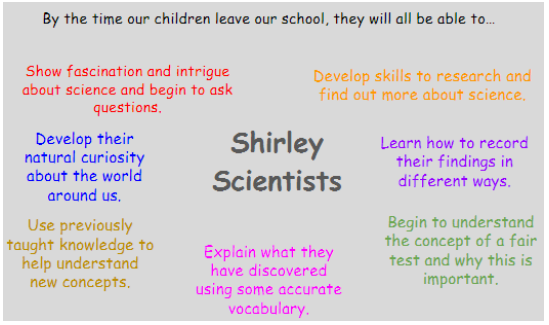
Science

Shirley Infant School

Subject Design



Science Pedagogy in Shirley Infant School

Science in Shirley is based upon the natural **curiosity** that children have. We want our children to experience and observe a range of science within our school and ensure that they will become a Shirley Scientist! Our children learn the skills needed to access Science using their knowledge of how to Work Scientifically and be able to say '**I know how to….**' They also need Substantive **Knowledge** (Domains) of science facts and knowledge of '**I know that…**'. We aim to ensure that both parts of the science pedagogy are taught simultaneously to complement each other.

We aim to teach scientific concepts with first-hand practical experiences, direct teaching, as well as using some appropriate secondary sources, such as books, photographs, trips and videos to support children's learning. The children have opportunities to develop their understanding of a range of scientific ideas by using different types of scientific enquiry to answer their own questions. These include, observing changes over a period of time, noticing patterns, recording, making links as well as grouping and classifying things.

Lessons are planned carefully during the year from the National Curriculum and Development Matters to show progression from each year group. When planning where and how we want to teach the different science subjects, we make links between concepts, prior knowledge, and also take into account the time of the year and weather limitations etc…

We are now starting to use some of Rosenshines' principles in our teaching and each lesson is planned accordingly.

Prior knowledge – making sure the children are properly equipped for learning the new concept/idea.

Teach – Learning the new concept/idea and seeing it in action (aiming to prove).

Apply – Challenging the children to question the idea and use the idea to solve a problem.

Regular Reviews - To check the learning has been embedded into working and ultimately, long term memory.

A Shirley School Scientist…

In our Shirley Schools, we believe that Science is a process of **exploration**, of **finding out more** about the world in which we live and of **making sense** of it in a logical coherent way. Science involves the **development** of **skills, knowledge, concepts** and **attitudes**. The Shirley Schools recognise that children live in an age of fast-moving science and we believe that this area of learning is fundamental to **exploring, understanding** and **influencing** the world in which we live. We offer our children a wealth of **experiences** and develop **ideas** that encourage their **natural curiosity and creativity, inspiring awe and wonder**. Our children gain their scientific knowledge through a mixture of explicit Science sessions and working scientifically across the curriculum. Science in the Shirley Schools supports the development and advances in **technology** and we learn how these lead to new scientific discoveries which shape how we live **safe and healthy lives** in our changing world.

Moving forward- my vision and how it relates to Science

Focussing on the skills of EAL children to learn and retain new vocabulary, the research has allowed school to change aspects of our provision to support the children (and their families).

Naldic 2011

- Science can be a challenge for primary teachers unless they have adequate resources for investigative work.
- It is important in the EYFS and UTW to be a very practical experience.
- Reporting back should be visual as well as verbal. Using camera and Ipads to record pictures and videos.
- Rhymes, songs, games and good quality stories have a role to play in developing language skills alongside scientific understanding.
- In KS1, some EAL chn will not have experienced the learning through play approach and so will need to have direct and practical experiences provided in school.
- Teachers need to model scientific language so chn can move from everyday language to more specialised scientific vocabulary.
- Drama, mime, art or music can be used to show some scientific understanding.

Sword 2021

- Chn can become conversationally fluent in a second language in two to three years but they can take four to eight years to catch up with monolinguals in academic contexts.
- Use labelled images and videos and print images out for chn to stick in their books to refer to.
- Sit them near the front and consider who they sit next to.
- Group work increases student engagement.
- When you ask a question, give chn an extra three to five seconds to think before they answer.
- Use sentence frames to scaffold the chns' responses.
- If your EAL chn are given the learning materials in advance it increases the likelihood that they will understand the lesson and their confidence will be boosted.
- Communicate with home and give parents useful websites they can use with their chn to support the learning in school.

Reflections on what we currently do well

- Practical experiences and learning through play in Year R.
- Talk partners and group work activities take place.
- Pictures in science sessions are used in most sessions.
- Careful questioning to chn within lessons.

What I would like to implement (short term)

- Change pictures from illustrations to real life photographs.
- Send home vocab mats, photographs and where possible, links to suitable websites for parents to share with their chn before the new topic starts.
- Give chn access to the Ipads to be able to record their work if suitable to the topic.

Long term impact

- More EAL chn will be assessed as ARE and not Below.
- Teachers will increase their skill set to teach EAL chn in a more practical and interactive way.

Concepts (taken from the National Curriculum)

Working scientifically 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 Statutory Requirements

Plants	Pupils should be taught to: -identify and name a variety of common wild and garden plants, including deciduous and evergreen trees; -identify and describe the basic structure of a variety of common flowering plants, including trees.
Animals, including humans	Pupils should be taught to: - identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals - 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 (fish, amphibians, reptiles, birds and mammals, 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
Everyday 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
Seasonal Changes	Pupils should be taught to: - observe changes across the four seasons - observe and describe weather associated with the seasons and how day length varies.

YEAR 2 Statutory Requirements

Living things and their habitats	Pupils should be taught to: - explore and compare the differences between things that are living, 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 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.
Plants	Pupils should be taught to: - 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.

Animals, including humans	Pupils should be taught to: - notice that animals, including humans, have offspring which grow into adults - find out about 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.
Uses of everyday materials	Pupils should be taught to: - identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses - find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Topic Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
R	**Dinosaurs** Archaeologist digging for fossils.	**Pets** Pets at home visit Animals into school	**People who help us** Hospital Day Visitors from various people who help us	**Animals and their babies** Farm visit	**Let's Pretend** Hawthorne Centre Trip	**Commotion in the Ocean** Aquarium trip?
E L G	***"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."***					
1	**Everyday Materials** Exploring materials and their properties.	**Animals** Zoo Lab visit Sorting animals into groups and naming body parts	**Seasonal Change and Weather** Change over time. Looking at different weather.	**Humans** Senses and parts of our bodies. Staying healthy	**Plants** Label plants, identify trees, Plant and grow a bean. Record results over time.	**Minibeasts** Hilliers Trip Pond dipping Sorting insects, labelling,
2	**Plants** Explore local environment. Grow a selection of seeds/ bulbs and observe and compare.	**Experimenting and recording results through a selection of awe and wonder activities**	**Animals (Humans)** Change over time, eating healthily and exercise	**Uses of Everyday Materials** Changes in materials	**MOOT** science to explore electricity, floating and sinking, forces, light and dark	**Animals and their habitats** Marwell Trip Observing animals, sorting and classifying according to criteria

4 Knowledge Overview

Shirley Schools Knowledge Progression Year R - Year 6

Sticky knowledge required for B20% children

Biology			
	Animals including humans	Plants	Living things and their habitats
EYFS	Use our senses to explore the world and describe what we can see, hear, feel, smell and taste around school.	Name and describe some familiar plants and animals we have around our school grounds.	Life cycle of chicks - observe changes from egg to chick Visit from farm - use senses to describe and observe the animals.
Year 1	Recognise and name body parts on animals. Identify and name animals, including fish, amphibians, reptiles, birds and mammals. Use language of carnivores, herbivores and omnivores to classify animals. Describe and compare the structure of a variety of different animals	Identify and describe the structure of a variety of common flowering plants and trees. Name and identify a range of plants including deciduous and evergreen. Classify plants as deciduous or evergreen.	
Year 2	Describe the importance of exercise, healthy eating and hygiene for humans. Compare differences between living things, non-living things and things that have been alive. Describe what living means. Explain the basic needs of humans (water, food, air). Understand that living things grow and reproduce. Recognise that humans have offspring which grow into adults.	Observe and describe how seeds and bulbs grow into mature plants considering what healthy plants need to grow.	Identify that most living things live in habitats to which they are suited. Match animals/plants to their habitats. Explore different habitats and describe how the habitat provides for the needs of the animals.

Year 3	-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. -identify different types of teeth in humans and their simple functions. - identify that animals, including humans, need the right types and amounts of nutrition which they get from what they eat.	-identify and describe the functions of different parts of flowering plants. -explore requirements of plants for life and growth. -investigate the way water is transported within plants. -explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.	
Year 4			- recognise that living things can be grouped in a variety of ways. -explore and use classification keys to help group, identify and name a variety of living things. - recognise that environments can change and this can sometimes pose dangers to living things. - construct and interpret a variety of food chains including predator, producer and prey
Year 5	-describe the changes as humans develop to old age. -describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird -describe the life process of reproduction in some plants and animals		

Year 6	-identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. -recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.		-describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals. -give reasons for classifying plants and animals based on specific characteristics. -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. -identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

Chemistry

	Materials	States of Matter	Rocks
EYFS	Understands that different media can be combined to create new effects. (EAD) Manipulates materials to achieve a planned effect. (EAD) Constructs with a purpose in mind, using a variety of resources (EAD)		
Year 1	Identify and name a variety of materials, including wood, plastic, glass, metal, water and rock. Describe materials by saying what they look and feel like. Describe the physical properties of materials (strong, flexible, etc.). Compare and group materials based on properties. Begin to give reasons for why or why not a material may be suitable for a particular purpose.		
Year 2	Identify a range of common materials and identify their properties. Compare materials. Group materials in a variety of ways.	Know that some changes can be reversed - and some can not.	

	Consider the suitability of materials for particular uses. Explore how different materials can be changed by squashing, bending, twisting and stretching. Describe the process required to change materials. Give reasons for the way materials have been grouped.		
Year 3			compare and group together different types of rocks -recognise that soils are made -from rocks and organic matter
Year 4		- 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 or research the temperature at which this happens in degrees Celsius (°C)	
Year 5	-compare and group together everyday materials on the basis of their properties (solubility, transparency, conductivity and their response to magnets -know that some materials will dissolve in liquid to form a solution. -use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering and sieving.	identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	

	-demonstrate that mixing and changes of state are reversible changes. -explain that some changes result in the formation of new materials, and this kind of change is usually irreversible (including changes associated with burning).		
Year 6			Fossils

Physics - The World Around Us

	Changes	Earth and Space	Light
EYFS	Explore the natural world around them - observe and interact with natural processes (ice melting/ floating and sinking objects). Understand that the seasons change and observe how our outside environment changes - what happens to the trees/ leaves? Read stories/ texts set in different places/ weather systems.		Explore how to make a shadow. Explore torches and colour fans to find out how the light changes.
Year 1	Describe and compare changes and weather in four seasons. Compare how length of day varies within the different seasons. Opportunity to link to clothing through seasonal changes	*(The moon landings are taught as a history unit and chn do their own research about the moon and space in general).*	
Year 2	In relation to materials topic, apply knowledge of seasons, e.g. different temperatures.		
Year 3			-recognise that they need light to see things and that the dark is the absence of light. -notice that light is reflected from surfaces

			-recognise that shadows are formed when the light from a light source is blocked by an opaque object. -recognise that light appears to travel in straight lines -explain why objects are seen because they give out or reflect light into the eye (understand) -explain that we can see things because light travels from a light source to our eyes, or a light source to an object to our eyes.
Year 4			
Year 5		-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.	
Year 6			recapping light objectives (taught in Y3) to design a lighting set for final production. -use the idea that light travels in a straight line to explain why shadows have the same shape as the objects that cast them.

Everyday Physics

	Forces and Magnets	Sound	Electricity
EYFS	Exploration of magnets during MOOT Know that the higher the ramp, the fastest/ furthest the emergency vehicle will travel	Musical instruments available to differentiate between different kinds of sounds	
Year 1	Continue exploration of magnets during Materials term.		
Year 2			
Year 3			-find common appliances that run on electricity. - construct a simple series electrical circuit and identify whether a lamp will light or not. -recognise the use of a switch and add to their circuit. -recognise common conductors and insulators and associate metals being good conductors. -use recognised scientific symbols when representing a diagram in a circuit.
Year 4	-compare how things move on different surfaces.- notice that forces need contact, but magnets can create force at a distance.	- identify how sounds are made, associating them with something vibrating.	

	- observe magnets attracting and repelling. - describe magnets as having two poles. -predict whether two magnets will attract or repel depending on which poles are facing.	- recognise that vibrations and sounds travel from a medium to the ear. - find patterns between the pitch of a sound and the features of the object that produces it. -find patterns between the volume of the sound and the strength of the vibrations that produced it. -recognise that sounds get fainter as the distance from the sound source increases.	
Year 5	-explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. -identify the effects of air resistance, water resistance and friction, that act between moving surfaces. -recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect		
Year 6			Revisit of Year 3 electricity objectives as a refresh ahead of It's a Wrap! -find common appliances that run on electricity. - construct a simple series electrical circuit and identify whether a lamp will light or not. -recognise the use of a switch and add to their circuit.

			-recognise common conductors and insulators and associate metals being good conductors. -use recognised scientific symbols when representing a diagram in a circuit.

8. Subject Specific Enhancements

Science Days/Week-

These occur annually and can be in line with the National Science Week or a 'stand alone' school focus. We come off timetable and focus solely on Science activities. The Science leader will provide resources and ideas to choose and share with the children. There will also be a link home to families so they can get involved.

To support the science day/ week we have had outside agencies into school to provide shows/ hands-on experiments/ workshops (class or year group) etc.

Trips-

Year R

- Visit to the school pond and grounds for their Understanding the World learning objectives. This will happen throughout the year to see change over time, minibeasts, plants and trees and how the weather affects our surroundings.
- Teddy Bear's picnic visit to the Common to discuss how animals and plants grow and survive.
- Visit from Dinosaur Dave to explore fossils and learn how to dig for them.
- Trip to Pets at Home and visits arranged from parents and staff with their pets.
- Teddy Bear Hospital. Student doctors come into school to help chn look after their teddy bears and to find out how to look after our bodies too.
- Hospital Day. A year group role playing scenario on the different ways our hospitals can look after us.
- Farm visit into school field for chn to have hands-on animal experience. The farm leaves eggs for us to hatch and each class looks after the chicks.

Year 1

- Visit from Zoo Labs to support the Animals topic.

- Trip to Hillier's Garden Centre to focus on Minibeasts and Growing Plants.
- Use of school grounds to support topics should be happening within the science sessions.
- Children grow caterpillars into butterflies and release them into the school grounds.
- Bean in a bag growing activity

Year 2

- Use of school grounds to support growing/ habitat topics.
- Marwell Zoo trip to support animals and their habitats.
- Flowers grown in class can be taken home.