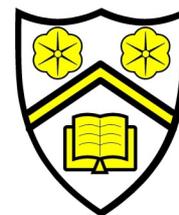


## WHITEHILL COMMUNITY ACADEMY (3-11).

### A rationale for the Teaching of Science.



#### Purpose.

Science has changed our lives and is vital to the world's future prosperity. All pupils in the Academy should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

#### Science unit aims (taken from NC)

##### **Aims include:**

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them.
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

#### Science overview for KS1 and KS2.

	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>	<b>Year 6</b>
<b>Biology</b>	1. Living Things (humans and animals: describing, labelling and basic classification)  2. Plants (covering NC 2014 Years 1 & 2 objectives)	1. Living Things and their Habitats  2. Staying Alive (humans and animals)	1. Plants  2. Skeletons and Nutrition (animals and humans)	1. Living Things and their Habitats (grouping, classification and environmental threats)  2. Teeth and Digestion (animals and humans)	1. Life cycles of plants, animals and humans  2. The Heart and Staying Healthy	1. Classifying micro-organisms, plants and animals  2. Evolution and adaptation
<b>Chemistry</b>		1. Everyday Materials (covering NC 2014 Years 1 & 2 objectives)	1. Rocks and Soils	1. Changing States	1. Changing Materials	
<b>Physics</b>	1. Weather and Seasons		1. Forces and Magnets  2. Light and Shadows	1. Sound  2. Electricity	1. Earth and Space  2. Light	1. Electricity  2. Forces

## **Science Curriculum**

### **Foundation Stage**

Children know about similarities and differences in relation to places, objects, materials and living things. They talk about the features of their own immediate environment and how environments might vary from one another. They make observations of animals and plants and explain why some things occur, and talk about changes.

### **Working Scientifically Year 1 and 2**

During years 1 and 2, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking simple questions and recognising that they can be answered in different ways
- observing closely, using simple equipment
- performing simple tests
- identifying and classifying
- using their observations and ideas to suggest answers to questions
- gathering and recording data to help in answering questions.

### **Year 1**

#### **Plants**

Pupils use the local environment throughout the year to explore and answer questions about plants growing in their habitat. Where possible, they should observe the growth of flowers and vegetables that they have planted. They become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem). Pupils are introduced to the requirements of plants for germination, growth and survival, as well as to the processes of reproduction and growth in plants.

#### **Living Things**

Pupils use the local environment throughout the year to explore and answer questions about animals in their habitat. They understand how to take care of animals taken from their local environment and the need to return them safely after study. Pupils become familiar with the common names of some fish, amphibians, reptiles, birds and mammals, including those that are kept as pets. Pupils have plenty of opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) through games, actions, songs and rhymes.

## **Weather and Seasons**

Pupils observe and talk about changes in the weather and the four seasons. They also discuss how the length of day varies. Pupils are warned that it is not safe to look directly at the Sun, even when wearing dark glasses.

## **Year 2**

### **Living Things and Their Habitats**

Pupils are introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. They should raise and answer questions that help them to become familiar with the life processes that are common to all living things. Pupils use the terms 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). They raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. Pupils compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest.

### **Staying Alive**

Pupils are introduced to the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans. They discuss the processes of reproduction and growth in animals. The focus at this stage should be on questions that help pupils to recognise growth. The following examples might be used: egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep. Growing into adults can include reference to baby, toddler, child, teenager, adult.

### **Everyday Materials**

Pupils explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Pupils experiment with a wide variety of materials, not only those listed in the programme of study, but others including for example: brick, paper, fabrics, elastic, foil.

Pupils identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass). They

think about the properties of materials that make them suitable or unsuitable for particular purposes and they are encouraged to think about unusual and creative uses for everyday materials. Pupils might find out about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam.

### **Working Scientifically Year 3 and 4**

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, comparative and fair tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

### **Year 3**

#### **Plants**

Pupils are introduced to the relationship between structure and function: the idea that every part of a plant has a job to do. They explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction. Pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens.

#### **Skeletons and Nutrition**

Pupils identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat. Pupils learn that humans and some other animals have skeletons and muscles

for support, protection and movement. They are introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.

### **Rocks and Soils**

Linked with work in geography, pupils explore different kinds of rocks and soils, including those in the local environment. They compare and group together different kinds of rocks on the basis of their appearance and simple physical properties. Pupils can describe in simple terms how fossils are formed when things that have lived are trapped within rock. They must also recognise that soils are made from rocks and organic matter.

### **Forces and Magnets**

Pupils observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). They explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe). They discuss poles and how magnets attract or repel each other and attract some materials and not others.

### **Light and Shadows**

Pupils recognise that they need light in order to see things and that dark is the absence of light. They explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. Pupils should think about why it is important to protect their eyes from bright lights. They look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.

## **Year 4**

### **Living Things and their Habitats**

Pupils use the local environment throughout the year to raise and answer questions that help them to identify and study plants and animals in their habitat. They identify how the habitat changes throughout the year. Pupils explore possible ways of grouping a wide selection of living things that include animals and flowering plants and non-flowering plants. Pupils could begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects. Pupils explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks, or garden ponds, and the negative effects of population and development, litter or deforestation.

### **Teeth and Digestion**

Pupils identify the different types of teeth in humans and their simple functions. They are introduced to the main body parts associated with the digestive system, for

example, mouth, tongue, teeth, oesophagus, stomach and small and large intestine and explore questions that help them to understand their special functions.

### **Changing States**

Pupils explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). Pupils observe water as a solid, a liquid and a gas and should note the changes to water when it is heated or cooled. They also identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

### **Sound**

Pupils identify how sounds are made, associating some of them with something vibrating. They recognise that vibrations from sounds travel through a medium to the ear. They find patterns between the pitch of a sound and features of the object that produced it. They also find patterns between the volume of a sound and the strength of the vibrations that produced it. Pupils recognise that sounds get fainter as the distance from the sound source increases.

### **Electricity**

Pupils can identify common appliances that run on electricity. They can construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers. They 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. Pupils recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They can give examples of some common conductors and insulators, and associate metals with being good conductors.

### **Working Scientifically Year 5 and 6**

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations

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

## **Year 5**

### **Lifecycles**

Pupils should study and raise questions about their local environment throughout the year. They observe life-cycle changes in a variety of living things, for example, plants in the vegetable garden or flower border, and animals in the local environment. They can describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird. They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall. Pupils find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals. Pupils draw a timeline to indicate stages in the growth and development of humans. They learn about the changes experienced in puberty.

### **Staying Healthy**

Pupils identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. They can recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. They describe the ways in which nutrients and water are transported within animals, including humans.

### **Changing Materials**

Pupils compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets. They know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution. They use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. Pupils give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. They demonstrate that dissolving, mixing and changes of state are reversible changes and 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 and the action of acid on bicarbonate of soda. Pupils find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

## **Earth and Space**

Pupils describe the movement of the Earth, and other planets, relative to the Sun in the solar system. They can describe the movement of the Moon relative to the Earth and describe the Sun, Earth and Moon as approximately spherical bodies. Pupils use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. Pupils find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

## **Light**

Pupils recognise that light appears to travel in straight lines. They use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. They 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. Pupils use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. They could extend their experience of light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters

## **Year 6**

Pupils will revise units previously taught in KS2.

## **Classification**

Pupils describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals. They should be aware that these grouping can be subdivided further. Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). They discuss reasons why living things are placed in one group and not another. Pupils find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.

## **Evolution and Adaptation**

Pupils recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. They recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. They identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution, for example, by exploring how giraffes' necks got longer, or the development of insulating fur on the arctic fox. Pupils find out about the work of

palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.

### **Electricity**

Pupils construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers and motors. They associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. They 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. Pupils use recognised symbols when representing a simple circuit in a diagram.

### **Forces**

Pupils explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. They raise questions about the effects of air resistance on falling objects, for example by observing how different objects such as parachutes and sycamore seeds fall. They experience forces that make things begin to move, get faster or slow down. Pupils explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. They also explore the effects of levers, pulleys and simple machines on movement. Pupils find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

E. Noble / W. Begum September 2017