

## Science at Angel Oak Academy

Our science curriculum covers the disciplines of biology, chemistry and physics, and it exceeds the breadth of the National Curriculum. Science at Angel Oak Academy prioritises pupils becoming secure in the substantive concepts before their understanding is developed further through scientific enquiry (or disciplinary knowledge). The sequence of knowledge has been carefully ordered to allow pupils to build on existing schemas, and pupils are provided with regular opportunities for spaced retrieval to ensure the knowledge is retained in their long-term memory.

## Science Key Learning Indicators

Year		Units					
R	Declarative Knowledge	<b>Living Things</b> Name and describe some familiar plants and animals. Understand what seeds need to grow and what plants need to stay healthy. Understand the key features of the life cycle of a plant and an animal.	<b>The Natural World</b> Observe animals and plants in the natural world around them. Discuss how we care for the natural world around us. Observe and interact with natural processes, such as ice melting, a sound causing a vibration, light travelling through transparent material, an object casting a shadow, a magnet attracting an object and a boat floating on water.	<b>Materials</b> Explore natural materials with different sounds, textures, smells and tastes using their senses Explore collections of materials with similar and different properties	<b>Changing States</b> Talk about the differences between materials and changes they notice. Observe how one material can be changed from one state into another (melting, cooking).	<b>Seasons</b> Understand the weather and seasonal features. Observe how animals behave differently as the seasons change.	<b>Forces</b> Explore and talk about different forces they can feel (stretch of an elastic band, the snap of a twig) Explore how things work such as wind-up toys, pulleys, sets of cogs with pegs and boards.
	Working Scientifically	Observe the growth and decay of a living thing over time (plant or apple core).	Make observational drawings of plants and animals in their natural habitat, shadows formed on the playground or a boat floating on water.	Ask questions about materials and explain why their properties are different	Ask questions about how one material can change from one state into another. Make observational drawings when a material has changed from one state into another.	Provide opportunities for children to note and record the weather.	Observe and explain how an object can be changed if a force is acted upon it.
1	Declarative Knowledge	<b>Humans</b> Identify, name and label the basic parts of the human body (head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) Say which part of the body is associated with each sense	<b>Animals</b> Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals Label different features of fish, amphibians, reptiles, birds and mammals Identify and name a variety of common animals that are carnivores, herbivores and omnivores Scientist: Carl Linnaeus	<b>Plants</b> Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees Identify and describe the basic structure of a variety of common flowering plants, including trees	<b>Seasons and Weather</b> Observe changes across the four seasons Identify the four seasons Describe characteristic local weather patterns during the different seasons Describe how day length varies Scientist: Daniel Fahrenheit	<b>Materials</b> Distinguish between an object and the material from which it is made Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock Describe the simple physical properties of a variety of everyday materials Compare and group together a variety of everyday materials based on their simple physical properties	<b>Taking care of the Earth</b> Identify what makes up our environment Describe how land and water pollution is harmful Identify how we can take care of the Earth through reducing, reusing and recycling
	Working Scientifically	Ask questions about the human body Label diagrams of the human body	Label features of animals Look for patterns in animal groups Sort animals based on observable features Record sorting in tables or sorting circles Identify similarities and differences and use scientific vocabulary to talk about them	Ask questions about plants Look for patterns in plants Classify plants based on their features Record observations in words or pictures Draw comparisons between features of plants	Ask questions about how things change across the seasons Record observations in words or pictures or in simple prepared formats such as tables and or charts Sequence the changes across the four seasons Use scientific vocabulary to discuss the changes across the four seasons	Ask questions about how and why materials and objects are similar or different Sort materials based on observable features Record sorting in tables or sorting circles Identify similarities and differences and use scientific vocabulary to talk about them	With help, make suggestions about how to find things out Use simple books and electronic media to find things out and record in words and pictures Use scientific language to talk about what was learnt from research



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Declarative Knowledge

### Humans

Know that humans, have offspring which grow into adults

Describe the basic needs of animals for survival (water, food and air)

Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene

Scientist: Louis Pasteur, Edward Jenner

### Habitats

Compare things that are alive, once alive and never alive

Describe how living things are suited to their habitats and how plants and animals in them depend on each other

Identify and name a variety of plants and animals in their habitats/microhabitats

Describe how animals obtain their food from plants and other animals; use the idea of a simple food chains

### Plants

Observe and describe how seeds and bulbs grow into mature plants

Find out and describe how plants need water, light, air, nutrients, space and a suitable temperature to grow and stay healthy

Recognise how the requirements for survival are different for different plants

### Materials

Identify and compare the suitability of a variety of everyday materials, including wood, plastic, metal, glass, brick, rock, paper and cardboard for particular uses

Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching

Scientist: Charles Mackintosh

Working Scientifically

Ask questions about exercise, nutrition and hygiene

With help, make suggestions about how to find things out

Use simple books and electronic media to find out about the importance of exercise, nutrition and hygiene; and record findings in words

Use scientific language to talk about what you have found out and give an opinion

Talk about whether the information source was useful

Sort objects and living things based on observable features

Record sorting in tables or sorting circles

Research different food chains and record in a scientific diagram

Use scientific language to talk about similarities and differences between food chains

Ask questions about why and how a plant's life cycle works

With help, identify simple variables to change and measure

Make a simple prediction based on something they have observed before

Record findings in words or pictures, or in simple prepared formats such as tables or tally charts

Use scientific language to identify and describe simple causal relationships

Say if the relationship was as expected

Sort objects and materials by observable and behavioural features

Ask questions about why materials are used for different objects

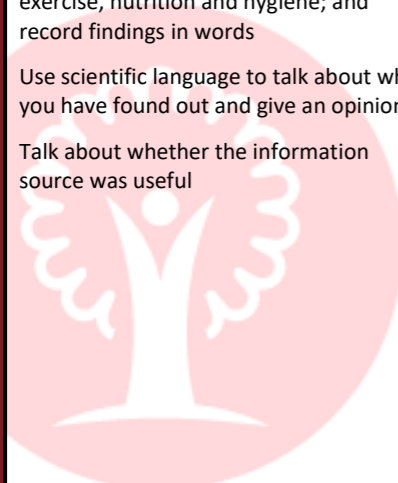
With help, decide what patterns to observe and measure and suggest how to do it

Make a simple prediction based on something they have observed before

Use non-standard units and simple equipment to record events that might be related

Record in words or pictures, or in simple prepared formats such as tables, tally charts and maps

Identify simple patterns; use scientific language to talk about them and whether the pattern was expected





3	Declarative Knowledge	<p><b>Humans</b></p> <p>Identify that animals need the right types and amounts of nutrition; they cannot make their own food – they get nutrition from what they eat</p> <p>Identify that humans and some other animals have skeletons and muscles for support, protection and movement</p>	<p><b>Classification</b></p> <p>Recognise that living things can be grouped in a variety of ways</p> <p>Explore and use classification keys to group, identify and name a variety of living things in the local and wider environment</p> <p>Scientist: Carl Linnaeus</p>	<p><b>Plants</b></p> <p>Identify and describe the functions of different parts of a plant: root, stem/trunk, flowers, leaves</p> <p>Investigate how water is transported in plants</p> <p>Explore the part flowers play in plant life cycles, including pollination, seed formation and seed dispersal</p>	<p><b>Light</b></p> <p>Recognise we need light to see and dark is the absence of light</p> <p>Notice that light is reflected from surfaces</p> <p>Recognise that light from the sun can be dangerous and the need to protect their eyes</p> <p>Recognise that shadows are formed when light from a source is blocked; identify patterns in how the size of a shadow changes</p>	<p><b>Rocks</b></p> <p>To understand the processes involved in the formation of sedimentary, metamorphic and igneous rocks</p> <p>Recognise the difference between hard and soft rocks</p> <p>Describe in simple terms how fossils are formed when things that have lived are trapped within rock</p> <p>Recognise that soils are made from rocks and organic matter</p> <p>Scientist: Mary Anning</p>	<p><b>Magnets</b></p> <p>Notice that magnetic force can act at a distance</p> <p>Observe how magnets attract or repel each other and attract some materials and repel others</p> <p>Compare and group materials according to if they are magnetic</p> <p>Describe magnets as having two poles and use this to predict if they will attract or repel</p>
		Working Scientifically	<p>Decide when questions can be answered by research using secondary sources</p> <p>Use information sources to find information about nutrition, skeletons or muscles and record findings in their own words</p> <p>Use findings to draw conclusions using scientific language</p>	<p>Formulate a scientific question that could be answered using sorting and classifying</p> <p>Discuss the criteria that could be used to sort and classify living things and decide what equipment to use</p> <p>Carry out simple tests to sort and classify according to properties or behaviour</p> <p>Use Carroll diagrams, Venn diagrams tables and simple classification keys to sort living things</p> <p>Draw simple conclusions about living things that have been sorted and classified</p> <p>Discuss the similarities and differences identified using scientific language</p> <p>Suggest improvements to the way living things are sorted and classified</p>	<p>Discuss transport of water in plants; and decide when questions can be answered by observing over time</p> <p>Decide what observations to make, how often and what equipment to use</p> <p>Predict outcomes using previous experience and knowledge</p> <p>Use a range of equipment to collect data using standard measures and record using tables</p> <p>Draw simple conclusions from the changes observed using scientific language; and suggest improvements to the ways observed</p> <p>Talk about where patterns may be found in the structure of flowers; and decide when questions can be answered by pattern seeking</p> <p>Decide on what observations to make and what equipment to use</p> <p>Use a range of equipment to collect data using standard measures</p> <p>Draw conclusions about simple patterns between two sets of data using scientific language; and suggest improvements in the approach to pattern seeking</p>	<p>Discuss where patterns may be found in the size of shadows; and decide which questions can be answered by pattern seeking</p> <p>Decide on which sets of data to collect, what observations to make and what equipment to use</p> <p>Predict outcomes using previous experience and knowledge</p> <p>Use a range of equipment to collect data using standard measures</p> <p>Make records using tables and bar charts</p> <p>Draw conclusions about simple patterns between two sets of data using scientific language; and suggest improvements to the way to look for patterns</p>	<p>Discuss links between cause and effect, and with help, pose a fair test question to investigate the properties of rocks</p> <p>Decide what data to collect, what equipment to use and how to make observations</p> <p>Predict outcomes using previous experience and knowledge</p> <p>Use a range of equipment to collect data using standard measures and record in tables</p> <p>Draw simple conclusions from the fair test using scientific language; and suggest ways to improve fair tests</p>

4	Declarative Knowledge	<b>Humans</b> Describe the simple functions of the basic parts of the digestive system in humans  Identify the different types of teeth in humans and their function	<b>Habitats</b> Construct and interpret a range of food chains; identify producers, predators, prey  Recognise that environments can change and that this can sometimes pose dangers to living things	<b>States of matter</b> Recognise the particle structure and behaviour of solids, liquids and gases  Compare and group materials according to whether they are solid, liquid or gas  Observe that some materials change state when they are heated or cooled and measure the temperatures at which these changes happen  Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	<b>Electricity</b> Identify common appliances that run on electricity  Construct a simple series circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers  Recognise that a component will only work if the circuit is complete  Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit  Identify common conductors and insulators  Scientist: Humphrey Davy and Thomas Edison	<b>Materials</b> Compare and group properties on the basis of their properties (hardness, transparency, magnetism and conductivity – electrical and thermal)  Give reasons for particular uses of materials	<b>Sound</b> Identify how sounds are made  Recognise that vibrations from sounds travel through a medium to the ear  Find patterns between the pitch of a sound and the features of the object that produced it  Find patterns between the volume of a sound and the strength of the vibrations  Recognise that sounds get fainter as the distance from the source increases
		Working Scientifically	Decide when questions about teeth or the digestive system can be answered by research using secondary sources  Use information sources to find the information needed and record findings in their own words  Use findings to draw conclusions using scientific language; and suggest ways to improve how to find out and use information	Research different food chains and record in a correctly labelled scientific diagram  Use scientific language to talk about similarities and differences between food chains	Discuss links between cause and effect and with help pose a fair test question about melting or evaporation  Help to plan a fair test by deciding what data to collect, what equipment to use and how to record it  Predict outcomes using previous experience and knowledge and compare with actual results  Use a range of equipment to collect data using standard measures and record using tables and bar charts  Draw simple conclusions from fair tests and explain causal relationships using scientific language  Suggest ways to improve fair tests	Record electrical circuits in a correctly labelled scientific diagram  Discuss links between cause and effect and with help pose a fair test question about electrical conductors  Help to plan a fair test by deciding what data to collect, what equipment to use and how to record it  Predict outcomes using previous experience and knowledge and compare with actual results  Use a range of equipment to collect data using standard measures and record using tables and simple scatter graphs  Draw simple conclusions from fair tests and explain causal relationships using scientific language  Suggest ways to improve fair tests	Formulate a scientific question that could be answered using sorting and classifying  Discuss the criteria that could be used to sort and classify materials and decide what equipment to use  Carry out simple tests to sort and classify according to properties or behaviour  Use Carroll diagrams, Venn diagrams tables and simple classification keys to sort materials  Draw simple conclusions about materials that have been sorted and classified  Discuss the similarities and differences identified using scientific language  Suggest improvements to the way materials are sorted and classified





5	Declarative Knowledge	<p><b>Humans</b></p> <p>Describe the life cycle of a human</p> <p>Describe the changes as humans develop from babies to old age (including puberty)</p> <p>Recognise that gestation periods vary in different animals</p>	<p><b>Living things</b></p> <p>Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</p> <p>Describe the process of asexual and sexual reproduction in some plants and animals</p> <p>Scientist: David Attenborough</p>	<p><b>Light</b></p> <p>Recognise that light travels in straight lines and that we see things when objects give out or reflect light into the eye</p> <p>Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then our eyes</p> <p>Use the idea that light travels in straight lines to explain the shapes of shadows</p>	<p><b>Earth and space</b></p> <p>Describe the movement of the Earth and other planets relative to the Sun in the solar system</p> <p>Describe the movement of the moon relative to earth</p> <p>Describe the Sun, Earth and Moon as approximately spherical bodies</p> <p>Use the idea of the earth's rotation to explain day and night and the apparent movement of the sun across the sky</p> <p>Scientist: Galileo Galilei</p>	<p><b>Materials</b></p> <p>Know that some materials will dissolve and describe how to recover them from a solution</p> <p>Use knowledge of solids, liquids and gases to separate mixtures of materials</p> <p>Demonstrate that dissolving, mixing and changes of state are reversible</p> <p>Explain that some changes are irreversible and result in the formation of new materials</p>	<p><b>Forces</b></p> <p>Recognise the relationship between forces and movement</p> <p>Identify the effects of air resistance, water resistance and friction, that act between moving surfaces</p> <p>Explain that unsupported objects fall to earth because of the force of gravity acting between the Earth and the object.</p> <p>Recognise that levers, pulleys and gears allow a smaller force to have a greater effect</p> <p>Scientists: Isaac Newton, Galileo Galilei</p>
	Working Scientifically	<p>Recognise when pattern seeking will help to answer questions about gestation periods</p> <p>Decide what data to collect</p> <p>Make predictions based on their scientific knowledge and understanding, and compare prediction with actual results</p> <p>Record data appropriately and accurately</p> <p>Present data in scatter graphs</p> <p>Recognise patterns in results</p> <p>Recognise the effect of sample size on reliability</p> <p>Recognise the significance of relationships between sets of data</p> <p>Draw valid conclusions from data about patterns and recognise their limitations</p>	<p>Recognise when research using secondary sources will help to answer questions about life cycles; and decide what sources of information might answer questions</p> <p>Use relevant information and data from a range of secondary sources</p> <p>Recognise how data has been obtained; and start to notice when information or data is biased or based on opinions rather than facts</p> <p>Present findings in suitable formats</p> <p>Draw valid conclusions from own research using scientific language</p> <p>Evaluate how well research has answered the question; and recognise that some scientific questions may not have been answered definitively</p>	<p>Draw a correctly labelled scientific diagram to represent light travelling</p> <p>Recognise when variables need to be controlled and when a fair test is the best way to answer a question about angles of reflected light</p> <p>Plan a fair test selecting the most suitable variables to measure, change and keep the same</p> <p>Decide what equipment to use to make measurements as accurate as possible</p> <p>Make predictions based on their scientific knowledge and understanding, and compare prediction with actual results</p> <p>Use equipment accurately to collect observations and record data appropriately and accurately</p> <p>Present data in line graphs</p> <p>Identify, discuss and explain causal relationships using scientific language</p> <p>Evaluate the effectiveness of fair testing, recognising variables that were difficult to control.</p>	<p>Recognise when observing changes over time will help to answer questions about how shadows change across the day</p> <p>Decide how detailed observations need to be and what equipment to use to make measurements as accurate as possible</p> <p>Make predictions based on their scientific knowledge and understanding, and compare prediction with actual results</p> <p>Use equipment accurately without support</p> <p>Record data appropriately and present data in line graphs</p> <p>Interpret changes in the data</p> <p>Recognise the effect of changing the time and number of observations</p> <p>Draw valid conclusions from data about changes in shadows using scientific language</p> <p>Evaluate how observations could be improved</p>	<p>Recognise when identifying and classifying will be helpful to answer questions about dissolving</p> <p>Decide what equipment and tests to use to identify and classify things</p> <p>Use a series of tests to sort and classify materials and use equipment accurately to collect observations</p> <p>Draw valid conclusions using scientific language when sorting and classifying materials</p> <p>Evaluate the method taken and offer suggestions to improve</p>	<p>Recognise when variables need to be controlled and when a fair test is the best way to answer a question about parachute size and air resistance</p> <p>Plan a fair test selecting the most suitable variables to measure, change and keep the same</p> <p>Decide what equipment to use to make measurements as accurate as possible</p> <p>Make predictions based on their scientific knowledge and understanding, and compare prediction with actual results</p> <p>Use equipment accurately to collect observations and record data appropriately and accurately</p> <p>Present data in line graphs</p> <p>Identify, discuss and explain causal relationships using scientific language</p> <p>Evaluate the effectiveness of fair testing, recognising variables that were difficult to control</p>

6	Declarative Knowledge	<b>Humans</b> Identify and name the main parts of the circulatory system and describe their functions Recognise the impact of diet, exercise, drugs and lifestyle on body function Describe how nutrients and water are transported within animals including humans	<b>Classification</b> Describe how living things are classified into groups according to observable characteristics based on similarities and differences, including micro-organisms, plants and animals Give reasons for classifying plants and animals based on specific characteristics Scientist: Carl Linnaeus, Louis Pasteur	<b>Evolution and Inheritance</b> Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago Recognise that offspring vary from and are not identical to their parents Identify how animals and plants are adapted to suit their environment and that this may lead to evolution Scientists: Charles Darwin, Mary Anning	<b>Electricity</b> Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit Compare and give reasons for variations in how components function Use recognised symbols in simple circuit diagrams Scientist: Benjamin Franklin		
		Working Scientifically	Recognise when variables need to be controlled and when a fair test is the best way to answer a question about heart rate Plan a fair test selecting the most suitable variables to measure, change and keep the same Decide what equipment to use to make measurements as accurate as possible Make predictions based on their scientific knowledge and understanding, and compare prediction with actual results Use equipment accurately to collect observations and record data appropriately and accurately Present data in line graphs Identify, discuss and explain causal relationships using scientific language Evaluate the effectiveness of fair testing, recognising variables that were difficult to control	Recognise when identifying and classifying will be helpful to answer questions about living things Decide what equipment, tests and secondary sources of information to use to identify and classify things Use secondary sources to identify and classify things Make own keys and branching data bases with 4 or more items Draw valid conclusions when sorting and classifying Recognise the significance of sorting and classifying Evaluate how well the keys have worked	Recognise when research using secondary sources will help to answer questions about the evolution of Darwin's finches; and decide what sources of information might answer questions Use relevant information and data from a range of secondary sources Recognise how data has been obtained; and start to notice when information or data is biased or based on opinions rather than facts Present findings in suitable formats Draw valid conclusions from own research using scientific language Evaluate how well research has answered the question; and recognise that some scientific questions may not have been answered definitively	Record electrical circuits in a correctly labelled scientific diagram Recognise when variables need to be controlled and when a fair test is the best way to answer a question about voltage how buzzer volume Plan a fair test selecting the most suitable variables to measure, change and keep the same Decide what equipment to use to make measurements as accurate as possible Make predictions based on their scientific knowledge and understanding, and compare prediction with actual results Use equipment accurately to collect observations and record data appropriately and accurately Present data in line graphs Identify, discuss and explain causal relationships using scientific language Evaluate the effectiveness of fair testing, recognising variables that were difficult to control	

Biology
Physics
Chemistry
Meteorology
Environmental Science