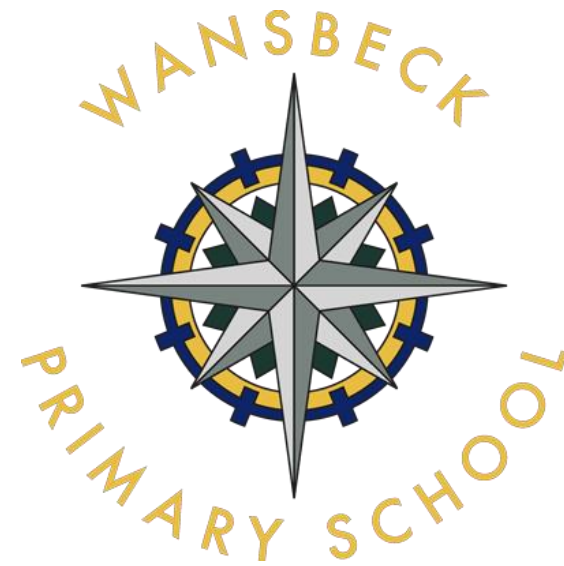


# Wansbeck Primary School

## Progression of knowledge and skills.

### Science



## Wansbeck Primary School Progression in Science

In Science substantive knowledge sets out the content that is to be learned and the scientific facts children will learn as they move through the school. #This is referred to as scientific knowledge and conceptual understanding in the national curriculum

Disciplinary knowledge is equally important. Disciplinary knowledge (knowledge of how scientific knowledge is generated and grows): this is specified in the 'working scientifically' sections of the national curriculum and it includes knowing how to carry out practical procedures - this enables children to learn the practices of science in other words, how to work like scientists. By learning substantive and disciplinary knowledge, pupils not only know 'the science'; they also know the evidence for it.

At Wansbeck Primary school substantive and disciplinary knowledge is taught side by side and disciplinary knowledge is embedded within the substantive content of biological strands, physics strands and chemistry strands. This enables pupils to see the important interplay between both categories of knowledge, allowing pupils to:

- appreciate the nature of substantive knowledge by knowing the evidence for it
- use disciplinary knowledge together with substantive knowledge to ask and answer scientific questions by carrying out different types of scientific enquiry

## Progression of Substantive Knowledge - Biological Strands

Strand	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
<b>Animals Including Humans</b>	<p>Make connections between the feature of their family and other families.</p> <p>Notice the differences between people.</p> <p>Understand the key features of the life cycle of an animal.</p> <p>Begin to understand the need to respect and care for the natural environment and all living things.</p> <p>Describe what they see, hear and feel whilst outside.</p> <p>Explore the natural world around them.</p>	<p>Know the names of a variety of animals and their groups (fish, amphibians, reptiles, birds and mammals)</p> <p>To know the difference between the different animal groups</p> <p>To know the difference between carnivores, herbivores, omnivores</p> <p>To know the features of different animals (body parts)</p> <p>To know the difference between the features of different animals (body parts)</p> <p>To know the names of different body parts and the names of the senses</p>	<p>Know that animals (including humans) have offspring which grow into adults e.g. kittens into cats, puppies into dogs, babies into adults</p> <p>Know the basic needs of animals (including humans) e.g. food, water, air</p> <p>Know the importance for humans of exercise, eating the right amounts of different food and hygiene.</p>	<p>Know the simple functions of the basic parts of the digestion system in humans</p> <p>Know the different types of teeth in humans (and other animals) and their simple functions.</p> <p>Know a variety of food chains and how the energy flows through a food chain</p> <p>Know how to correctly draw a food chain</p> <p>Know some producers, predators and prey</p>	<p>Know the simple functions of the basic parts of the digestion system in humans</p> <p>Know the different types of teeth in humans (and other animals) and their simple functions.</p> <p>Know a variety of food chains and how the energy flows through a food chain</p> <p>Know how to correctly draw a food chain</p> <p>Know some producers, predators and prey</p>	<p>To know the changes as humans develop into old age</p> <p>To know the gestation period of other animals and humans</p> <p>Know the main parts of the human circulatory system, and the functions of the heart, blood vessels and blood.</p> <p>Know the impact of diet, exercise, drugs and lifestyle on the ways their bodies function.</p> <p>Know the ways in which nutrients and water is transported</p>	
<b>Vocabulary</b>	head eyes nose mouth ears hands fingers feet toes arm leg animal	Amphibians Reptiles Mammals Carnivores Herbivores Omnivores Gills Claws Hooves Hips More advance human body parts - Ankle - Elbow - Hips - Shoulder Knee	Habitat offspring adult reproduction water air survival mouth tongue teeth exercise diet Hygiene Nutrition Growth Eat food	Skeleton Muscles Skull Ribs Hips Protection healthy Movement Carbohydrates Muscles Protein Fats Sugar Balanced diet	Digestive system Oesophagus Stomach Small/large intestines Incisors Molars Pre-molars Canines Wisdom teeth Milk teeth Pulp Enamel Root Gum Food chain Producer Predator, Prey, Consume	Puberty Sibling Offspring Young Adult teenager Elderly Retirement Gestation Life cycle Period	Circulatory system Aorta Ventricles Arteries Capillaries White/red blood cells Bloodstream Drug substances Glucose Starch Trans and saturated fats Medicine

<p><b>Plants, Habitats, Living Things and Evolution</b></p>	<p><u>Plants</u></p> <p>Plant seeds and care for growing plants.</p> <p>Understand the key features of the life cycle of a plant.</p> <p>Begin to understand the need to respect and care for the natural environment and all living things.</p> <p>Describe what they see, hear and feel whilst outside.</p> <p>Explore the natural world around them.</p> <p><u>Living things</u></p> <p>Explore and respond to different natural phenomena in their setting and on trips.</p> <p>Begin to understand the need to respect and care for the natural environment and all living things.</p> <p>Describe what they see, hear and feel whilst outside.</p> <p>Explore the natural world around them.</p>	<p><u>Plants</u></p> <p>To know a variety of common, wild and garden plants including deciduous and evergreen trees</p> <p>To know the basic structure of a variety of common flowering plants including trees.</p> <p><u>Living Things</u></p> <p>To know what a habitat is (local environment).</p> <p>To know what their local habitat is (Different habitats?)</p> <p>To know specific environments of plants and animals.</p> <p>Everyday materials</p> <p>To know that wood was once a tree and be able to explain whether it is living or dead</p> <p><u>Animals, including humans</u></p> <p>To know carnivore, herbivores and omnivores and understand that they eat different things</p>	<p><u>Plants</u></p> <p>To know how seeds and bulbs grow into mature plants</p> <p>To know why plants need water, light and a suitable temperature to grow and stay healthy</p> <p><u>Living Things</u></p> <p>To know how animals obtain their food from plants and other animals, using the idea of a simple food chain and identify and name different sources of food</p> <p>To know the differences between things that are living, dead and things that have been alive.</p> <p>To know that most living things live in habitats to which they are situated. To know that different kinds of animals and plants depend on each other.</p> <p>To know and name a variety of plants and animals in their habitats including microhabitats</p>	<p><u>Plants</u></p> <p>To know the functions of different parts of flowering plants.</p> <p>To know the requirements of plants, the life and growth and how they vary from plant to plant.</p> <p>To know the way in which water is transported in plants</p> <p>To know the part that flowers play in the lifecycle of plants</p> <p><u>Living things</u></p> <p>Know how to use classification keys to help group, identify and name a variety of living things</p> <p>Know key characteristics of plants and animals.</p> <p>Know different ways to group living things eg mammals etc, evergreen etc.</p> <p>Know a variety of living things in their local and wider environment.</p> <p>Know that environments can change and that this can sometimes pose dangers to living things</p>	<p><u>Living things</u></p> <p>Know the life process of reproduction in some plants and animals</p> <p>Know the differences in the life cycles of a mammal, amphibian, insect and a bird.</p>	<p><u>Living things</u></p> <p>To know a range of observable characteristics of animals, microorganisms and plants.</p> <p>To give reasons for classifying plants, animals and microorganisms based on specific characteristics</p> <p><u>Evolution and Inheritance</u></p> <p>Know that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.</p> <p>Know that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.</p> <p>Know how animals and plants adapted to suit their environment in different ways and that adaptation may lead to evolution</p>
<p><b>Vocabulary</b></p>	<p>tree leaf flower stem seed</p>	<p>Plants Deciduous evergreen Stem Roots Soil Petal Trunk Branches Seed/bulb Compost Blossom Names of plants and trees</p>	<p>Seedlings Shoot Temperature Bud Germination Reproduction Nutrients Conditions</p> <p>Habitat Food chain Deciduous Evergreen Predator Prey</p>	<p>Pollination Seed formation Seed dispersal Transported Stamen Style Stigma Fertiliser Pollen nectar</p>	<p>Adaptation Classification Ecology Deforestation Pollution Environment Population Identify Group litter</p>	<p>Asexual/sexual puberty Organism Offspring Nutrition Excretion Respire Sibling Stamen Stigma Sepal Ovual Pollination Reproducing Reproduction Fertilise(tion) Germinate(tion) Movement Sensitivity Growth Retirement</p> <p>Micro-organism Microbe Decay Exoskeleton Endoskeleton Bacteria Virus Mould</p> <p>Offspring Adaptation Characteristics Breeds Environments Genes Evolution Environments Palaeontologists Survival Species Classification</p>

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**Progression of Substantive Knowledge - Physics Strands**

<p><b>Forces and Magnets</b></p>	<p>Explore and talk about different forces they can feel.</p>			<p><u><b>Forces and magnets</b></u></p> <p>Know how things move on different surfaces.</p> <p>Know that some forces need contact between two objects, but magnetic forces act at a distance.</p> <p>Know how magnetics attract or repel each other and attract some materials and not others</p> <p>Know that everyday materials can be compared and grouped on the basis of whether they are attracted to a magnet, and identify some magnetic materials.</p> <p>Know magnets have two poles.</p> <p>Know whether two magnets will attract or repel each other. Depending on which poles are facing</p>	<p><u><b>Forces</b></u></p> <p>Know that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.</p> <p>Know the effects of air resistance, water resistance and friction that act between moving surfaces.</p> <p>Know that some mechanisms, including pulleys and gears, allow a smaller force to have a greater effect,</p>
<p><b>Vocabulary</b></p>				<p>Force Magnets (bar, ring horseshoe) Attract Repel Strength Magnetic Surface Poles Push Pull Distance Direct contact Properties</p>	<p>Gravity Resistance Air resistance Water resistance Mechanisms Levers Pulleys Gears</p>
<p><b>Electricity</b></p>				<p>Know the names of common appliances that run on electricity</p> <p>Know what a circuit is</p> <p>Know the parts/components of a circuit</p> <p>Know what makes a circuit work</p> <p>Know how a switch works</p> <p>Know what conductors and insulators are</p>	<p>Know the number of cells and voltage in the circuit and how it is associated with the brightness of a lamp/bulb or the volume of a buzzer.</p> <p>Know how the use of switches affects a circuit</p> <p>Know the symbols in an electrical circuit diagram</p>

<b>Vocabulary</b>				Buzzer Insulator Electricity component	Cell Battery Lamp Switch Circuit Conductor Bulb Symbol Motor Copper Open Closed Series parallel	Voltage amp Transformer Filament Energy Current Resistance resistor			
<b>Light, Sound and Earth and Space</b>	Understand the effect of changing seasons on the natural world around them.	<p>To know the changes across the four seasons.</p> <p>To know which weather types are associated with the seasons and how the length of 'day' changes.</p> <p>To know how plants change across the four seasons and how some do not appear to change.</p>		<p><u>Light</u></p> <p>Know that light is needed in order to see things and that dark is the absence of light.</p> <p>Know that light is reflected from surfaces.</p> <p>Know that light from the sun can be dangerous and that there are ways to protect their eyes.</p> <p>Know that shadows are formed when the light source is blocked by a solid object.</p> <p>Know that there are patterns in the way that the size of shadows change</p> <p><u>Sound</u></p> <p>Know how sounds are made - vibrating.</p> <p>Know that vibrations need a medium to travel through to get to the ear.</p> <p>Know that different objects can produce a different pitch.</p> <p>Know that 'stronger' vibrations produce greater volume.</p> <p>Know that sound gets fainter as the distance from the source increases</p>	<p><u>Light</u></p> <p>Know that light appears to travel in straight lines.</p> <p>Know that light travels in straight lines and use this to explain that objects are seen because they give out or reflect light into the eye.</p> <p>Know that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.</p> <p>Know that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</p> <p><u>Earth and Space</u></p> <p>Know the movement of the Earth, and other planets, relative to the sun in the solar system.</p> <p>Know the movement of the moon relative to the Earth.</p> <p>Know the sun, Earth and moon are approximately spherical bodies.</p> <p>Know the Earth rotates</p> <p>Know night and day is caused by the Earth's rotation</p> <p>Know and name the planets in the solar system and their order from the sun</p>				
<b>Vocabulary</b>	Summer Day Spring Dark Autumn Light Winter Night Season Moon Sun	Autumn Spring Summer Winter Temperature Frost Storm Shadows Deciduous evergreen Sunburn Frostbite		Light Dark Shadow Reflect Light source Translucent Absence of light Bright Dul	Solid Block Mirror Reflective surface Transparent	Pitch Vibrations Medium Volume Conduct Vacuum Waves Faint Frequency Vibrate Insulate Particles	Sun Moon All planets of solar system Solar System Orbit Planets Spherical Rotate Axis star Tilt	Gravity Elliptical orbit Asteroid Eclipse Satellite Lunar Equator Northern and southern hemisphere poles	Reflect Direction Refraction Light spectrum Beam Lens Iris Retina Pupils



## Progression of Substantive Knowledge -Chemistry Strands

<b>Rocks</b>				<p>Know different kinds of rocks on the basis of their appearance and simple physical properties</p> <p>Know how fossils are formed when things that have lived are trapped within rock</p> <p>Know that soils are made from rocks and organic matter</p>			
<b>Vocabulary</b>				<p>Granite Chalk Limestone Organic Permeable Impermeable Fossils Sedimentary Rocks</p>	<p>Slate Marble Matter Property Formation Soil</p>		
<b>Materials and States of Matter</b>	<p>Explore materials with different properties.</p> <p>Explore natural materials, indoors and outside.</p> <p>Use all their senses in hands-on exploration of natural materials.</p> <p>Explore collections of materials with similar and/or different properties.</p> <p>Talk about the differences between materials and changes they notice.</p> <p>Explore the natural world around them.</p>	<p>Know differences between an object and the material from which it is made.</p> <p>Know and name a variety of materials: Wood, plastic, glass, metal, water, rock</p> <p>Know some simple physical properties of a variety of materials.</p> <p>Know how some materials have different properties to others.</p>	<p>Know that some materials are more suitable than others for specific uses.</p> <p>Know how the shape of some solid objects can be changed in different ways.</p>	<p>Know if an object is a solid, liquid or gases.</p> <p>Know the difference between solids, liquids and gases.</p> <p>Know that some materials change state when heated.</p> <p>Know the part played by evaporation and condensation in the water cycle</p>	<p>Know the similarities and differences between everyday objects and be able to group them based on their properties and results of testing.</p> <p>Know that some materials are more suitable for particular uses than others based on testing and conclusions.</p> <p>Know that some materials will dissolve in liquid to form a solution, and know how to recover a substance from a solution.</p> <p>Know how mixtures might be separated, including through filtering, sieving and evaporating.</p> <p>Know and explain the difference between reversible and irreversible changes.</p> <p>Know that dissolving, mixing and changes of state are reversible changes.</p> <p>Know that some changes result in the formation of new materials and that this kind of change is not usually reversible. E.g. burning or mixing acid with bicarb.</p>		
<b>Vocabulary</b>	<p>Material Wood Glass Paper hard soft</p>	<p>Wood Plastic Glass Paper Metal Rock Water properties Material Hard Soft Bendy Rough smooth</p>	<p>Waterproof Absorbent Opaque Transparent Brick Fabric Elastic foil Cardboard Stretchy Stiff Shiny Dull Squash Twisty stretchy</p>	<p>Temperature Celsius Compressibility Soluble Dissolve Humidity Condensation Evaporation Precipitation Weight</p>	<p>Mass Vapour Solid Liquid Gas Matter Mixture Climate pressure</p>	<p>Solubility Transparency Conductivity Filter Evaporation Dissolving Sieving Reversible/irreversible</p>	<p>Hardness Magnetic Mixing Liquid Solution melting</p>

Disciplinary Knowledge progression is outlined below. At Wansbeck Primary we aim to embed this within developing substantive knowledge. We aim to develop the knowledge of methods that scientists use to answer questions. This covers the diverse methods that scientists use to generate knowledge - we define this in 6 areas

- Asking Questions
- Identifying, Grouping and Classifying
- Pattern Seeking
- Comparative and Fair Testing
- Research
- Gathering, Recording and Communicating data

Disciplinary Knowledge - Progression of Working Scientifically				
National Curriculum Links	EYFS	Key Stage 1	Lower Key Stage 2	Upper Key Stage 2
		<ul style="list-style-type: none"> <li>• asking simple questions and recognising that they can be answered in different ways</li> <li>• observing closely, using simple equipment performing simple tests</li> <li>• <b>identifying and classifying</b></li> <li>• using their observations and ideas to suggest answers to questions</li> <li>• gathering and recording data to help in answering questions.</li> </ul>	<ul style="list-style-type: none"> <li>• asking relevant questions and using different types of scientific enquiries to answer them setting up simple practical enquiries, comparative and fair tests</li> <li>• making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers</li> <li>• gathering, recording, classifying and presenting data in a variety of ways to help in answering questions</li> <li>• recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables</li> <li>• reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions</li> <li>• using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions</li> <li>• identifying differences, similarities or changes related to simple scientific ideas and processes</li> <li>• using straightforward scientific evidence to answer questions or to support their findings.</li> </ul>	<ul style="list-style-type: none"> <li>• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>• making measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>• recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>• using test results to make predictions to set up further comparative and fair tests</li> <li>• 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</li> <li>• identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>
<b>Asking Questions</b>	Demonstrate curiosity about the world around them.	Explore the world around them and raise their own simple questions  Begin to recognise different ways in which they might answer scientific questions	Raise their own relevant questions about the world around them  Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions	Use their science experiences to explore ideas and raise different kinds of questions  Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions
<b>Identifying, Classifying and Grouping</b> <i>children identify features or tests that help them distinguish between different things enables children to learn the names of things, their characteristics, similarities and differences</i>	Identify simple features. Group objects using simple characteristic.	Use simple features to compare objects, materials and living things  With help, decide how to sort and group them (identifying and classifying)	Talk about criteria for grouping, sorting and classifying; and use simple keys	Use and develop keys and other information records to identify,  Classify and describe living things and materials, and identify patterns that might be found in the natural environment



<p><i>enables things to be grouped by observable features</i></p>		<p>Use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data</p>		
<p><b>Observing Over Time</b> <i>identify, observe or measure changes over time can take place over a span of time from minutes and hours to weeks and months enables children to identify a pattern that may emerge from observations facilitates making predictions based on these observations may involve understanding natural sequences and cycles</i></p>	<p>Talk about simple changes that happen over time - growth of chicks, changes in weather/ seasons, plant growth.</p>	<p>Observe closely using simple equipment  With help, observe changes over time  Use their observations and ideas to suggest answers to questions  Talk about what they have found out and how they found it out</p>	<p>Make systematic and careful observations  Help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used</p>	<p>Make their own decisions about what observations to make, what measurements to use and how long to make them for</p>
<p><b>Pattern Seeking</b> <i>children observe, measure and record events, systems or phenomena variables cannot be controlled survey or collect data from secondary sources identify relationships or patterns in observations or measurements can involve learning about causal relationships/cause and effect</i></p>	<p>Talk to an adult about what has been found out.</p>	<p>With guidance, they should begin to notice patterns and relationships</p>	<p>Begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them</p>	<p>Look for different causal relationships in their data and identify evidence that refutes or supports their ideas</p>
<p><b>Comparative and Fair Testing</b> <i>children identify the effect of changing one variable on another whilst attempting to keep other variables constant can be used for finding out about materials and physical phenomena because variables can be changed children need to decide how they will measure/ observe the effects and choose a suitable way to collect the data, but have control over all of the other variables to ensure a fair test</i></p>	<p>Watch and take part as a group in carrying out simple investigations.</p>	<p>Carry out simple tests</p>	<p>Set up simple practical enquiries, comparative and fair tests  Recognise when a simple fair test is necessary and help to decide how to set it up  Begin to understand that measurement involves some error and scientists put steps in place to reduce this</p>	<p>Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why  Understand that measurement involves some error and scientists put steps in place to reduce this</p>
<p><b>Research</b> <i>children use secondary sources of evidence often used when the question raised is impossible or unsafe for children to answer first hand enables children to compare and evaluate the information they gather from a range of sources enables children to see that questions don't always have definite answers</i></p>		<p>Ask people questions and use simple secondary sources to find answers  Use their research to suggest answers to questions Talk about what they have found out and how they found it out</p>	<p>Recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations</p>	<p>Recognise which secondary sources will be most useful to research their ideas.  Begin to separate opinion from fact</p>

**Gathering, Recording and Communicating data**

Talk to an adult about what has been found out.

Respond to prompts to say what happened to objects, living things or events.

With some support explain what they have seen occur.

Talk about what they have found out and what might happen next bases on their own experiences.

Use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data

Record simple data

Use their observations and ideas to suggest answers to questions

Talk about what they have found out and how they found it out

With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language

Take accurate measurements using standard units learn how to use a range of (new) equipment, such as data loggers / thermometers appropriately

Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys and help to make decisions about how to analyse this data

With help, pupils should look for changes, patterns, similarities, and differences in their data in order to draw simple conclusions and answer questions

Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusions

With support, they should identify new questions arising from the data, making predictions for new values within or beyond the data they have collected and finding ways of improving what they have already done.

Choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately. Take repeat measurements

Decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs

Identify scientific evidence that has been used to support or refute ideas or arguments

Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas, use oral and written forms such as displays and other presentations to report conclusions, causal relationships, and explanations of degree of trust in results

Use their results to make predictions and identify when further observations, comparative and fair tests might be needed