

ACE Science Curriculum

Intent

At Altrincham CE Primary School, we believe that all children should know what it means to be a scientist by being immersed and inspired by science. Science has changed our lives and is vital to the world's future prosperity. We offer a high-quality science education that will ignite pupils' curiosity and fascination about the world around them. It is our intent that we inspire children to love science and carry this with them into further education and future careers. All pupils should be taught essential knowledge, methods, processes and uses of science within the foundations of biology, chemistry and physics.

Purpose (the reason it is taught)

At ACE, we recognise the importance of all pupils being taught **essential knowledge**, **methods**, **processes** and **uses** of science within the foundations of biology, physics and chemistry. Children immerse themselves in a **rich scientific vocabulary** and **broad concepts**, promoting a deeper, conceptual understanding.

As pupils progress, they are enabled to recognise the power of **rational explanation** as well as developing a **sense of excitement** and **curiosity** about natural phenomena.

Scientific knowledge, **understanding** and **skills** provide the frameworks for **explaining** what is occurring, **predicting** how things will behave and **analyse** causes. Our children are encouraged to **ask questions** and **discover answers**.

We set this learning in the context of our Christian, church school heritage. We encourage children to appreciate, interpret and question the moral merit of human and physical processes in the light of our values framework.

Aims (desired outcomes)

- **Thinking independently** and **raising questions** about working scientifically and **understanding** the knowledge and skills that questioning brings.
- **Confidence** and **competence** in the full range of practical skills, taking the **initiative** in, for example, planning and carrying out scientific investigations.

- Excellent **scientific knowledge** and **understanding** which is demonstrated in **written and verbal explanations, solving** challenging problems and **reporting** scientific findings.
- High levels of **originality, imagination** and **innovation** in the **application** of skills.
- Undertaking **practical work** in a variety of context, **including fieldwork**.
- A **passion** for science and its **application** in past, present and future technologies.
- Utilising opportunities outside the classroom including home learning and **real life experiences to enrich experiences** and to **learn about science in an active and creative way**.
- Ensure learning without limits, **making cross-curricular links to secure application and mastery**
- **Ensure continuity and progression across key stages**, recognising science as an **enquiry** with a focus on skills and deepening knowledge and understanding, supported by robust assessment.
- Encourage **inference, the ability to use high-order vocabulary, questioning, curiosity and communication**.
- **Understand** key scientific **threshold concepts** and use them to make **connections, draw contrasts** and **analyse causes**.

These are:

- **Working scientifically** –the understanding of the nature, processes and methods of science

Biology

- **Understanding plants** - becoming familiar with different types of plants, their structure and reproduction.
- **Understanding animals and humans** – understanding the needs of animals for survival as well as the processes of reproduction and growth.
- **Investigating living things** - becoming familiar with a wide range of living things, including insects and understanding life processes.
- **Understanding evolution and inheritance** - understanding that organisms come into existence, adapt, change and evolve and become extinct

Chemistry

- **Investigating materials** - Becoming familiar with a range of materials, their properties, uses and how they may be altered or changed.

Physics

- **Understanding movement, forces and magnets** - Understanding what causes motion.
- **Understanding light and seeing** - Understanding how light and reflection affect sight.
- **Investigating sound and hearing** - Understanding how sound is produced and how it travels and how it is heard.
- **Understanding electrical circuits** - Understanding circuits and their role in electrical applications.
- **Understanding the Earth's movement in space** - Understanding what causes seasonal changes, day and night.

These threshold concepts ensure coverage of the key scientific concepts laid down in the National Curriculum:

The science curriculum at ACE is carefully planned and structured to ensure that current learning is linked to previous learning and the school's approaches are informed by current pedagogy.

We use Milestones to inform our assessment.

Milestones are the goals the children are aiming for and this is how they equate to the different year groups across school:

<u>Milestone 1</u>	<u>Years 1 and 2</u>
<u>Milestone 2</u>	<u>Years 3 and 4</u>
<u>Milestone 3</u>	<u>Years 5 and 6</u>

Science is taught in blocks throughout the year, so that children achieve depth in their learning. Teachers have identified the key knowledge and skills of each topic and consideration has been given to ensure progression and continuity across topics throughout each year group across the school. Topics and skills are 'interleaved' so that children revisit skills and knowledge in different contexts and are able to make links which result in 'big picture' learning and 'sticky knowledge'.

Each unit of work has a series of POP tasks. POP is an acronym of Proof of Progress. POP tasks further deepen learning and understanding by gradually changing the nature. POP tasks are categorised into three cognitive domains: basic, advancing and deep. In the first year of a milestone, children will experience basic tasks which will progress to advancing and deeper tasks into the second year of the milestone as the learning schema gets stronger.

Knowledge Webs and Pop Tasks Milestone 1

Knowledge Webs and Pop Tasks Milestone 2

Knowledge Webs and Pop Tasks Milestone 3

Conscious Connections

Making connections between science and other subject areas means that pupils can benefit from more connected learning experiences and a large amount of curriculum time is saved. Cross curricular outcomes in science are specifically planned for, with strong links between the science curriculum, geography, design and technology, physical education, PSHE, music, mathematics and English lessons enabling further contextual learning.

Learning walls specific to science themes are used in lessons to highlight key knowledge and vocabulary. Both fiction and non-fiction texts are used to develop children's scientific understanding and links to our text rich English curriculum.

The local area is also fully utilised to achieve the desired outcomes, with extensive opportunities for learning outside the classroom embedded in practice. Planning is informed by and aligned with the National Curriculum. In addition, staff have access to The Essentials Curriculum (Chris Quigley) plans and resources, however, teachers lesson design is not limited by this and is informed by national agencies, including the Science Association, of which the school is a member. Consideration is given to how greater depth will be taught, learnt and demonstrated within each lesson, as well as how learners will be supported in line with the school's commitment to inclusion. Outcomes of work are regularly monitored to ensure that they reflect a sound understanding of the key identified knowledge and skills.

The Early Years Foundation Stage (EYFS) follows the 'Development Matters in the EYFS' guidance which aims for all children in reception to have an 'Understanding of the World; people and communities, the world and technology' by the end of the academic year.

Threshold Concepts (the big ideas we want our children to learn that tie together the subject topics into a meaningful long term learning structure).

Progression of Threshold Concepts in Science

Biology	<u>Milestone 1</u>	<u>Milestone 2</u>	<u>Milestone 3</u>
Understanding plants	<ul style="list-style-type: none"> Identify and name a variety of common plants, including garden plants, wild plants and trees and those classified as deciduous and evergreen. Identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers. Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. 	<ul style="list-style-type: none"> Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers. Explore the requirements of plants for life and growth (air, light, water, nutrients from soil and room to grow) and how they vary from plant to plant. Investigate the way in which water is transported within plants. Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. 	<ul style="list-style-type: none"> Relate knowledge of plants to studies of evolution and inheritance. Relate knowledge of plants to studies of all living things.
Understanding animals and humans	<ul style="list-style-type: none"> Identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles, mammals, and invertebrates, including pets). Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. 	<ul style="list-style-type: none"> Identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition from what they eat. Construct and interpret a variety of food chains, identifying producers, predators and prey. Identify that humans and some animals have skeletons and muscles for support, protection and movement. Describe the simple functions of the basic parts of the digestive system in humans. Identify the different types of teeth in humans and their simple functions 	<ul style="list-style-type: none"> Describe the changes as human and develop to old age. Identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood. Recognise the importance of diet, exercise, drugs and lifestyle on the way the human body functions. Describe the ways in which nutrients and water are transported within animals, including humans.

	<ul style="list-style-type: none"> • Notice that animals, including humans, have offspring which grow into adults. • Investigate and describe the basic needs of animals, including humans, for survival. • Describe the importance for humans of exercise, eating the right amounts of different types of food and hygiene. 		
Investigating living things	<ul style="list-style-type: none"> • Explore and compare the differences between things that are living, that are dead and that have never been alive. • Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants and how they depend on each other. • Identify and name a variety of plants and animals in their habitats, including microhabitats. • Describe 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. 	<ul style="list-style-type: none"> • Recognise that living things can be grouped in different ways. • Explore and use classification keys. • Recognise that environments can change and that this can sometimes pose dangers to specific habitats. 	<ul style="list-style-type: none"> • Describe the differences in the life cycle of a mammal, an amphibian, an insect and a bird. • Describe the life processes of reproduction in some plants and animals. • Describe how living things are classified into broad groups according to common, observable characteristics. • Give reasons for classifying plants and animals based on specific characteristics.
Understanding evolution and inheritance	<ul style="list-style-type: none"> • Identify how humans resemble their parents in many features. 	<ul style="list-style-type: none"> • Identify how plants and animals, including humans, resemble their parents in many features. • Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. 	<ul style="list-style-type: none"> • 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 living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.

		<ul style="list-style-type: none"> Identify how animals and plants are suited to and adapt to their environment in different ways. 	<ul style="list-style-type: none"> Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
Chemistry	<u>Milestone 1</u>	<u>Milestone 2</u>	<u>Milestone 3</u>
Investigate materials	<ul style="list-style-type: none"> 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 on the basis of their simple properties. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and sketching. Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock and paper/cardboard for particular uses. 	<p>Rocks and Soils</p> <ul style="list-style-type: none"> Compare and group together different kinds of rocks on the basis of their simple, physical properties. Relate the simple physical properties of some rocks to their formation (igneous or sedimentary). Describe in simple terms how fossils are formed when things that have lived are trapped within sedimentary rock. Recognise that soils are made from rocks and organic matter. <p>States of Matter</p> <ul style="list-style-type: none"> Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when they are heated or cooled, and measure the temperature at which this happens in degrees Celsius, building on their teaching in mathematics. Identify the part played by evaporation and condensation in the water cycle and associate the rates of evaporation with temperature. 	<ul style="list-style-type: none"> Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets. Understand how some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Demonstrate that dissolving, mixing and changes of state are reversible changes. Explain that some changes result in the formation of new materials and that this kind of change is not usually reversible. Including changes associated with burning, oxidation and the action of acid on bicarbonate of soda.
Physics	<u>Milestone 1</u>	<u>Milestone 2</u>	<u>Milestone 3</u>
Understand movement, forces and magnets.	<ul style="list-style-type: none"> Notice and describe how things move, using simple comparisons such as faster and slower. Compare how different things move. 	<ul style="list-style-type: none"> Compare how things move on different surfaces. Notice that some forces need contact between two objects, but magnetic forces can act at a distance. 	<p>Magnets</p> <ul style="list-style-type: none"> Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing.

		<ul style="list-style-type: none"> • Observe how magnets attract or repel each other and attract some materials and not others. • Compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet and identify some magnetic materials. • Describe magnets as having two poles. • Predict whether two magnets will attract or repel each other, depending on which poles are facing. 	Forces <ul style="list-style-type: none"> • Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. • Identify the effect of drag forces, such as air resistance, water resistance and friction that act between moving surfaces. • Describe in terms of drag forces, why moving objects that are not driven tend to slow down. • Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs. • Understand that some mechanisms including levers. Pulleys and gears, allow a smaller force to have a greater effect.
Understanding light and seeing	<ul style="list-style-type: none"> • Observe and name a variety of sources of light, including electric lights, flames and the sun, explaining that we see things because light travels from them to our eyes. 	<ul style="list-style-type: none"> • Recognise that they need light in order to see things and that dark is the absence of light. • Notice that light is reflected from surfaces. • Recognise that light from the sun can be dangerous and that there are ways to protect their eyes. • Recognise that shadows are formed when the light from a source is blocked by a solid object. • Find patterns in the way that the size of shadows change. 	<ul style="list-style-type: none"> • Understand that light appears to travel in straight lines. • Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eyes. • Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them and to predict the size of shadows when the position of the light source changes. • Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
Investigate sound and hearing	<ul style="list-style-type: none"> • Observe and name a variety of sources of sound, noticing that we hear with our ears. 	<ul style="list-style-type: none"> • Identify how sounds are made, associating some of them with something vibrating. 	<ul style="list-style-type: none"> • Find patterns between the pitch of a sound and features of the object that produced it.

		<ul style="list-style-type: none"> Recognise that vibrations from sounds travel through a medium to the ear. 	<ul style="list-style-type: none"> Find patterns between the volume of a sound and the strength of the vibrations that produced it. Recognise that sounds get fainter as the distance from the sound sources increases.
Understand electrical circuits	<ul style="list-style-type: none"> Identify common appliances that run on electricity. Construct a simple series electrical circuit. 	<ul style="list-style-type: none"> Identify common appliances that run on electricity. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. Recognise some common conductors and insulators and associate metals with being good conductors. 	<ul style="list-style-type: none"> 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, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches. Use recognised symbols when representing a simple circuit in a diagram.
Understand the Earth's movement in space	<ul style="list-style-type: none"> Observe the apparent movement of the sun during the day. Observe changes across the four seasons. Observe and describe weather associated with the seasons and how day length varies. 	<ul style="list-style-type: none"> Describe the movement of the Earth relative to the Sun in the solar system. Describe the movement of the Moon relative to the Earth. 	<ul style="list-style-type: none"> Describe the movement of the Earth and other planets, relative to the Sun in the solar system. Describe the movement of the Moon relative to the Earth. Describe the Sun, Earth and Moon as approximately spherical bodies. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

Items highlighted are not statutory in the English National Curriculum.

Skills (the ability to do something well; expertise)

All of the POP tasks – Planning for and assessing progress, involve one or more of the ‘working scientifically’ objectives of the National Curriculum.

Key ‘Working Scientifically Skills’ and Progression

	<u>EYFS</u>	<u>Milestone 1 Years 1 and 2</u>	<u>Milestone 2 Years 3 and 4</u>	<u>Milestone 3 Years 5 and 6</u>
Work scientifically	<ul style="list-style-type: none">• Showing curiosity, energy and fascination about objects, events and people.• Using senses to explore the world around them.• Paying attention to details.• Thinking of ideas and ways to solve problems.• Making links and noticing patterns in their experience.• Beginning to make predictions and test ideas.	<ul style="list-style-type: none">• Ask simple questions.• Observe closely, using simple equipment.• Perform simple tests.• Identify and classify.• Use observations and ideas to suggest answers to questions.• Gather and record data to help in answering questions.	<ul style="list-style-type: none">• Ask relevant questions.• Set up simple, practical enquiries and comparative and fair tests.• Make accurate measurements using standard units, using a range of equipment e.g. thermometers and data loggers.• Gather, record, classify and present data in a variety of ways to help in answering questions.• Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables.• Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.• Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests.• Identify differences, similarities or changes related to simple, scientific ideas and processes.	<ul style="list-style-type: none">• Plan enquiries, including recognising and controlling variables where necessary.• Use appropriate techniques, apparatus and materials during fieldwork and laboratory work.• Take measurements using a range of scientific equipment, with increasing accuracy and precision.• Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs and models.• Report findings from enquiries including oral and written explanations of results, explanations involving causal relationships and conclusions.• Present findings in written form, displays and other presentations.• Use test results to make predictions to set up further comparative and fair tests.• Use simple models to describe scientific ideas, identifying scientific evidence that has

			<ul style="list-style-type: none">• Use straightforward, scientific evidence to answer questions or to support their findings.	been used to support or refute ideas or arguments.
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Some of the higher order 'working scientifically' objectives are embedded in the advancing and deep tasks which are suggested for the second phase of each milestone.

Science Units of work

EYFS	Aspects of scientific understanding and exploration appear through these six themes throughout the EYFS curriculum and are guided by the Early Learning Goals.					
	<u>Marvellous Me</u> Seasons - Autumn Harvest Ourselves Parts of our bodies Senses	<u>Colours and Celebrations</u> Planting spring bulbs What colours are in a rainbow? Light and Dark Day and Night Nocturnal and diurnal animals Materials	<u>Surviving Winter</u> Seasons- Winter Polar animals Birds in Winter Bird Watching Winter clothing	<u>Growing</u> Seasons- Spring New life and stages of growth Life cycles Grow cress plants	<u>Journeys</u> Seasons- Summer Space facts Minibeast hunting in outdoor area	<u>Farm and Zoo Animals</u> Seasons- Summer Summer Animals and habitats

Milestone 1 Years 1/2	Continuous Provision – Understand the Earth’s Movement in Space (Seasons and Weather), Electric circuits, Light and Sound, Forces through STEM		
Cycle A	Biology: <i>What does a botanist do?</i> Identify a variety of common plants; observe plant growth from bulbs and seeds. Chemistry: <i>Can you squish it?</i> Distinguish between object/materials Describe between object/material Describe simple properties of materials. Compare/Group materials	Biology: <i>What does the tiger have for tea?</i> Identify carnivores, herbivores, omnivores <i>How can I look after my body?</i> Describe the importance of exercise/diet/hygiene	Biology: <i>Who lives in a home like this?</i> Investigate animals’ basic survival needs Identify habitats suitable for plants/animals <i>What do mini-beasts eat, and who eats them?</i> Identify plants/animals in habitats, including micro-habitats Describe food chains
Cycle B	Chemistry: <i>What are my toys made of?</i> Identify/name variety of everyday materials Find out how shapes of solid objects can be changed. How can I change the shape of things? <i>Should I make a boat out of paper?</i> Identify suitability of materials for purpose. Biology: <i>How could we make our school deaf/blind friendly?</i> Identify basic body parts.	Biology: <i>How does your garden grow?</i> Structure of flowering plants. Do all plants have roots? Investigate conditions needed for plant growth. <i>Who lives in the animal kingdom?</i> Identify and classify animals.	Biology: <i>Can you tell a mammal from a reptile?</i> Describe/compare structure of animals. <i>Who makes a good parent in the animal kingdom?</i> Notice animals have similar offspring. Identify how humans resemble their parents. <i>Where did your lunch begin?</i> Explore differences between living/dead/never alive.

Milestone 2 Years 3/4	Please refer to Chris Quigley for suggested Continuous Provision activities.		
Cycle A	<p>Chemistry: <i>What are states of matter?</i> Describe properties of solids, liquids and gases; evaporation and condensation</p> <p>Biology: <i>How do systems help our bodies work?</i> Investigate skeletons and muscles and find out how these systems work together</p>	<p>Biology: <i>Do plants eat, grow and live like people?</i> Nutrition and water; conditions for healthy growth; life cycle including pollination</p> <p>What fuels our bodies? Explore further systems in the body – find out how the digestive system works and why teeth are important</p>	<p>Physics: <i>Do opposites really attract?</i> Investigate poles on magnets and know that these cause them to attract/repel; measure distance of attractive force</p> <p>How does light travel? Reflection; shadows; safe practice to protect our eyes</p>
Cycle B	<p>Chemistry: <i>What is planet earth made of?</i> Compare and identify properties of different types of rocks; formation of fossils; soils</p> <p>Physics: <i>What does life really revolve around?</i> Find out why the sun is crucial to life on earth and how it affects life cycles and processes</p>	<p>Physics: <i>How does electricity work?</i> Build circuits; investigate conductivity</p> <p>What gives you good vibrations- how does sound travel? Vibration; pitch; volume</p>	<p>Biology: <i>How has life evolved?</i> Adaptation leading to evolution; what do fossils tell us?</p> <p>What happens at feeding time in the zoo (and other habitats)? Food chains; teeth; compare habitats and investigate adaptation</p>

Milestone 3 Years 5/6	Please refer to Chris Quigley for suggested Continuous Provision activities.		
Cycle A	<p>Chemistry: <i>How do scientists, engineers and designers use materials?</i> (Properties and grouping)</p> <p>Physics: <i>How can we control and use electricity?</i> Explore, construct and modify circuits and their components. Create circuits for specific purposes; solve problems.</p>	<p>Biology: <i>How do scientists classify living things?</i> Characteristics of mammals, reptiles, birds; data presentation</p> <p>Chemistry: <i>Which changes can be reversed?</i> Explore effects of heating and cooling; experiment with mixing and manipulating materials</p>	<p>Biology: <i>What can scientists learn from historians?</i> Theories about evolution and inheritance</p> <p>How do life systems work in plants? Nutrition, reproduction</p> <p>Physics: <i>Can we control light?</i> How light travels; colour; refraction</p>
Cycle B	<p>Physics: <i>Third rock from the sun?</i> Earth, sun, moon.</p> <p>Can you feel the force? Investigate friction, gravity, magnetic force, air resistance, upthrust, gears and levers.</p>	<p>Biology: <i>What is the most important muscle in your body?</i> Structure and function of the heart and lungs; circulatory system</p> <p>Chemistry: <i>How does life depend on understanding mixtures and solutions?</i> Find out how different mixtures are composed and can be separated into constituent parts; review water cycle</p>	<p>Biology: <i>Are humans more similar to other animals than we think?</i> growth and change, life cycles, reproduction in animals – this is supported by our work in PSHE on Health and Relationships</p> <p>Physics: <i>How can we measure and manipulate sound?</i> Experiments to find out how sound travels; volume measurement</p>

KNOWLEDGE

(known information)

EYFS

Through science, pupils should experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They are encouraged to be **curious and ask questions about what they notice**. They are helped to develop their understanding of scientific ideas by using different types of scientific enquiry to **answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests**, and finding things out using secondary sources of information. They begin to **use simple scientific language** to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the **use of first-hand practical experiences**, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

Children are taught to:

- Observe effects of activity on their bodies
- Talk about why things happen and how things work
- Begin to gain an understanding of how things grow, decay and change over time
- Eat healthy food stuff and understand the need for a variety of food
- Become familiar with the basic scientific concepts e.g. floating and sinking
- Follow a set of simple instructions to carry out an investigation
- Develop their own ideas through investigative activities
- Make links in their learning
- Estimate, weigh, measure and compare and order objects and talk about properties.

Key Stage 1

Through science, pupils should experience and observe phenomena, looking more closely at the natural and humanly constructed world around them. They are encouraged to be **curious and ask questions about what they notice**. They are helped to develop their understanding of scientific ideas by using different types of scientific enquiry to **answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests**, and finding things out using secondary sources of information. They begin to **use simple scientific language** to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the **use of first-hand practical experiences**, but there should also be some use of appropriate secondary sources, such as books, photographs and videos. using their observations

Children are taught about:

- Plants
- Animals, including humans
- Everyday materials
- Seasonal Changes
- Living things and their habitats

Lower Key Stage 2

Through science teaching in lower key stage 2 **pupils broaden their scientific view of the world around them**. They do this through **exploring, talking about, testing and developing ideas** about everyday phenomena and the **relationships** between living things and familiar environments, and by beginning to develop their ideas about **functions, relationships and interactions**. They **ask their own questions** about what they observe and make some decisions about which types of **scientific enquiry** are likely to be the best ways of answering them, including **observing changes over time, noticing patterns, grouping and classifying things**, carrying out simple comparative and **fair tests** and finding things out using secondary sources of information. They **draw simple conclusions** and use some **scientific language**, first, to talk about and, later, to write about what they have found out.

Lower Key Stage 2

Children are taught about:

- Plants
- Animals including humans
- Rocks and soils
- Light
- Sound
- Forces and magnets
- Living things
- Habitats
- States of matter
- Electricity
- Earth's movement through space.

Upper Key Stage 2

Through science teaching in upper key stage 2 pupils develop a **deeper understanding of a wide range of scientific ideas**. They do this through **exploring and talking about their ideas**; asking their own **questions about scientific phenomena**; and **analysing functions, relationships and interactions** more systematically. At upper key stage 2, they encounter more **abstract ideas** and begin to recognise how these ideas help them to **understand and predict** how the world operates. They should also begin to recognise that **scientific ideas change and develop over time**. They should select the most appropriate ways to answer science questions using different types of **scientific enquiry**, including **observing changes over different periods of time**, **noticing patterns, grouping and classifying things**, carrying out comparative and **fair tests** and finding things out using a wide range of secondary sources of information. Pupils should **draw conclusions** based on their data and observations, use **evidence to justify their ideas**, and use their scientific knowledge and understanding to **explain their findings**.

Children are taught about:

- Living things and their habitats
- Animals including humans
- Evolution and Inheritance
- Properties and changes of materials
- Earth and Space
- Forces
- Light
- Sound
- Electricity

Scientific Vocabulary

It is an essential part of our curriculum that our children are immersed in **rich scientific vocabulary** across a breadth of concepts, **promoting deeper conceptual understanding**.

The Importance of Vocabulary

Pupils with the most **extensive vocabulary** have:

- Better **reasoning, inference** and **pragmatic** skills
- Academic **success** and **employment**
- Better **mental health** in adulthood

At ACE, we believe pupils should be taught, systematically. A range of academic words so that they can articulate complex ideas

Milestone 1 Years 1 and 2 Scientific Vocabulary

Understand Plants	Investigate Living Things	Animals including Humans	Investigate Materials	Understand Light and Seeing	Investigate Sound and Hearing	Understand Evolution and Inheritance	Understand Movement, Forces and Magnets	Understand Electrical Circuits	Earth's Movement in Space
Common Garden Wild Deciduous Evergreen Flowering Similarities Differences Categorise Design Structure Names Roots Stem Trunk Flowers Seeds Bulbs Water Light	Living Dead Alive Never Been Alive Features Habitats Micro-Habitats Conditions Require Environment Suitable Survive Ideal Obtain Food Chain Food Sources	Common Birds Fish Amphibians Reptiles Mammals Invertebrates Carnivores Herbivores Omnivores Human Body Five Senses Offspring Adults Babies Dependent Needs Require Survival	Everyday Object Material Sand Fleece Plastic Wood Glass Metal Water Rock Brick Paper Made From Started Off Properties Physical Properties Clothing Useful	Sources of Light Electric Lights Flames The Sun Eyes Travels Brighter Dimmer	Source of Sound Hear Ears Protect Loud Quiet	Humans Resemble Parents Features Children Similarities and Differences	Move Faster Slower Push Pull Gently Hard Slope Speed Rolls Slow Down Surface Affects Magnets Heavy Light	Common Appliances Run On Electricity Mains Battery Power Construct Electrical Circuit Component Effects	Movement Sun Day Times of Day Day Length Position Sky Four Seasons Key Features Images Objects Warm Dry Wet Cold Weather

Temperature Healthy	Carnivore Herbivore	Water Food Air Exercise Hygiene Healthy Diet Lifestyle Food Types Food Groups	Solid Squash Bend Twist Stretch Shape Change Uses Suitability						
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Milestone 1 Years 1 and 2 Working Scientifically

Devise, Prove, Apply, Describe, List, Propose, Describe, Generalise, Explain, Name, Categorise, Suggest, Design, Match, Point out, Explain, Create, Label, Show, Complete, Compare and Contrast, Evidence, Illustrate, Suggest, evidence, Illustrate, Suggest, Observe, Organise, Draw, Deduce, Choose, Arrange, Group, Place, Experiment, Summarise, Reason, Justify, Record, Identify patterns, Recognise, Follow instructions, Modify, Diagnose and Repair

Milestone 2 Years 3 and 4 Scientific Vocabulary

Understand Plants	Investigate Living Things	Animals including Humans	Investigate Materials	Understand Light and Seeing	Investigate Sound and Hearing	Understand Evolution and Inheritance	Understand Movement, Forces and Magnets	Understand Electrical Circuits	Earth's Movement in Space
Creating Functions Requirements Life Growth Air Light Nutrients Vary Conditions Range Transported Role Life Cycle Pollination Seed Formation	Features Classify Classifications Keys Criteria Environments Dangers Specific Habitats Deforestation Rainforests Conservation Preservation	Nutrition Health Fractions Natural Sources Obtain Differences Carbohydrates Fibres Fats Proteins Water Vitamins Minerals Malnutrition Illness Deficiency Vitamin C Food Chains	Rocks Physical Properties Observable Properties Minerals Origins Quartz Shale Limestone Sandstone Content Igneous Sedimentary Formed Formation Hardness Fossils Organic Matter	Light Dark Absence Effect Darkness Relationship Seeing Visibility Earth's Rotation Sun Sunlight Natural Source Solar System Reflected Reflecting Surface Effects	Sound Vibration Vibrating Sources Tuning Fork Loud Quiet Stringed Instruments High Low Notes Pitch Mediums Travel Ear Transmitting Air	Resemble Resemblances Features Offspring Parents Inheritance Research Fossils Conditions Inhabited Process Formation Survived Fossil Fuels Temperature Suited to Adapt Environment Adaptation	Move Surface Smooth Rough Flat Inclined Degrees Friction Relationship Patterns Design Forces Magnets Magnetic Force Contact Force Material Applications Attract	Electricity Appliances High/Low Voltage Mains Battery Powered Solar Volt Watt Halogen Bulb LED Benefits Problems Series Circuit Components Lamp	Earth Sun Relative Solar System Scientists Movement Seasonal Changes Seasons Gives Rise Equator Year Time Zones Moon Moon Shape Phases Tides Seas Calendar

Seed Dispersal Locate Reproduce		Producers Predators Prey Energy Flow Sunlight Reduction Increase Affected Natural Environment Skeleton Muscles Support Protection Movement Bones Joints Relaxing Contracting Exercise Functions Digestive System Suffer Teeth Diet	Soils Parent Materials Alluvial Soils Solids Liquids Gases Helium Change State Heating Cooling Temperature States of Matter Relationship Water Cycle Evaporation Condensation	Properties Protect Eyes Safety Damage Solar Eclipse Shadows Blocking Night-time Patterns Changes Length Size Shape Position Height			Repel Iron Filings Magnetic Fields North Pole South Pole Earth Aurora Borealis	Loop Faults Complete Incomplete Switch Opening Closing Morse Code Conductor Insulator Metals Conductivity Resist Flow	Leap Year
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Milestone 2 Years 3 and 4 Working Scientifically

Describe, Illustrate, Explain, Prove/Disprove, Observe, Record, Compare/Contrast, Create, Justify, Read About, Answer Questions, Experiment, Demonstrate, Summarise, Scientific Conclusion, Label, List, Apply, Suggest, Reason, Name, Investigate, Construct, Interpret, Identify Patterns, Categorise, Explain Relationships, Recommend, Relate, Cite Evidence, Match, Propose, Arrange, Complete, Adapt, Construct, Notice, Note, Group, Infer, Generalise, Test, Classify, Measure, Hypothesise, Graph, Use, Experiment With, Give Examples, Listen, Follow Instructions, Predict, Solve Problems

Milestone 3 Years 5 and 6 Scientific Vocabulary

Understand Plants	Investigate Living Things	Animals including Humans	Investigate Materials	Understand Light and Seeing	Investigate Sound and Hearing	Understand Evolution and Inheritance	Understand Movement, Forces and Magnets	Understand Electrical Circuits	Earth's Movement in Space
Evolution Human Evolution Adaptation	Life Cycles Mammal Amphibian Insect	Human Body Childhood Functions Adulthood	Materials Hardness Solubility Conductivity	Light Straight Lines Travels	Pitch Features Musical Instruments	Offspring Vary Identical Parents	Unsupported Earth Force Gravity	Brightness Loudness Volume Buzzer	Spherical Bodies Approximate Sun

Environment Life Processes Vary Information Theory	Bird Young Offspring Adult Parents Eggs Reproduction Process Food Chains Classification Keys Identify Observable Features Criteria Broad Groups Specific Characteristics	Physical Signs Ageing Appearance Height Male Female Blood Pressure Diet Exercise Lifestyle Fitness Regime Circulatory System Function Blood Vessel Veins Arteries Capillaries Coronary Joints Mucus Membranes Toxins Heart Heartbeat Heart Attack Pulse Rate Lifestyle Drug Misuse Smoking Sugar Nutrients Water Transport	Electrical Thermal Magnets Comparative Tests Fair Tests Properties Soluble Non-Soluble Evaporation Solution Substance Dissolved Liquid Solvent Water Cycle Solid Liquid Gas Mixture Separation Filtering Sieving Evaporating Salt Recover Insulator Conductor Suitability Live Uninsulated Power Line Changes of State Reversible Irreversible Formation Burning Oxidisation Acid Bicarbonate of Soda Powder Temperature	Reflective Reflect Surface Bend Corners Blocking Diverges Divergent Periscope Invisible Shadows Size Position Moon	Orchestral Volume Strength Vibrations Pattern Faint Loud	Living Things Environments Suited Adapt Theory of Evolution Adaptation Survive	Falling Object Rate Height Air Resistance Water Resistance Friction Drag Forces Size Driven Slow Down Transferred Mechanical Devices Gears Pulleys Levers Springs Directions Working Mechanism Rotary Motion Linear Motion Effect	Voltage Circuit Series Cells Bulb Increase Variations Components Function Position Electrical Resistance Wire Resistor Symbols Diagrams	Earth Moon Gravity Planets Equatorial Bulge Phenomenon Rotation Day Night Sundial
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Milestone 3 Years 5 and 6 Working Scientifically

Describe, Compare/Contrast, Organise, Find Relationships, Generalise, Relate, Graph, Draw, Label, Explain, Read, Answer Questions, Observe, Record, Discover, Argue, Name, Propose, Present, Identify, Look at, Copy, Use, Make, Recognise, List, Categorise, Note, Investigate, Match, Illustrate, Carry Out, Adapt, Modify, Devise, Prove/Disprove, Apply, Demonstrate, Cite Evidence, Predict, Hypothesise, Experiment, Summarise, Interpret Data, Reason, Suggest, Learn,

Implementation

It is our belief that pupils should be taught in the best way possible according to up to date pedagogical thinking. High quality, inclusive teaching (IQFT) is an essential component of our curriculum framework model so that our ‘irresistible’ curriculum intent translates into outstanding teaching at the point of implementation.

The following constructs and conscious connections may be used to teach science at ACE, these are suggestions but are not exhaustive.

<u>IQFT</u>	<u>Subject Specific</u>
<p><u>Planning Learning Opportunities</u></p> <ul style="list-style-type: none">• Carefully planned, well-structured and paced lessons.• Making strong cross-curricular links when appropriate.• Clearly defined Learning Objectives and Tasks, shared with pupils at the beginning of each lesson. These are known as ‘Ls’ and ‘Ts’ at ACE.• Each Learning Objective is differentiated on a number of levels so that children gradually develop skills, knowledge and application of knowledge. These are known as ‘Chilli- Challenges’ at ACE.	<ul style="list-style-type: none">• Use of ‘hooks’, wow moments, first hand experiences• Outdoor learning opportunities. E.g. Forest School, nature walks, observe seasonal changes, weather and climate, habitats, environments, growing things in the school grounds, name that tree, animal wiki• Geography – Use geographical vocabulary to refer to and describe key physical features of locations E.g. Investigate the world’s oceans and continents with a focus on habitats and food chains.• Art – painting, drawing, patterns and design, textiles• Design Technology – Use of a wide range of materials, components, construction materials, mechanical/electrical systems, textiles and ingredients.• PE/ Personal Development– Participation, competition and leading a healthy lifestyle• Maths – Counting, measuring, number operations, statistics, graphs,• History – combine with studies about evolution and inheritance e.g. how human skeletons have changed over time.• Music – Trolley/table for children to investigate making sounds in a variety of ways• Reading and Writing – imaginative description in a range of genres, retrieving information from non-fiction texts.
<p><u>High Expectations</u></p> <ul style="list-style-type: none">• Children at ACE are expected to be RISK-TAKERS and choose their own level of challenge. Thereby taking control of their own learning.• Children understand that they need to challenge themselves in order to learn and that this will require them to work outside of their comfort zone and show RESILIENCE. At ACE, we talk about being in the ‘Learning Pit’ and ‘Wobbling’.• Resource boxes and Table packs develop INDEPENDENCE, support and deepen leaning.• Positive relationships between adults and pupils, using praise and positive reinforcement so that children feel valued and inspired to achieve their best.• Setting high standards and expectations for behaviour.	

- Debates – E.g. Moral dilemmas relating to habitats and the environment.
- Books and pictures kept in class library or on display, access to websites on devices available
- Visits/ Trips – these may be virtual ones
- Visitors to talk about first hand experiences
- Theme days

Engagement and Enhancement

- Pupils **demonstrating their learning** in a variety of forms, with a focus on enjoying the journey that comes from **DEEP THINKING, LEARNING** and **PROBLEM SOLVING**.
- **Imaginative and creative approaches** to ensure lessons are interesting and stimulating.
- Varied **teaching styles**.
- Use of **ICT** to enhance learning experiences

Learning Environment

- Classrooms are bright, vibrant and **alive with learning**, following our ‘communication friendly’ guidelines.
- Displaying **self-help working walls** to promote independence and perseverance
- Examples of **WAGOLs (What a good one looks like)** and high quality pupils’ work.

Feedback

- Use continuous **Assessment for Learning** to make ongoing judgements of pupils
- **Teach at the Point of Learning (TaPoL)** to be responsive to children’s needs.
- Give **timely feedback** during the lesson.
- Enabling pupils to **respond to feedback** (self, peer, adult) in an age appropriate way. Pupils at ACE in Year 1 (Summer Term onwards) and Years 2-6, will have opportunities to edit, improve and correct their learning outcomes. For example, pupils will make changes to their work. At ACE, this is known as **‘Purple Polishing’**.

Impact

Science is monitored by the subject leader throughout all year groups using a variety of strategies such as book scrutiny, lesson observations, staff discussions and pupil interviews. Feedback is given to teachers so that they can continually review and improve their practice. School leaders use the information to see if the children have developed the correct skills and knowledge for their milestone, making good progress from their starting points.

- **scientific knowledge** through the specific disciplines of biology, chemistry and physics.
- **conceptual understanding** within science and apply some concepts to wider learning.
- understanding of the nature, processes and methods of science through **different types of science enquiries**.
- the ability to **answer scientific questions** about the world around them.
- a **curiosity about natural phenomena** to inspire the need to ask scientific questions.
- the understanding and use of **scientific vocabulary**.
- the scientific knowledge required to **understand the uses and implications of science**, today and for the future.

Assessment

Science is assessed through teacher judgement and monitored by the subject leader and Senior Leadership Team. Proof of Progress Tasks and pupil voice supports teachers in making accurate judgements of what the children know.