HILL FARM PRIMARY SCHOOL
Science Curriculum



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Intent

Through Hill Farm Primary School's Science Curriculum, we endeavour to ensure all children that leave our school have developed a deep scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. Our aim is to develop understanding of the nature, processes and methods of science through different types of science enquiries such as practical experiments, guided and independent research and linking their learning to real world problems experienced by everyday scientists. This will help them to answer a range of scientific questions about the world around them. They will be equipped with the scientific skills required to understand the uses and implications of science, today and for the future. We have blended the National Curriculum with the Chris Quigley's Greater Depth in Science to produce a bespoke curriculum for our school to meet the needs of our changing cohorts and our individual learners.

Implementation

Teachers create a positive and enthusiastic attitude towards science learning within their classrooms and reinforce an expectation that all pupils are capable of achieving high standards in science. Hill Farm's approach to the teaching and learning of Science is as follows:

- Using the blended National Curriculum and Chris Quigley's Greater Depth in Science approach, children are exposed to every topic of science each year. This strategy allows children to build on their previous learning and reflect on what has been previously taught.
- We also build on children's skill development of the previous year. As the children's skill becomes more proficient, they become abler to select and use relevant scientific equipment, collate and interpret results and become increasingly confident in their growing ability to make conclusions based upon real evidence.
- Existing knowledge is checked at the beginning of each lesson using a 'Flashback' activity. This ensures that the teaching is informed by children's starting points and lessons can be adapted as needed.
- Throughout planning, we involve problem solving opportunities that, where possible, link with vocations and allow children to apply their knowledge and find out answers for themselves. Our learning intentions reflect this by detailing the occupation the children are learning about. This practical application linked with a job allows children to have higher aspirations, captivates children's imaginations and allows them to make links across the curriculum.
- Working Scientifically skills are embedded into lessons to ensure skills are developed throughout the children's schooling career. New vocabulary is introduced each lesson and is constantly referred to within the topic. These words are then reintroduced in the following years when that topic is taught again.
- Teachers demonstrate how to use scientific equipment,
- Regular events, such as STEM week or Teen Tech Live, allow all pupils to come off-timetable to provide a broader provision and the acquisition and application of knowledge and skills. These events often involve families and the wider communities.
- Children are offered a wide range of extra-curricular activities, visits, trips and visitors to compliment and broaden the curriculum. These are purposeful and link with the knowledge being taught in class.
- Children's learning is assessed weekly in the form of the 'Flashback' activity where children's knowledge is reviewed and consolidated if necessary. Children are assessed termly in a practical task, testing their problem solving and scientific investigative skills through the form of a scenario.

Curriculum Content coverage

Each year group has a science timetable which can be found **here** [This needs to be hyperlinked]

Alternatively, you can scan the QR code access the folder.

Year 3 Science Yearly Overview

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	To understand plants			To understand animals and humans				To understand evolution and inheritance		To investigate living things		Consolidation
	STEM Project – Mechanical systems											
Spring	To investigate materials							To understand electrical circuits			STEM Week	Consolidation
	STEM Project - Textiles											
Summer	To understand movement, forces and magnets				To understand light and seeing				To investigate sound and hearing		To understand the Earth's movement in space	Consolidation
	STEM Project - Structures											

This is an example of the timetable used for all year groups. This has been organised to allow for the organisation of practical resources through the school. The timetable is colour coded to represent each category of science, green being Biology, blue being Chemistry and yellow being Physics. Once every term, there will be a STEM project and the topic of these is detailed in the timetable. For example, in Autumn 2, Year 3 will be accessing a STEM project on Mechanical systems.

Curriculum Content Overview			
	Milestone 1	Milestone 2	Milestone 3
To understand plants	Pupils should be taught to: 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	Pupils should be taught to: 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 lowering plants, including pollination, seed formation and seed dispersal	Pupils should be taught to: Relate knowledge of plants to studies of evolution and inheritance Relate knowledge of plants to all living things
To understand animals and humans	Pupils should be taught to: 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 Notice that animals, including humans, have offspring which grow into adults	Pupils should be taught to: Identify that animals, including humans, need the right types and amounts of nutrition, that they cannot make their own food and they get nutrition form 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	Pupils should be taught to: Describe the changes as humans 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 human

	Investigate and describe the basic needs of animals, including humans, for survival (water, food and air) Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene		
To investigate living things	Pupils should be taught to: Explore and compare the differences between things that are living, that are dead and things 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 micro-habitats 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.	Pupils should be taught to: Recognise that living things can be grouped in a variety of ways Explore and use classification keys Recognise that environments can change and that this can sometimes post dangers to specific habitats	Pupils should be taught to: Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird Describe the process 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
To understand evolution and inheritance	Pupils should be taught to: Identify how humans resemble their parents in many features	Pupils should be taught to: Identify how plants and animals, including humans, resemble their parents in many features Recognise that living things have changed over time and the fossils provide information about the living things that inhabited the Earth millions of years ago Identify how animals and plants are suited to and adapt to their environment in different ways	Pupils should be taught to: Recognise that living things have changed over times 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 the parent Identify how animals and plants are adapted to suit their environment in different ways and how that adaptation may lead to evolution

To investigate materials	Pupils should be taught to: 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 physical properties Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock and paper/cardboard for particular uses.	Pupils should be taught to: 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 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 (°C), building on the teaching in mathematics Identify the part played by evaporation and condensation in the water cycle and associate that rate of evaporation with temperature	Pupils should be taught to: 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 quickly 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, oxidisation and the action of acid on bicarbonate of soda
To understand movement, forces, and magnets	Pupils should be taught to: Notice and describe how things move, using simple comparisons such as faster and slower Compare how different things move	Pupils should be taught to: Compare how things move on different surfaces Notice that some forces need contact between two objects, but magnetic forces can act at a distance 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	Pupils should be taught to: Describe magnets as having two poles Predict whether two magnets will attract or repel each other, depending on which poles are facing 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

		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	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 greater effect
To understand light and seeing	Pupils should be taught to: Observe and name a variety of sources of light including electric lights, flames and the sun, explaining the we see things because light travels from them to our eyes	Pupils should be taught to: Recognise that light is required in order to see things and that dark is the absence of light Notice that light is reflected from surfaces Recognise that light from sun can be dangerous and that there are ways to protect your eyes Recognise that shadows are formed when light from a light source Is blocked by a solid object Find patterns in the way that the size of a shadow changes	Pupils should be taught to: 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 travel in straight lines to explain why shadows have the sae 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 then to our eyes
To investigate sound and hearing	Pupils should be taught to: Observe and name a variety of sources of sound, noticing that we hear with our ears	Pupils should be taught to: Identify how sounds are made, associating some of them with vibrating Recognise that vibrations from sounds travel through a medium to the ear	Pupils should be taught to: Find patterns between the pitch of a sound and features of the object the produced it 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 source increases
To understand electrical circuits	Pupils should be taught to: Identify common appliances that run on electricity Construct a simple series electrical circuit	Pupils should be taught to: Identify common appliances that run on electricity	Pupils should be taught to: Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit

		Construct a simple series electrical circuit, identifying and naming its basic parts, including calls, 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 light in a simple series circuit Recognise some common conductors and insulators, and associate metals with being good conductors	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
To understand Earth's movement in space	Pupils should be taught to: 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	Pupils should be taught to: Describe the movement of the Earth relative to the Sun in the solar system Describe the movement of the Moon relative to the Earth	Pupils should be taught to: Describe the movement of the Earth relative to the Sun in the solar system Describe the movement of the Moon relative to the Earth Describe the sun, Earth and the Moon as approximately spherical bodies

Skills Progression

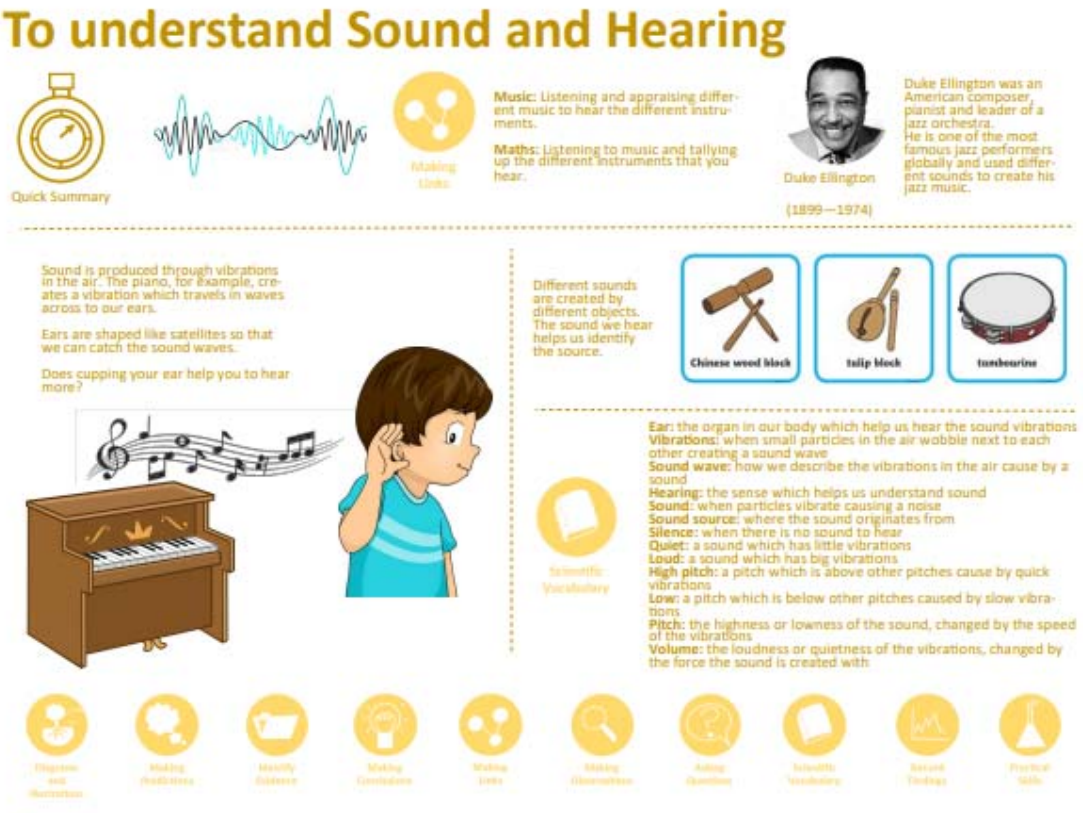
	Milestone 1	Milestone 2	Milestone 3
Scientific Knowledge	Communicate in a range of ways and being to use simple scientific vocabulary Draw a range of illustrations and diagrams	Record findings using simple scientific language, drawings, labelled diagrams and keys. Identify differences, similarities or changes related to simple scientific ideas and processes	Use scientific diagrams, labels, classification keys to represent scientific knowledge.
Scientific Investigation	Ask simple questions and recognize they can be answered in different ways Observe similarities and differences closely Perform simple tests using simple equipment Use simple measurements and equipment	Ask relevant questions and using different types of scientific enquiries to answer them. Set up simple practical enquiries, comparative and fair tests. Make systematic and careful observations and, where appropriate, take accurate measurements using standard units and a range of equipment. Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.	Plan different types of scientific enquiries to answer questions, including recognizing and controlling variables where necessary. Take measurements using a range of scientific equipment with increasing accuracy and precision. Use test results to make predictions to set up further comparative and fair tests.
Interpreting Data	Use observations and ideas to suggest answers to questions Gather and record data to help answer questions Use simple secondary sources to find answers	Gather, record and classify data in a variety of ways. Present data in a variety of ways. Record findings using bar charts and tables. Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.	Record data and results of increasing complexity. Portray data using tables, scatter graphs, bar and line graphs. Report and present findings from enquiries, including conclusions, causal relationships and explanations. Discuss whether results are trustworthy, in oral and written forms such as displays and other presentations.
Uses and implications	Talk about what they found out and how it can be used in a wider context	Use straightforward scientific evidence to answer questions or to support their findings. Identify scientific implications and uses in STEM projects.	Identify scientific evidence that has been used to support or refute ideas or arguments. Identify scientific implications and uses in STEM projects

Knowledge Organisers

Each year group has a science timetable which can be found here [This needs to be hyperlinked]

Alternatively, you can scan the QR code access the folder.

Below is an example of the knowledge organisers used to support the science curriculum.



Each knowledge organiser has

- All relevant diagrams and explanation of learning which is going to be shared within the topic
- All key vocabulary with definitions needed for the topic
- A key scientist that a lesson could be related to
- Links across the curriculum for further investigation within other subjects

Vocabulary Progression

All vocabulary and relevant definitions are found in our knowledge organisers. Below is a breakdown of the different vocabulary introduced in each milestone:

To understand plants		
Milestone 1	Milestone 2	Milestone 3
Bark Berry	Nutrients Photosynthesis	Photosynthesis Adaptation

Branch Bud Bulb Flower Fruit Germinate Leaf Petal Root Seed Seedling Stem trunk	Pollination	Microevolution Environment

To investigate living things		
Milestone 1	Milestone 2	Milestone 3
Living Dead Never been alive Habitat Micro-habitat Food chain	Classification Classification key Environment Habitat Migrate Hibernate Vertebrate Invertebrate	Life cycle Reproduction Sexual reproduction Asexual reproduction Fertilize Metamorphic Runner Bulb Cutting Tuber

To understand evolution and inheritance		
Milestone 1	Milestone 2	Milestone 3
Offspring Inherited Parent Characteristics	Adapt Resemble Growth Inheritance Environment Ancestor	Evolution Variation Species Fossil

To understand animals and humans		
Milestone 1	Milestone 2	Milestone 3
Carnivore Herbivore Omnivore Fish Amphibian Bird Mammal Reptile Head Neck Arm Elbow Leg Knee Face Ears Eyes Hair Mouth Teeth	Insectivore Nutrients Food source Food chain Top consumer Producer Secondary consumer Tertiary consumer Digestive system Skeletal system	

Sense Taste Touch Smell Vision Hearing Offspring Reproduction Growth Exercise Breathing Hygiene Germs Disease Nutrition		

To investigate materials		
Milestone 1	Milestone 2	Milestone 3
Transparent Translucent Opaque Flexible Rigid Reflective Non-reflective Absorbent	Sedimentary Metamorphic Igneous Minerals Fossil Soil Change of state Melting Freezing Melting point Boiling point Evaporation Condensation Water cycle Temperature	Soluble Dissolve Solution Filtering Reversible Irreversible Conductivity

To understand sound and hearing		
Milestone 1	Milestone 2	Milestone 3
Ear Hearing Sound Noise Silence Quiet Loud High pitch Low pitch Volume	Vibrations Sound wave	Sound insulation Sound source

To understand light and seeing		
Milestone 1	Milestone 2	Milestone 3
Light Dark Light source Shadow	Reflective Surface Solar eclipse	Reflective surface Diffraction Reflection Diverges

To understand movement, forces and magnets		
Milestone 1	Milestone 2	Milestone 3
Push Pull Force Repel Attract		Force Gravity Force meter Newton (N) Air resistance Water resistance Friction Mechanisms Simple machines Lever Pulleys Gears

To understand electrical circuits		
Milestone 1	Milestone 2	Milestone 3
Mains power Plug socket Battery power Battery Cell Wires Circuit Electricity Appliance Crocodile clip Bulb Power station	Motor Switch Buzzer Conductor Insulator Electrical component Electrical circuit	

To understand Earth's movement in Space		
Milestone 1	Milestone 2	Milestone 3
Season Autumn Winter Spring Summer Weather Sunrise Sunset Day Night Position Sunny Stormy Icy Snowy Rainy Foggy		

Building on/ Leading to…

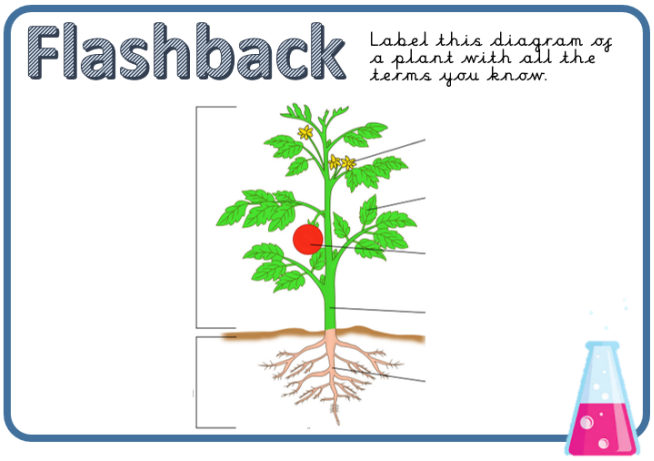
Our bespoke curriculum has been tailored to build on prior learning every step of the way. As each topic is taught once a year, children are constantly recapping prior learning. We also felt that this was more effective than having a block of learning but not revisiting it for the majority of a student's schooling life.

Years 1, 3 and 5 access the basic side of the curriculum and possibly push into the advancing area for TIFs where applicable.

Children will increase their understanding of the concepts by exploring:

	Basic	Advancing	Deep
	Identify common appliances that run on electricity.		
Lesson 1	Identify and name common appliances that run on electricity. **Label** appliances that run on high and low voltage electricity. **Identify** and **describe** sources of electricity for appliances, including mains,	between a 240 volt, 40 watt halogen light bulb and a 12 volt, 6 watt LED light bulb. **Explain** the **similarities** and **differences** between a 240 volt mains-powered vacuum cleaner and a 12 volt battery-powered vacuum cleaner.	**Investigate** battery-powered road cars and draw some conclusions about their benefits and problems.
	Recognise some common conductors and		
Lesson 2	**Observe** and **record** how different materials act as conductors or insulators of electricity. **Observe** the effect of some poor and good conductors and label materials as poor or good conductors.	**Categorise** materials on the basis of their conductivity. **Experiment** with materials that conduct but also resist the flow of electricity. Summarise your findings	**True or false?** Everything on Earth either conducts or doesn't conduct electricity, including humans.

Years 2, 4 and 6 access the advancing and deep end of the curriculum which builds on what they have learned in the previous years.



Each Science begins with a 5-minute flashback linked to the previous year's learning. This may consist of drawing or labelling diagrams, matching key vocabulary to definitions or trying to prove/disprove a hypothesis. Once this learning has been recapped, the lesson will continue.

Science through Early Years

In EYFS, Science is taught through the Understanding the World (Natural World) topic. Topics have been chosen to enable children to access science in their learning. We use the Early Years Framework, Development Matters and Birth to 5 to enable us to plan, teach and provide effective provision.

By the end of Early Years, a Hill Farm Primary School Scientist will be able to…

…make comments about what they have heard and ask questions to clarify their understanding

…explore the world around them, making observations about and drawing pictures of animals and plants

…understand some important processes and changes in the natural world around them



…being able to comment on similarities and differences in the world around them

…being able to manage their own needs, understanding germs and personal hygiene

…have a sense of excitement and curiosity about natural phenomena

…have an awareness of the jobs available to them linked with science

School Values / British Values

Throughout our science curriculum, we seek to promote both our school values and our British values.

Live without harm

We seek for children to understand the history of science and how, through the **patience** and **humility** of great scientists, the modern era has been shaped and developed We will also show children the importance of **trusting** in the scientific process, learning how to build a fair or comparative test of their own. We will give children an understanding how the study of science has helped us build a society with the **rule of law** to ensure our wellbeing and the protection of those who are vulnerable.

Equal opportunities

Our science curriculum is accessible to all children with staff differentiating appropriately so that all children can **respect** and understand the value of science. We champion group work, where possible, to enable children to **empathise** with each other's opinions and **tolerate** opposing views. We also seek to foster a sense of **responsibility** for high quality group work and accurate results.

Altruism

Through learning about the natural world around them, we aim for Hill Farm scientists to **love** the natural world around them, discovering how to **care** for and show **kindness** to their environments. By researching how humans and their environment

will thrive on the basis of **mutual respect,** we will foster a sense of **generosity** towards environmental issues.

Resourcefulness

Through practical investigation we will develop children's **curiosity** about the world around them and how it is made. We will investigate a range of scientific princibles including how **individual liberty,** can affect an investigation. Children will be **courageous** in their approach to scientific investigation, being determined to reach a conclusion despite obstacles.

Navigate the world

Children at Hill Farm will become **reflective** practitioners of science, building on their prior learning, mistakes made and research undertaken with a high level of **resilience.** They will be **ambitious** with their investigations, working with other in a **democratic** process to build on and share ideas to aid investigative thinking.

Oracy

Oracy is a vital part of scientific understanding and investigation and at Hill Farm, we recognise the importance of this. Without articulating predictions, results and methods clearly, children will not be able to demonstrate a good understanding of their task. We seek to promote oracy in science by:

- Giving children opportunity to discuss and plan tasks before embarking on them
- Mixed ability paired and group work to allow higher attaining children to model good practice to those children who haven't developed their oracy yet.
- Providing children with a range of problems which they will have to work collaboratively to solve
- Presenting results and observations to peers, groups and to the class as a whole
- Sharing high quality sentence stems related to science and having them on display within the classroom

Creative Learning

Delivery of Science lessons provides students with a perfect opportunity to use the technology around us to foster an atmosphere of creative learning. Rather lessons that predominantly use worksheets to check understanding we:

- Use QR codes, websites and google searches to research information for topics
- Use creative ways to record information found such as the Popplet app, Keynote, the Paper app and using the green screen located in the Science lab
- Take part in virtual experiments where physical experiments are not possible
- Participate in conversations, video chat or text-based, with scientists in a given field

Impact

By pursuing this bespoke science curriculum, we believe there will be a significant impact on the children at Hill Farm Primary School. We are confident that this will provide the learning opportunities for children to achieve age related expectations in the subject and/or make at least expected progress. Through the teaching of subject

specific and high quality vocabulary, we will see an increase in our children's oracy and knowledge retention. Through investigative science, children will become collaborative learners, able to question the world around them, develop hypotheses and investigate using their own methods. They will be confident presenters and able to articulate their understanding and reason why that might be the case. Finally, through the sharing of vocations linked with fields of science, our children will become successful members of society, demonstrating the school and British values in the world of work.

By the End of Key Stage 2, a Hill Farm Primary School Scientist will be able to…

… predict how things will behave, explain what is occurring and analyse causes

…have essential aspects of the knowledge, methods, processes and uses of science

…recognise, practice and demonstrate the power of rational explanation



…have an awareness of the jobs available to them linked with science

…question why things happen in the way they do and be able to work scientifically to answer these questions

…understand how Science has and is still changing our lives and that it is vital for the world's future prosperity

…have a sense of excitement and curiosity about natural phenomena