

Science Progression – Long Term Plan

Key concepts:

Working Scientifically	Animals	Plants	Materials & States of Matter	Forces & Motion	Environment	Energy - Light, Sound & Electricity
	Biology		Chemistry	Physics		

Automaticity:

Know the difference between Biology, Chemistry and Physics by Year 6.

Working scientifically

	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Observe	Say what they see, hear and feel. e.g. it's blue. What is the same and what is different. Draw pictures after close observation. Explore the natural world around them. Ask simple questions about what they see.	Describe what they see, hear and feel. e.g. include location and comparison. Compare and contrast and describe why they have grouped objects. Ask more complex questions about what they see, hear, smell and feel.	Make observations about all senses without prompting. E.g. smell, taste, look, feel and sound. Ask questions about the world around us and recognise that they can find answers in different ways.	Observe detail carefully. Use different methods to answer questions, including research, observation and experiments. Ask questions about their scientific topic.	Understand that they can use research, observations and experiments to answer their questions. Ask questions directly related to their science knowledge.	Understand that there are different types of scientific enquiry: observation over time, identifying/classifying through observation, pattern seeking, research, fair testing. Make observations linked to answering the questions. Identify hazards.	Identify what sort of scientific enquiry they will use. Make a range of relevant observations. Compare not only based of physical properties but on knowledge gained through previous enquiry. Identify ways of reducing hazards.
Predict	Predict what will happen during play.	Make predictions based on observations.	Make predictions based on their questions.	Use learning to predict answers to questions.	Make predictions using scientific knowledge.	Plan a test based on a scientific prediction.	Choose the best type of enquiry to test a prediction, and say why.
Experiment	Try out their predictions.	Use simple equipment e.g. magnifying glass (with support).	Use simple equipment e.g. timers, rulers and magnifying glasses. Understand that a test should be fair. Set up a comparative test	Use more complex equipment with support Start to identify ways to make their test fair.	Make decisions about the best way to answer their questions. Suggest what equipment they will need. Use thermometers and data loggers.	Recognise and control variables Understand that sometimes taking several measurements and averaging can make results more accurate. Choose and use equipment with precision to the nearest integer.	Name the variable being changed (independent) and the variable being measured (dependent) Make decisions to ensure that their results will be as trustable as possible – understand the

					Measure using standard units. Identify what needs to be kept the same to make a test fair.		idea of the degree of trust. Identify when they have made errors. Explain which variables need to be controlled. Take repeat readings when necessary. Choose and use equipment with precision to 2 dp.
Concluding	Say what changed using comparative terms e.g. bigger. Talk about changes. Explain why things work and why things happen.	Record data with support in drawing a table. Compare relevant objects or pictures with support. Use first hand experiences to suggest answers to questions	Compare objects, and suggest ways of comparing or grouping them. Record data in a variety of ways, including a table and a diagram. Use observations and their knowledge to suggest answers to questions. Say what happened in an investigation.	Record data in tables, bar charts and diagrams. State what they've found out using data or observations. Suggest how an investigation could have been improved.	Record data in tables, bar charts, keys, graphs and diagrams, starting to choose the best way to record it. See patterns in results, such as similarities or changes, and describe them. Draw on their scientific knowledge to suggest further questions or explanations.	Choose a recording method that helps them analyse. Start to systematically analyse and compare their data. Use scientific knowledge to draw conclusions (identify patterns) Say whether they applied fair testing effectively.	Choose the best recording method and say why - eg scientific diagram, keys, tables, scatter graphs, line graphs... Use scientific knowledge to spot patterns and draw conclusions (identifying patterns) eg develop keys, analyse data mathematically. Systematically analyse and compare their data. discuss any data which does not fit the rest of the set. Recognise when further tests are necessary and. Suggest improvements Understand that scientists' conclusions help their ideas to change over time.

Famous Scientists		Buzz Aldrin and Neil Armstrong (Space)	Marie Curie	Mary Anning (Fossils)	Thomas Edison	Katherine Johnson, Dorothy Vaughan and Mary Jackson (Space) Sir Isaac Newton (Forces)	Charles Darwin Carl Linnaeus
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Biology:

	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Plants	A plant is a living thing. A plant grows from a seed. e.g. sunflower <u>Vocabulary:</u> daffodil flower leaf petal plant root soil stem sunflower	Identify at least 2 garden plants and 2 wild plants e.g. tulip, daffodil, dandelion and daisy Identify leaves, flowers, petals, fruit, roots, bulbs, seeds, trunk, branches, stem, evergreen and deciduous. Observe the growth of something they have planted. e.g. broad bean Draw diagrams of different parts of a plant <u>Vocabulary:</u> trunk	Know that plants grow from seeds and bulbs Plants need water, light and the right temperature to grow Germinations is when a seed starts to grow. <u>Vocabulary:</u> germination, light seed temperature	Know the role of roots, stem, leaves and flower Know plants need air, light, water, nutrients from soils and room to grow. Investigation: How is water transported in plants Understand that pollination leads to seed formation and seed dispersal <u>Vocabulary:</u> dispersal nutrients pollination transported	Know what distinguishes plants as a group from animals (make own food from sunlight, usually do not move around)	Draw a life-cycle for a plant. Know the process of reproduction in plants. Understand the difference between asexual and sexual reproduction in plants. <u>Vocabulary:</u> asexual reproduction life-cycle ovary ovule pollen sexual reproduction	

	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Animals	Manage their own basic hygiene and personal needs e.g. dressing, going to the toilet and understanding the importance of healthy food choices. A varied diet is healthy- some foods are good for and some should only be had as a treat. You need to brush your teeth twice a day to keep them healthy. Sugary food and drinks can be bad for your teeth. We need to sleep to stay healthy. An animal is a living thing. An insect has 6 legs. <u>Vocabulary:</u> air animal antennae badger bat balanced diet butterfly fox insect owl shell sunglasses sunhat sunscreen teeth toothbrush	Name at least one fish (e.g. goldfish), amphibian (e.g. frog), and reptile (e.g. snake). Identify cow, dog, cat, pig, blackbird, sparrow, hedgehog, squirrel, badger Identify simple differences between animals – eg legs/no legs, wings, feathers, fur, scales, beak, what they eat. Use terms carnivore, omnivore and herbivore Name, draw and label head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth. Say which part of the body is associated with each sense e.g. smell, taste, touch, sound & look. <u>Vocabulary:</u> amphibian arms beak blackbird ears elbows	Know animals including humans have babies (offspring) that grow into adults. Know they need food, water and air Know humans need to eat good foods like Vegetables e.g. broccoli, fruits e.g. apple, things like rice and bread and potatoes, and protein e.g. meat and lentils, and not too much fat and sugar. Understand that to stay healthy, humans need to exercise. E.g. running/ football Understand that to stay healthy, keep things clean, including washing hands. Identify if something is alive, dead or never alive. Understand that things are suited to the habitats they live in. e.g. polar bear in the arctic.	Know that animals, including humans, cannot make their own food. Know they need to eat the right types and amount of food. Know that different animals eat different sorts of food. Know humans and some other animals have skeletons to protect and support them. Know humans have muscles for movement <u>Vocabulary:</u> muscles skeleton	Know that adult humans have 32 teeth Identify teeth – incisors, canines, pre-molars and molars, wisdom teeth Know what the different teeth do – link to what they eat carnivore/herbivore Know what damages teeth and how to look after them. Be able to label the different parts of the digestive system – mouth, tongue, teeth, oesophagus, stomach, small intestine, large intestine Draw on a food chain to show what eats what. Understand a food chain starts with the sun, then a plant, then an animal (usually a herbivore) then carnivores and omnivores. Use terms predator, prey, producer. e.g. grass – rabbit – fox Follow a key to identify animals and plants (link to computing branching databases) Understand that plants and animals can be affected if the environment changes <u>Vocabulary:</u>	Identify changes for humans as they age, using a timeline. e.g. grow taller until max height, brain develops, grey hair Draw a life-cycle diagram for a human. Understand puberty prepares our bodies for being adult (reproduction) List changes boys and girls go through at puberty e.g. boys – deepening voice, grow facial and body hair, sexual organs develop, sweat. Girls – periods, growth of breasts, sweat Hormones control these changes which can be physical or emotional. [Link PSHE – girls/boys puberty talk] Know other animals age at different rates. Draw a life cycle diagram for another mammal (M), an amphibian (A), a reptile (R), an insect (I), a bird (B). e.g.	Know difference vertebrates and invertebrates e.g. vertebrates – back bone, invertebrates – no back bone. Know the 5 vertebrate groups e.g fish, mammals, birds, amphibians and reptiles. Know some common invertebrate groups, eg insects, spiders, annelids, molluscs) Be able to put example animals into the right group e.g. frog – amphibian, snail – mollusc, whale – mammal, finch – bird, bee – insect (Linnaeus' system) Know at least five of the kingdoms Know what microorganisms are and how they can be grouped (Bacteria, viruses) Know that some microorganisms can be used

		eyes face feathers fur fish hair head hear hedgehog knees legs neck reptile scales see smell squirrel taste touch wings	Habitats provide food, water and shelter. Know the terms carnivore, herbivore and omnivore. Identify plants and animals in at least one micro-habitat and one larger habitat. E.g. woodlouse under a log, camel in the desert. <u>Vocabulary:</u> air bread carnivore exercise fat fruits habitat herbivore offspring omnivore potatoes protein rice shelter vegetables		canines digestive system food Chain food Web herbivore incisors large intestine pre-molars molars mouth predator prey producer small intestine stomach tongue	frog, stick insect, black bird and snake. Know the process of reproduction in animals. Identify differences between these groups eg M only ones that start as babies inside mothers, are fed milk by their mothers, or A and I have thousands of eggs. <u>Vocabulary:</u> adolescence adulthood age group childhood development embryo emotion foetus gestation hygiene infancy middle age, offspring physical features puberty relationship reproduction retirement sibling toiletries	for good. i.e. pencillium) Identify heart, lungs blood vessels, veins, arteries Know the function of each, including carrying nutrients and water; oxygen is breathed into the lungs and absorbed by the blood. E.g.Heart - pump, lungs - oxygen/CO2 exchange, veins carry blood towards the heart, arteries carry blood away from the heart. Investigate pulse-rate Describe one way that diet, exercise, drugs can affect the body positively and one way negatively. Know that living things produce offspring of the same kind Know offspring are similar but not identical to parents (variation) Understand that variation has meant that living things change over time Understand that variation means that
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							animals become more or less able to survive where they live. (Adapt to suit their environment) Know that the process of adaptation leads to evolution Fossils tell us about living things from millions of years ago. <u>Vocabulary:</u> adaptation arteries blood vessels heart invertebrates lungs nutrients offspring pulse-rate variation vertebrates veins
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Chemistry:

	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Materials & States of Matter	Ice is the solid form of water. Water turns to ice when the temperature is very cold (below freezing). When ice melts, it becomes liquid water again. Heat causes ice to melt <u>Vocabulary</u> cold freeze frost heat ice, liquid melt season solid snow temperature winter	Name objects and say what they are made of e.g. wood, plastic, glass, metal, water, rock, brick, paper and fabric. <u>Vocabulary:</u> glass rock water	Say whether a material is hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Group materials eg all hard ones compared to all soft ones. Choose the best material for a specific purpose. Find out how easily materials can be squashed, bent, twisted and stretched eg wood, metal, plastic, glass, brick, rock, paper cardboard. For at least two materials, link a property to how suitable these materials are for particular uses, eg bricks used for houses cannot be squashable, material used for windows must be transparent. <u>Vocabulary:</u> bendy hard properties soft squashable waterproof		Identify whether a material is a solid, a liquid or a gas. Know how particles are arranged in solids, liquids and gases. Know that materials can change state when heated or cooled. Know that water changes state at about 0°C and 100°C. Know that evaporation is different from boiling. Know evaporation is more rapid at higher temperatures. Know that water evaporates, then condenses to fall as precipitation. Draw a diagram of the water cycle. <u>Vocabulary:</u> boiling condensation evaporation gas liquid solid states of matter water cycle	Understand meaning of solubility, transparency, conductivity (thermal and electric), and magnetic. Group materials by these properties. Understand meaning of dissolving and solution - know that some materials are soluble in water and some not. Know methods of separating materials - filtering, sieving and evaporating. Know complex properties and associated use of different materials. Give evidence for these properties of materials. Know the difference between reversible and irreversible changes e.g. a cooked egg cannot be uncooked, melted wax can be cooled to form wax. Know dissolving, mixing and changes of state are reversible.	

						Know that irreversible changes can make a new material. Know burning and action of acid on bicarbonate of soda are irreversible. <u>Vocabulary:</u> Conductivity Dissolving Filtering Hardness Irreversible Reversible Sieving Solubility Solution Transparency	
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Physics:

	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Forces and Motion			Know they use a force to bend and squash materials <u>Vocabulary:</u> Bend Squash	Understand that the roughness of a surface affects how things move Know friction is a force between two surfaces in contact Know some objects require large forces to make them move; Know magnetism can act at a distance Know magnets have 2 poles and that N and N, and S and S, repel Know magnets attract some materials, eg iron, but not others <u>Vocabulary:</u> Attract Contact Friction Magnetism Poles Repel Surface		Know unsupported objects fall because of gravity between earth and the object. Identify forces and their effects: Air resistance, water resistance, friction Know air resistance, water resistance and friction act between moving surfaces in contact Know levers and pulleys make lifting easier. Gears, pulley and levers can reduce the force needed to make things move <u>Vocabulary:</u> Air resistance Gravity Levers Pulleys Water resistance	

	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Environment	Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class Know that the sun shines in the day/it is dark at night. Know that some people/ animals work whilst we sleep. Know that dinosaurs lived millions of years ago and are now extinct. Know that scientists, called palaeontologists, study the fossils of dinosaurs. Know that some dinosaurs were carnivores e.g. T.Rex some dinosaurs were herbivores e.g. triceratops <u>Vocabulary:</u> Bedtime dark daytime dinosaur	Identify the differences between weather/temperature throughout the year e.g. using snow, rain, wind, day length, hot and cold know days are shorter in winter <u>Vocabulary:</u> Autumn Rain Seasons Snow Spring Summer Wind Winter		Put rocks into groups eg colour, crumbly hard, grainy, have crystals, have fossils in them. Name some different types of rock e.g. igneous, sedimentary and metamorphic. Know fossils are formed when something dies and is buried in rock. Know that soil is a mixture of crumbled rock and dead plants and animals. <u>Vocabulary:</u> Fossil Igneous Metamorphic Sedimentary Soil <u>Famous Scientists:</u>		Know we live on a planet Know that planets orbit a star (the sun in our case) Know that there are 8 planets in the solar system (and be able to name them) Know that the sun does not move - it just seems to because the Earth is rotating. Know planets may have moons orbiting them and that Earth has 1 moon. Know the Earth, Moon and Sun are roughly spherical. Use the idea of Earth's rotation to explain day and night. Neil Armstrong, Buzz Aldrin, Katherine Johnson, Dorothy Vaughan, and Mary Jackson, three mathematicians who worked as computers (then a job description) at NASA, during the space race. Scientists have different ideas	

	extinct fossil light moon night nocturnal palaeontologist reptile sleep stars sun time				about the Solar System as more evidence has been gained. <u>Vocabulary:</u> Axis Earth Jupiter Mars Mercury Moon Neptune Planet Pluto Satellite Saturn Solar system Star Uranus Venus	
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	Reception	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Energy - Light, Sound & Electricity				Know darkness is the absence of light Know we need light to see Know they must not look at the sun directly - light from the sun can be dangerous Realise that light is <i>reflected</i> from surfaces Know we get <i>shadows</i> when light is blocked by an <i>opaque</i> object. Know that sizes of shadows change, and identify patterns in that eg shadows get bigger or fuzzier when object is near the light.	Know sounds are made by something vibrating Know that sounds travel through something to get to our ears Know the <i>pitch</i> of the sound depends on the thing producing it. Know the faster the vibration the higher the pitch Know the <i>volume</i> of a sound depends on the strength of the vibration producing it. Know that sounds get fainter the further away they are Identify things at home and school that run on <i>electricity</i> Identify the following things in a circuit: <i>Cell, wire, bulb, switch, buzzer, lamp.</i> Know a circuit with everything in a single loop is a <i>series</i> circuit. Know there must be a complete loop for electricity to flow.		Know that light travels in straight lines Understand that this explains why shadows have the shapes they do. Understand that we (including animals) see a light because it sends light to our eyes Understand that we see other objects because light hits them and they reflect it to our eyes (unless they are black). Non shiny surfaces scatter the light so we don't see the beam How a simple optical instrument works (periscope) Use the circuit symbols for bulb, switch, cell, battery, motor, buzzer and wire. Draw accurately a simple circuit diagram. Know that in a series circuit more cells make lights brighter or buzzer sound louder.

					Know most metals are good <i>conductors</i>. Name some insulators eg wood, plastic. Know an open switch stops the electricity and a closed switch lets it flow.	Know that more cells provide greater voltage, so more energy Use a voltmeter to measure voltage. Know an open switch stops the bulb or buzzer working and a closed switch lets it work Understand that an open switch stops the electrical <i>energy</i> flowing to the bulb or buzzer Identify a parallel circuit. Know that resistance can have an effect on the component in a circuit.
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