electric circuits as well as opportunities for relating knowledge and understanding of electricity to familiar phenomena.* Build on prior knowledge from Year 4 electricity unit. Discuss where electricity comes from and how it can be generated. Watch clips showing electricity in remote places.

	characteristics and based on similarities and differences, including micro-organisms, plants and animals. • **Give reasons for classifying plants and animals based on specific characteristics.** Watch Ted Talk on Linnaeus' early classification **https://ed.ted.com/on/90vRVJZ6** Noting his 5 levels: Kingdom, order, genus, species. Classification crowns activity to decide an order from the broadest level of classification to the most specific (Resource Folder). Children work in pairs to look at a range of living things, sort into kingdoms and create classification routes, identifying relatedness through researching online. Classification Connoisseur Challenge to find out who is the most closely related. Discuss why classification systems change- new species and scientific advances. • Show examples of animal classification at http://www.oum.ox.ac.uk/thezone/animals/animalid/classify.htm. and http://www.oum.ox.ac.uk/thezone/animals/animalid/kingdom.htm to read details about each kingdom. Demonstrate identifying similarities and differences between living things in order to determine their class. Use classification keys to sort living things according to observable characteristics. Play the Odd one out game looking at similarities and difference between animal, micro organism and plant classification. Group into broad groups and sub groups according to observable features. https://fergusonfoundation.org/bridging-the-watershed/interactive-lessons/	Identify the components of blood, describe their functions and note different blood groups, types of blood vessel. Create 'blood smoothies' and observe close up photos of red and white blood cells from electron microscope. **Cross Curricular Links**: Art-Sketch or paint magnified blood cells Literacy -Create a leaflet for a doctor's surgery about the composition of blood and the role it plays in the human body. Explore the structure and function of the human heart. Watch 'How does a healthy heart work?' https://www.bhf.org.uk/informationsupport/how-a-healthy-heart-works and the computer generated image of a heart beating https://en.wikipedia.org/wiki/Heart#/media/File:CG_Heart.gif Children to sketch and label their own heart diagrams. Demonstrate how to find and take their own pulse. Investigate that heart size and speed relates to age, fitness and activity and can be improved. Investigate and recreate heartrates for varying levels of exertion, giving explanations for observations. Record, compare and analyse findings in table form, noting that heart rates are not identical even across children of the same age Using knowledge of heart rates, suggest possible heart rates for various conditions and ages. Link to the school's new defibrillator.	www.bbc.co.uk/learningzone/clips/ • **Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.** Show full range of electrical equipment and elicit whether the children can name them and their function in a circuit. Children take part in practical circuit work to revise understanding of simple circuits and identify the changes that occur when components are added, removed or changed. Challenge Cards https://www.bbc.co.uk/programmes/p0118bzv https://www.bbc.co.uk/programmes/p01198l5 **Test 1: Checking Circuits:** Revises the key concept that a complete circuit is needed to light a bulb or make a motor spin. **Test 2: Bulb Brightness:** Reminds children how to change the brightness of a bulb or the speed of a motor. This can be achieved by adding/removing cells or by changing the voltage of the battery (NB: Check voltage of bulbs or they may simply blow!). **Test 3: Overloaded Circuits:** This activity provides hands on examples of the effects of 'overloading' a circuit with too many bulbs or motors. The power from the cell or battery is shared between them. **Test 4: Circuit Construction:** Tackle the challenge of creating a circuit using a switch they have made themselves. **Test 5: Circuits on Computers:** Allow one group to work together through the activities at http://www.andythelwell.com/blobz/. Can children light the first four stars?

	Create a feature-led sweet classification system. Design and test out a branching database (dichotomous key) for birds, bees or butterflies. Children to present a branching database to identify tree or flower leaves using their learning and first hand observations. Describe the key characteristics of unusual living things from around the world, using descriptions of features and online research to classify them. Use the creatures below https://listverse.com/2016/02/12/10-recently-discovered-animals-with-amazing-f as well as the unit resources Describe, name and sketch a new creature within a known classification route and sort 'new' creature within the Animalia classification system.	• **Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.** Through discussion, consider the pros and cons of different foods using a nutrition chart. Identify aspects of a diet that are healthy and unhealthy and the impact diet can have on the body using scientific evidence. Discuss processed food and show examples of food labels noting hidden sugar and salt. Children to predict how much exercise they should be getting and what sort. Explore using the NHS guidance on the amount and types of exercise that keep a child and adult healthy. https://www.nhs.uk/live-well/exercise/physical-activity-guidelines-children-and-young-people/#moderate Children to reflect on where improvements could be made. Develop an advert in groups using research into diet and exercise. Identify the way drugs affect the way a body functions Use myth or truth cards to elicit discussion. Look at different types of drugs and the impact they can have on the body as well as which are harmful and which can be beneficial. • **Describe the way in which nutrients and water are transported within animals, including humans.** **Investigate diffusion and osmosis as processes that move nutrients and water in the body.** Set up jelly worm and egg investigation well in advance of lesson to demonstrate the processes of osmosis and diffusion. https://kitchenpantryscientist.com/diffusion-and-osmosis-experiments/	• **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.** Investigate, design and make a dimmer switch, describe how it affects resistance. https://www.sciencebuddies.org/blog/turn-your-pencil-into-a-dimmer-switch https://www.bbc.co.uk/bitesize/guides/z8ykmsg/revision/5 • **Use recognised symbols when representing a simple circuit in a diagram.** Show examples of circuit symbols using BBC learning zone clips on circuit diagrams. Children to create circuit diagrams which will and will not work. Create circuits with motors and buzzers and represent with symbols.

		https://www.steamsational.com/osmosis-for-kids-blood-cell/ Children write up observations and explanations using scientific vocabulary.	
Working Scientifically Focus	• **Record data using classification keys** TAPS -Creating Keys 	• **Take measurements with increasing accuracy and repeat if necessary.** • **Record data in a line graph** • TAPS – Heart rate poses Children to plan and carry out a test into stationary exercises.  **Activity** *Today we are going to be cardiovascular scientists.* **Previous lesson:** measuring pulse rate at rest and after exercise (measuring and recording focus). **This lesson:** Discuss previous findings about pulse rate: can be hard to measure, but generally found that pulse rate increases after exercise. Recap why: *blood carries oxygen around the body, the muscles need more oxygen during exercise, so your heart works harder to supply more oxygen.* But what if your body is still e.g. headstand, raised arms, balance, yoga pose, plank? Focus individual recording on predictions and explanations. Discuss with the children how to plan and carry out a test into a stationary exercise. Consider how long the pose should last, comparison with resting pulse rate, whether one child or several children should be tested, how to carry out the tests safely. Ask the children to carry out the test and record results as in a group. Discuss findings. **Adapting the activity** **Support:** Provide a table for children to record their findings: Pulse before, Pulse after, Difference. **Extension:** Children carry out further investigation to test new predictions. **Other ideas:** Do you think a giraffe has a smaller or greater pulse than you? Find pulse rates of other animals on websites. Or link to healthy living. **Questions to support discussion** • After our last pulse rate investigations, what do you predict this time? • What is the difference between resting rate and after the stationary exercise? • Can you see any visible changes caused by blood circulation when a person does a head stand etc? • Why do you think the heart beats faster when you are upside down? • Do your results support or contrast with your prediction?	• **To plan a fair test** • How does the number of bulbs affect the brightness of a bulb in a series circuit?' Record results after measuring brightness of the bulbs with a data logger. Repeat with a parallel circuit and compare results. • **Recording data and results of increasing complexity using tables, scatter graphs, bar and line graphs.** Children take part in a series of enquiries that explore electrical circuits and various effects, recording their findings in tables and graphs. Use 'What if ?' cards to suggest what might happen and why in different circuit scenarios including motors, buzzers and bulbs. Show sample circuit diagrams. Eg: Does wire length affect how components in a ciruit work?

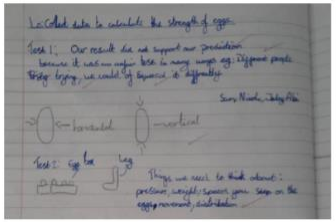
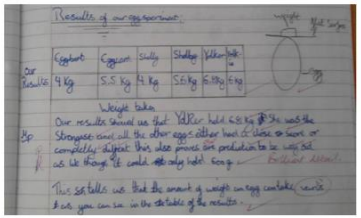
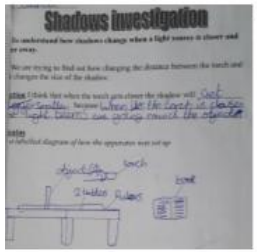
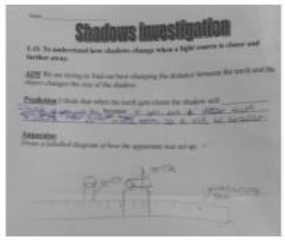
Subject specific Vocabulary	Pupils should read, spell and pronounce scientific vocabulary correctly					
	classification kingdom phylum class order family genus	species similarities differences taxonomist microorganism bacteria	circulatory system blood vessels arteries veins capillaries oxygenated/ deoxygenated blood	plasma drug alcohol nutrients carbon dioxide lungs water	circuit symbol cell/ battery current amps voltage resistance electrons	buzzer wire switch motor fossil fuel power stations solar wind tidal

	SPRING 2	**SUMMER 1**	**SUMMER 2**
Topic	Benin	Crime and Punishment	Celebrating Difference

Science Topic	Evolution and inheritance	Light	The Science of Sport
Addressing stereotypes	Mary Anning - palaeontologist		Paralympic athletes
Key questions	How do fossils support the theory of evolution through extinct and /or common ancestors? How do anatomical observations help support the idea of natural selection? Are offspring always identical to their parents?	What is light and where does it come from? What is reflection and refraction and how can they be used? How do we see light?	What are the best conditions for turf growth? What are the properties of materials used for Paralympian biomechanics materials? How can forces impact sports games? What factors impact sports talent?
Content	*In this unit, children will recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. They will recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. They will identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.* Check prior knowledge of fossilisation from Year 3 Rocks and Soils topic • **Recognise that living things produce offspring of the same kind but normally offspring vary and are not identical to their parents.** Play class Guess Who and note any inherited characteristics. Identify variations between themselves and classmates. Create dog breed Top Trumps cards noting variation across breeds. • **Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.** Explain through the context of a chosen animal that natural selection occurs as a result of variation to deal with changing environments and takes place over huge timescales. Share example of the peppered moth and how it adapted to its environment.	*In this unit, children will investigate mirrors and shiny surfaces and how they alter the direction in which light travels and that when they see objects, light enters the eye. Children contrast reflection and shadow formation. They will investigate first hand refraction, colours of light and the making a periscope. Science learning will include also the works of key scientific figures like the British scientist Isaac Newton and invention of the first reflecting telescope.* Check prior knowledge of how we are able to see from Year 3 Light topics as well as knowledge from Earth and Space topic. • **Recognise that light appears to travel in straight lines.** • **Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.** • **Explain that we see things because light travels from light sources to objects and then to our eyes.** • **Use the idea the light travels in straight lines to explain why shadows have the same shape as the objects that cast them.** Share Crime Lab Investigation notes with instructions to plan and carry out 5 light investigations in response to given enquiry questions. Identify variables which need to be controlled in order to achieve a fair test	*In this unit, children will focus mainly on investigations developing Working Scientifically skills in the context of exploring aspects of sport. These will include the grounds, the kit, the people and the physics behind them.* • **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.** • **Working Scientifically Objective** • **Plan different types of scientific enquiries to answer questions, recognising and controlling variables.** In the context of creating a sports pitch which needs quality, durable grass, the children will identify the key characteristics of a sports pitch , create a classification key for given grasses and set up an investigation to determine the best methods for turf maintenance. • **Give reasons based on evidence from comparative and fair tests for the particular uses of everyday materials including metals, wood and plastics.** • **Working Scientifically Objectives** • **Recording data and results of increasing complexity using tables.** • **Reporting and presenting findings from enquiries including conclusions.**

	Investigate variation across specific plants and animals by completing species adaptation research. Identify subtle adaptations to environments in the animal and plant world and advantages and disadvantages of certain characteristics by playing the variation game and researching local species. http://www.saps.org.uk/primary/teaching-resources/1378-primary-booklet-6-plants-in-their-natural-environment Explain how some animals and plants are adapted to extreme environments. Watch clip showing how plants are adapted to cold conditions. https://www.bbc.co.uk/bitesize/clips/z8sjxnb https://www.bbc.co.uk/bitesize/clips/z8fpyrd Children play 'Extreme Survivor' to see which creatures and plants survive. • **Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.** • **Working Scientifically Objective:** • **Report and present 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.** • **Identify scientific evidence that has been used to support or refute ideas or arguments.** Discuss examples of extinct plants and animals.	and record and present findings, identifying patterns and drawing conclusions. Children to complete challenges, addressing misconceptions about light. Explore how light travels by creating models, labelled diagrams, acting out how we see things. Explore the parts and functions of the human eye and the use of glasses. https://www.bbc.co.uk/bitesize/clips/zyntsbk https://www.bbc.co.uk/bitesize/clips/zf9c87h Demonstrate that light travels in straight lines and use this information to work out plausible height of the culprits. Children carry out practical activities with torches and two pieces of card with slits in. Line them up and then move one so light does not travel through. Children to record this in diagrams and with explanations. Demonstrate and describe the movement of light beams off reflective surfaces. Children plan and carry out an investigation into the reflectiveness of given materials, recording results in a graph and noting patterns. Investigate how light reflects/ makes a periscope. Investigation to explore how light travels in straight lines, how light is reflected and refracted. Children to carry out tasks demonstrating refraction: paintbrush in water and glass over an image. Describe the effect of refraction and using scientific vocabulary explain the process. Plan and carry out and investigation into colour mixing, noting the effect of mixing light colours. http://physics-chemistry-interactive-flash-animation.com/optics_interactive/additive_color_model_mixing_synthesis.htm	In the context of identifying and comparing the properties of sports top materials, the children will work to create fair tests to compare cotton t-shirts to modern football tops and identify the properties of Paralympian biomechanics materials and understand the impact they have on disability sport. https://www.youtube.com/watch?v=BxkAAmCTc0I • **Identify the effects of forces that act on moving surfaces.** • **Working Scientifically Objectives** • **Recording data and results of increasing complexity using tables, bar and line graphs.** • **Reporting and presenting findings from enquiries including conclusions.** Watch the physics videos and look at examples of curled goals. https://www.youtube.com/watch?v=nLm-t6mcCus https://www.youtube.com/watch?v=FYVetdD6um8 Children to set up their own investigations into forces in sport. The following resources for investigations are in the resource folder. Footie Boot friction, Basketball Bounce Wicket Keeper's gloves. Ensure children carry out repeat tests and find the average and use the results to create a range of graphs. • **To recognise the impact of diet, exercise, drugs and lifestyle on the way their bodied function.** • **Working Scientifically Objective**

	http://www.oum.ox.ac.uk/thezone/animals/extinct/define.htm. Discuss knowledge of fossils from Year 3 Rocks and Soils topic, eliciting that not all plants and animals that die become fossils. http://www.oum.ox.ac.uk/thezone/fossils/intro/form.htmhttp://www.bbc.co.uk/nature/fossils http://www.youtube.com/watch?v=SEDfRy6DQns. Research the work of Mary Anning, Charles Darwin and Alfred Wallace and share as a presentation. Create key facts chart and highlight the processes that they used to develop their theories: finding and using the fossil record. observing living things and their environments, looking for patterns in nature. Using some of the evidence and observations of the three individuals, children will identify ways in which their evidence supports the evolutionary theory. https://www.youtube.com/watch?v=DDyiyl0DKWw&feature=youtube - Alfred Wallace http://www.lymeregismuseum.co.uk/in-the-museum/mary-anning. – Mary Anning https://www.pbslearningmedia.org/resource/tdc02.sci.life.evo.dar/evolving-ideas-who-was-charles-darwin/ - Charles Darwin Examine how the fossil record helps us understand evolutionary relationships and explore how a cladogram shows these. Watch the Tree of Life video. Children order a variety of biscuits by complexity. Create a class evolutionary tree for biscuits, noting links between all the biscuits / common ancestors and features that evolved. https://www.bbc.co.uk/programmes/p005lp0j Explore online the evolution of flight in birds through the fossil record. Use the link below, working through each stage in turn.	Suggest and carry out further investigations on the effects of coloured light on coloured materials.	• **Identify scientific evidence that has been used to support or refute ideas or arguments.** Explore the way that nutrition, exercise and injury prevention impact on sports performance. Show clips below to help understand the role of diet for an athlete, look at. Design an eating plan for a junior athlete.the 24hour footballer's food diary. https://www.youtube.com/watch?v=6EggN3szhYM https://www.fourfourtwo.com/performance/nutrition/diego-forlan-my-24-hour-food-diary Show pictures of muscles in the body and note how they are lengthened during activity. Explain that many injuries are muscle related and emphasise the importance of warming up. Children to work through the 11+ warm up to notice effect on their body. https://websites.sportstg.com/assoc_page.cgi?c=1-8386-0-0-0&sID=214494 • **To recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.** • **Working Scientifically** • **Take measurements using a range of scientific equipment with increasing accuracy and precision, taking repeat readings when appropriate.** Identify the influence of inheritance and environmental factors on sports performance. Demonstrate genetic and inherited traits which can make someone better at sport in addition to environmental factors such as nutrition, quality and quantity of training Show Sports Champion cards and children sort between the two groups of factors.(See Resource Folder)

	https://ucmp.berkeley.edu/education/explorations/reslab/flight/introduction/I1.htm Watch whale evolution video to see how the fossil record has helped scientists to infer how they evolved. https://ocean.si.edu/through-time/ancient-seas/evolution-whales-animation Discuss examples of evolution today when bacteria mutate to evade antibiotics. Create a cladogram using modern animals.		Create a sports information leaflet on factors that that may impact on sports talent. https://www.topendsports.com/testing/tests/home-sit-and-reach.htm https://www.youtube.com/watch?v=MCEUW8moLeI Consider environmental and genetic factors for themselves. https://www.rcpch.ac.uk/resources/uk-who-growth-charts-2-18-years
Working Scientifically Focus	• **Explain degree of trust in results.** TAPS – Egg strength Children create their own method for investigating the strength of eggs and explain how much trust they had in their results.  	• **Planning different types of scientific enquiries to answer questions including recognising and controlling variables.** • **Recording data and results of increasing complexity using scientific diagrams and labels, tables and line graphs.** TAPS – Shadow Investigation Does the angle of a light source affect the size of the shadow it forms? Record the results in a table and line graph.  	All the lessons in this unit have a Working Scientifically Focus.
	Pupils should read, spell and pronounce scientific vocabulary correctly		

Subject specific Vocabulary	offspring characteristics inherit evolution environment adaptation characteristics	variation natural selection fossils theory opinion	reflection refraction opaque	variables accuracy periscopes	classification grass angiosperm growth monocotelydon variables conditions for growth conclusions fair test forces air resistance friction	diet exercise muscles heart rate lifestyle fitness inheritance genetic cardiac/ lung capacity circuit voltage cell/ battery bulb switch timer