Science

Potterhanworth Church of England Primary School

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OUR CURRICULUM INTENT

To nurture independent, resilient, inquisitive learners, who have a breadth of knowledge, experiences and skills, with aspiration to succeed in the wider world.

The GOLDEN THREADS of our Intent

Oracy	Diversity	Independence

Science – EYFS / Reception

Science within EYFS / Reception is introduced indirectly through inter-linked activities shaped by the seven areas of learning and development. The activities provide many opportunities for scientific exploration, thinking, decision-making, predicting and problem solving, covering the basics of the science curriculum they will move onto in KS1 and KS2. This overview shows the areas from which the majority of science learning will come.

EYFS

Understanding the World	**Expressive Arts and Design**
Understanding the world involves guiding children to make sense of their physical world and their community through opportunities to explore, observe and find out about people, places, technology and the environment.	It is important that children have regular opportunities to engage with the arts, enabling them to explore and play with a wide range of media and materials. The quality and variety of what children see, hear and participate in is crucial for developing understanding, self-expression, vocabulary and ability to communicate through the arts. The frequency, repetition and depth of experiences are fundamental to progress in interpreting and appreciating what they hear, respond to and observe.
ELG: The Natural World Children at the expected level of development will: Explore the natural world around them, making observations and drawing pictures of animals and plants. 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. Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.	**ELG: Creating with Materials** Children at the expected level of development will: Safely use and explore a variety of materials, tools and techniques, experimenting with colour, design, texture, form and function. Share their creations, explaining the process they have used; - Make use of props and materials when role playing characters in narratives and stories.
Knowledge may include: • Naming and describing animals that live in different habitats • Exploration of plants and animals in the surrounding natural environment • Exploring through playing outside in different weather, bserving things through the year. • Exploring shadows and rainbows. • Exploring how objects move in water and how the wind affects movement of objects. • Listening and identifying sounds outside – identifying the source of sounds. • Learning about the Solar System and stars	**Knowledge may include:** • Exploring a range of materials, including natural materials • Making objects from different material, including natural materials. • Observing, measuring and recording how materials change when heated and cooled. • Comparing how materials change over time and in different conditions.

Working Scientifically (Enquiry skills):

Know how to:

- Take a risk, engage in new experiences and learn by trial and error. (Playing and Exploring)
- Find ways to solve problems / find new ways to do things / test their ideas (Creating and thinking critically).
- Notice patterns and make links in their experience (Creating and Thinking Critically). E.g. increasing the incline of a slope to observe how fast a vehicle travels, or opening a mechanical toy to see how it works.
- Choose the resources they need for their chosen activities (Creating and Thinking Critically)
- Handle equipment and tools effectively (Moving and handling).
- Create simple representations of events, people and objects (Being imaginative)
- Answer *How* and *Why* questions about their experiences (Understanding)
- Make observations of animals and plants and explain why some things occurred. (The World)
- Develop their own ideas and narratives and explanations by connecting ideas of events (Speaking)
- Use vocabulary that matches their experiences (Understanding).

Science - Key Stage 1

		Animals including humans (Biology)	Plants (Biology)	Living things and their habitats (Biology)	Seasonal Change (Physics)	Everyday Materials (Chemistry)
Year 1 Overview		Name common animals Carnivores, etc Human body and senses	Common plants. Plant structure.		The four seasons. Seasonal Weather.	Properties of materials. Grouping Materials.
Year 1	Substantive and Disciplinary Knowledge	Know what classification is. Classify a range of animals by amphibian, reptile, mammal, fish and birds Know what carnivore, herbivore and omnivore are. Classify animals by what they eat (carnivore, herbivore and omnivore) Know the difference between living and non-living. Sort by living and non living things. Know the name of parts of the human body that can be seen. Label the parts of the body.	Know what is meant by the terms wild, garden, deciduous and evergreen. Know about and name a variety of common wild and garden plants. Know about and name the petals, stem, leaves and root of a plant. Know about and name the roots, trunk, branches and leaves of a tree.		Know about and observe the changes in weather in each season including how the day length varies. Explain how the weather associated with the seasons changes through the year.	Know and explain the difference between an object and the material from which it is made. Know what a property is a give examples e.g. smooth, rough, hard, soft. Know and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock Start to describe them. Compare and group together a variety of everyday materials on the basis of their simple physical properties.

Working Scientifically (disciplinary):

- Ask questions such as: • Why are flowers different colours? • Why do some animals eat meat and others do not?
- Set up a test to see which materials keeps things warmest, know if the test has been successful and can say what has been learned
- Explain to someone what has been learned from an investigation they have been involved with and draw conclusions from the answers to the questions asked.
- Begin to use scientific language.
- Record simple data with support.
- Measure (within Year 1 mathematical limits) to help find out more about the investigations undertaken

		Animals including humans (Biology)	Plants (Biology)	Living things and their habitats (Biology)	Seasonal Change (Physics)	Everyday Materials (Chemistry)
Year 2 Overview		Animal reproduction. Healthy living. Basic needs.	Plant and seed growth. Plant reproduction. Keeping plants healthy.	Alive or dead. Habitats. Adaptations. Food chains.		Identify different materials. Name everyday materials. Properties of materials. Compare the use of different materials. Compare movement on different surfaces.
Year 2	Substantive and Disciplinary Knowledge	Know what a life cycle is. Know the basic stages in a life cycle for animals, (including humans). Can draw or explain what a life cycle is. Know what exercise is. Know what a balanced diet might look like. Know what hygiene is. Know why exercise, a balanced diet and good hygiene are important for humans. Can explain through written or verbal means, what a balanced diet might look like. Give examples of how they can keep themselves healthy.	Know what seeds and bulbs are. Know how seeds and bulbs grow into plants. Explain what seeds are and how they grow into plants. Know what plants need in order to grow and stay healthy (water, light & suitable temperature. Explain how they would take care of a plant to keep it growing well.	Know what is meant by *living, dead, never alive* to be able to classify things by living, dead or never lived. Know what a habitat is to be able to match living things to their habitat. Know how a specific habitat provides for the basic needs of things living there (plants and animals). Know some different sources of food for animals. Know about and explain a simple food chain.		Know how materials can be changed by squashing, bending, twisting and stretching. Explore how materials can be changed by squashing, bending, twisting and stretching.
	Working Scientifically (Enquiry skills): Ask questions such as: • Why do some trees lose their leaves in Autumn and others do not? • How long are roots of tall trees? • Why do some animals have underground habitats? Use equipment such as thermometers and rain gauges to help observe changes to local environment as the year progresses / microscopes e.g. to find out more about small creatures and plants Record simple data. Set up a fair test e.g when finding out about how seeds grow best Classify or group things according to a given criteria, e.g. deciduous and coniferous trees To draw conclusions from fair tests and explain what has been found out Use measures (within Year 2 mathematical limits) to help find out more about the investigations they are engaged with. Communicate findings in a range of ways using scientific language.					

Science - Lower KS2

		Animals including humans (Biology)	Plants (Biology)	Rocks (Chemistry)	Electricity (Physics)	Forces (Physics)
NC Year 4 Objectives Year 3 NC Objectives	Overview	Skeleton and muscles, Nutrition, Exercise and health, Digestive system, Teeth, Food chains	Plant life, Basic structure and functions, Life cycle, Water transportation	Fossil formation. Compare and group rocks. Soil.	Uses of electricity. Simple circuits and switches. Conductors and insulators	Different forces. Magnets.
	Substantive and Disciplinary Knowledge	Know about the importance of a nutritious, balanced diet. Know how nutrients, water and oxygen are transported within animals and humans. Show understanding 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 Know about the skeletal and muscular system of a human. Describe some parts of the skeletal and muscular systems, identifying they are needed for support, protection and movement. Know the functions of the organs in the human digestive system Identify and describe the parts of the human digestive system. Know about different types of human teeth and their simple functions. Identify the types of teeth and explain their simple functions.. Know what a food chain is. Know what producers, predators and prey are. Use and construct food chains to identify producers, predators and prey.	Know the function of different parts of flowing plants and trees. Identify and describe the different parts of flowering plants. Know what transportation is. Know and explain how water is transported within plants. Know the plant life cycle. Explore and explain the part that flowers play within the life cyle of a plant. (pollination, seed formation and dispersal)	Know the names of different types of rock. Know the appearance and properties of different rocks. Compare and group rocks based on their appearance and physical properties, giving reasons. Know how soil is made and how fossils are formed. Know about and explain the difference between sedimentary, metamorphic and igneous rock	Know and name appliances that require electricity to function. Know what a circuit is and how to construct a series circuit. Know what a component is. Name and describe the appearance of components in a series circuit (including cells, wires, bulbs, switches and buzzers). Know how to test whether a lamp will light within a circuit. Be able to predict whether a lamp will light in a circuit. Know the function of a switch. Know what a conductor and insulator are. Explain the difference between a conductor and an insulator. Gives examples of some common conductors and insulators, and associate metals with being good conductors.	Know how objects move on different surfaces. Compare how things move on different surfaces. Know what a pulley is how a simple pulley works. Use to on to lift an object. Know what a force is and that some forces require contact and some do not, giving examples. Know what attract and repel means. Know that magnets have two poles. Know about and explain how magnets attract and repel. Predict whether magnets will attract or repel each other based on which poles are facing. Compare and group together materials on the basis of whether they are attracted to a magnet or not.
		Living things and their habitats (Biology)		**States of Matter (Chemistry)**	**Light (Physics)**	**Sound (Physics)**
	Overview	Grouping living things. Classification keys. Adaptation of living thing.		Compare and group materials. Solids, liquids and gases. Changing state. Water cycle.	Reflections. Shadows.	How sound is made. Sound vibrations. Pitch and Volume.

	Substantive and Disciplinary Knowledge	Know what a key is. Know what classification is. Know different groups of living things. Use classification keys to group, identify and name living things within their local and winder environments. Know and explain how changes to an environment could endanger living things.		Know the difference states of matter: solids, liquids and gases. Explain how to group materials based on their state of matter (solid, liquid, gas). Know the temperature at which materials change state. Know about and explore how some materials can change state by measuring or researching the temperature at which this happens in degrees Celsius (°C). Know what evaporation and condensation are. Know and explain the part played by evaporation and condensation in the water cycle	Know that dark is the absence of light. Know that light is needed in order to see and is reflected from a surface. Know and demonstrate how a shadow is formed and explain how a shadow changes shape. Find patterns in the way that the size of shadows change. Know about the danger of direct sunlight and describe how to keep protected	Know how sound is made, associating some of them with vibrating. Know how sound travels from a source to our ears. Know what pitch and volume are. Find patterns between the correlation between pitch and the object producing a sound. Find patterns between the volume of a sound and the strength of the vibrations that produced it. Explore and explain what happens to a sound as it travels away from its source.
		Working Scientifically (Enquiry skills): Ask questions such as: • Why does the moon appear as different shapes in the night sky? • Why do shadows change during the day? • Where does a fossil come from? Why are steam and ice the same thing? • Why is the liver important in the digestive systems? • What do we mean by 'pitch' when it comes to sound? Use a thermometer to measure temperature and know there are two main scales used to measure temperature. Gather and record information using a chart, matrix or tally chart, depending on what is most sensible. Observe at what time of day a shadow is likely to be at its longest and shortest. Group information according to common factors e.g. plants that grow in woodlands or plants that grow in gardens, materials that make good conductors or insulators , states of matter. Observe which type of plants grow in different places e.g. bluebells in woodland, roses in domestic gardens, etc. Use bar charts and other statistical tables (in line with Year 3 /4 mathematics statistics) to record findings. Use research to find out how reflection can help us see things that are around the corner / how much time it takes to digest most of our food / which materials make effective conductors and insulators of electricity. Carry out tests to see, e.g. which of two instruments make the highest or lowest sounds and to see if a glass of ice weighs the same as a glass of water. Use a key to help understand information presented on a chart Use research to find out what the main differences are between sedimentary and igneous rocks. Explain to others what has been found out e.g. about how the moon changes shape. Test to see which type of soil is most suitable when growing two similar plants. Present findings using written explanations and include diagrams when needed. Make sense of findings and draw conclusions, which help them to understand more about scientific information (Yr3). Make sense of findings and draw conclusions, which helps them understand more about the scientific information that has been learned (Yr4). Set up a fair test with different variables e.g. the best conditions for a plant to grow (Yr3). Set up a fair test with more than one variable e.g. using different materials to cut out sound (Yr4). Amend predictions according to findings. When making predictions there are plausible reasons as to why they have done so (Yr4). Explain to a partner why a test is a fair one e.g. lifting weights with right and left hand, etc. (Yr3). Explain to others why a test that has been set up is a fair one e.g. discover how fast ice melts in different temperatures (Yr4). Be prepared to change ideas as a result of what has been found out during a scientific enquiry. Measure carefully (taking account of mathematical knowledge up to Year 3/4) and add to scientific learning. Write up findings using a planning, doing and evaluating process (Yr4). Use a data logger to check on the time it takes ice to melt to water in different temperatures (example).				

Science - Upper KS2

		Animals including humans (Biology)	Living things and their habitats (Biology)	Properties and changes in materials (Chemistry)	Forces (Physics)	Earth and Space (Physics)
NC Year 6 Objectives Year 5 NC Objectives	Overview	Changes as humans develop from birth to old age The circulatory system Water transportation Impact of exercise on body	Life cycles – plants and animals • Reproductive processes • Famous naturalists Classification of living things and the reasons for it	Compare properties of everyday materials. Soluble/ dissolving. Reversible and irreversible substances.	Gravity. Friction. Forces and motion of mechanical device.	Movement of the earth and the planets. Movement of the Moon. Night and day
	Substantive and Disciplinary Knowledge	Know what a timeline is. Know the stages of growth in humans. Create a timeline to indicate stages of growth in humans. Describe the changes as humans develop to old age. Know what the circulatory system does. Know the names of and recognise the main parts of the human circulatory system and their functions. Explain the function of the heart, blood vessels and blood. Know and explain the impact of diet, exercise, drugs and lifestyle on health. Know what nutrients are. Know and explain the ways in which nutrients and water are transported in animals, including humans.	Know the life cycle of different living things e.g. mammal, amphibian, insect and bird. Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Know about the process of reproduction in plants. Know about the process of reproduction in animals Describe the life process of reproduction in some plants and animals. Classify living things into broad groups according to observable characteristics and based on similarities and differences. Know how living things have been classified - Give reasons for classifying plants and animals in a specific way	Know the properties of materials to be able to compare and group them based on their properties (e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Know what: dissolving, solution, substance, reversible and irreversible means. Know and explain how a material dissolves to form a solution. Know and show how to recover a substance from a solution. Know and demonstrate how some materials can be separated (e.g. through filtering, sieving and evaporating). Know and demonstrate that some changes are reversible and some are not. Know how some changes result in the formation of a new material and that this is usually irreversible. Give examples of irreversible changes.	Know what gravity is and its impact on our lives. Explain why unsupported objects fall towards the Earth Know about the effect of friction and types of resistance. Explain the effect of air and water resistance and friction that act between moving surfaces. Know what levers, pulleys and gears are and what they are used for. Explain verbally or through demonstrating, how levers, pulleys and gears allow a smaller force to have a greater effect.	Know about and explain the movement of the Earth and other planets relative to the Sun. Know about and explain the movement of the Moon relative to the Earth. Know and demonstrate how night and day are created. Describe the Sun, Earth and Moon (using the term spherical).

		Evolution and Inheritance (Biology)			Electricity (Physics)	Light (Physics)
	Overview	Identical off-spring. Fossil evidence and evolution. Adaptation and evolution			Electrical components. Simple circuits. Fuses and voltage.	How light travels. Reflection. Ray models of light.
	Substantive and Disciplinary Knowledge	Know what evolution means. Know about reproduction and offspring (recognising that offspring normally vary and are not identical to their parents). Explain with examples, what evolution is. Know how animals and plants are adapted to suit their environment - Link adaptation over time to evolution. Know how the Earth and living things have changed over time. Know how fossils can be used to find out about the past. Describe (using examples) how Earth and things on Earth have changed over time has changed over time. Explain how fossils can be used to find out about the past.			Know how to draw symbols for components in a circuit - Draw circuit diagrams using correct symbols. Compare and give reasons for why components work and do not work in a circuit. Know what voltage is. Know how the number and voltage of cells in a circuit links to the brightness of a lamp or the volume of a buzzer. Show this when making a circuit.	Know how light travel and how this affects shadows. Know and demonstrate how we see objects. Explain (verbally or through demonstration) why shadows have the same shape as the object that casts them. Know and explain how simple optical instruments work e.g. periscope, telescope, binoculars, mirror, magnifying glass etc
		Working Scientifically (Enquiry skills): Set up an investigation when it is appropriate e.g. finding out which materials dissolve or not. Know which type of investigation is needed to suit particular scientific enquiry e.g. looking at the relationship between pulse and exercise (Yr6). Able to present information related to scientific enquiries in a range of ways including using IT such as power-point and iMovie. Use diagrams, as and when necessary, to support writing. Use a range of written methods to report findings, including focusing on the planning, doing and evaluating phases (Yr6). Set up a fair test when needed e.g. which surfaces create most friction? / does light travel in straight lines? Set up an enquiry based investigation e.g. find out what adults / children can do now that they couldn't when a baby. Know how to set up an enquiry based investigation e.g. what is the relationship between oxygen and blood? (Yr6). Is evaluative when explaining findings from scientific enquiry. Clear about what has been found out from their enquiry and can relate this to others in class (Yr6). Explanations set out clearly why something has happened and its possible impact on other things (Yr6). Know what the variables are in a given enquiry and can isolate each one when investigating e.g. finding out how effective parachutes are when made with different materials. Justify which variable has been isolated in scientific investigation (Yr6). Clear about what has been found out from recent enquiry and can relate this to other enquiries, where appropriate. Aware of the need to support conclusions with evidence (Yr6). Use all measurements as set out in Year 5/6 mathematics (measurement), including capacity, mass, ration and proportion. Use diagrams, as and when necessary, to support writing and be confident enough to present findings orally in front of the class (Yr6). Their explanations set out clearly why something has happened and its possible impact on other things. Use other scientific instruments as needed e.g. thermometer, rain gauge, spring scales (for measuring Newtons). Able to give an example of something focused on when supporting a scientific theory e.g. how much easier it is to lift a heavy object using pulleys / classifying vertebrate and invertebrate creatures or why certain creatures choose their unique habitats. Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs. Keep an on-going record of new scientific words that they have come across for the first time. Keep an on-going record of new scientific words that they have come across for the first time and use these regularly in future scientific write ups(Yr6). Make predictions based on information gleaned from investigations. Make accurate predictions based on information gleaned from their investigations and create new investigations as a result (Yr6). Able to relate causal relationships when, for example, studying life cycles/ Create new investigations which take account of what has been learned previously/ Frequently carry out research when investigating a scientific principle or theory/