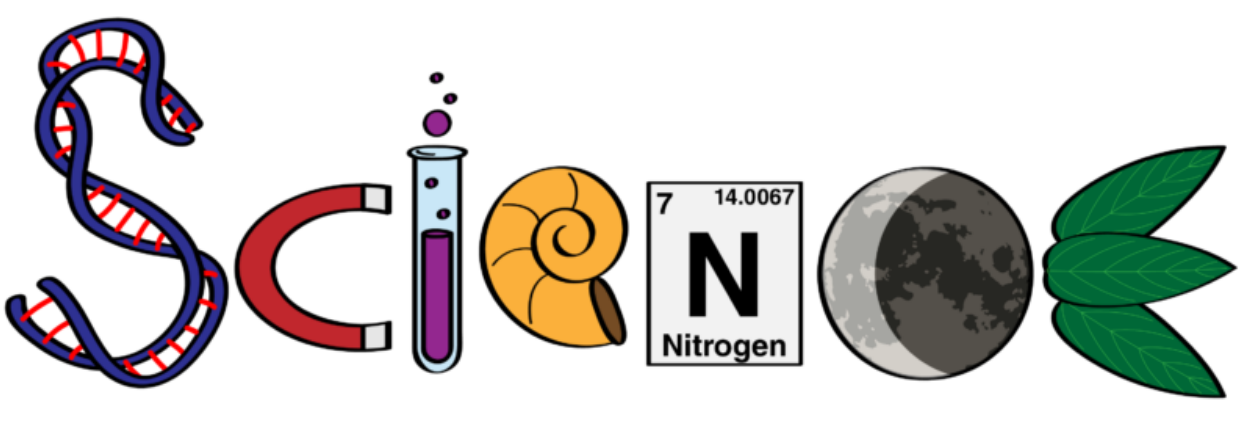
A Guide to Science at Raynville



This document outlines the expectations of how we teach and monitor the Science curriculum at Raynville Academy, ensuring progression across year groups and consistency across the school.

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Teaching Science at Raynville Academy

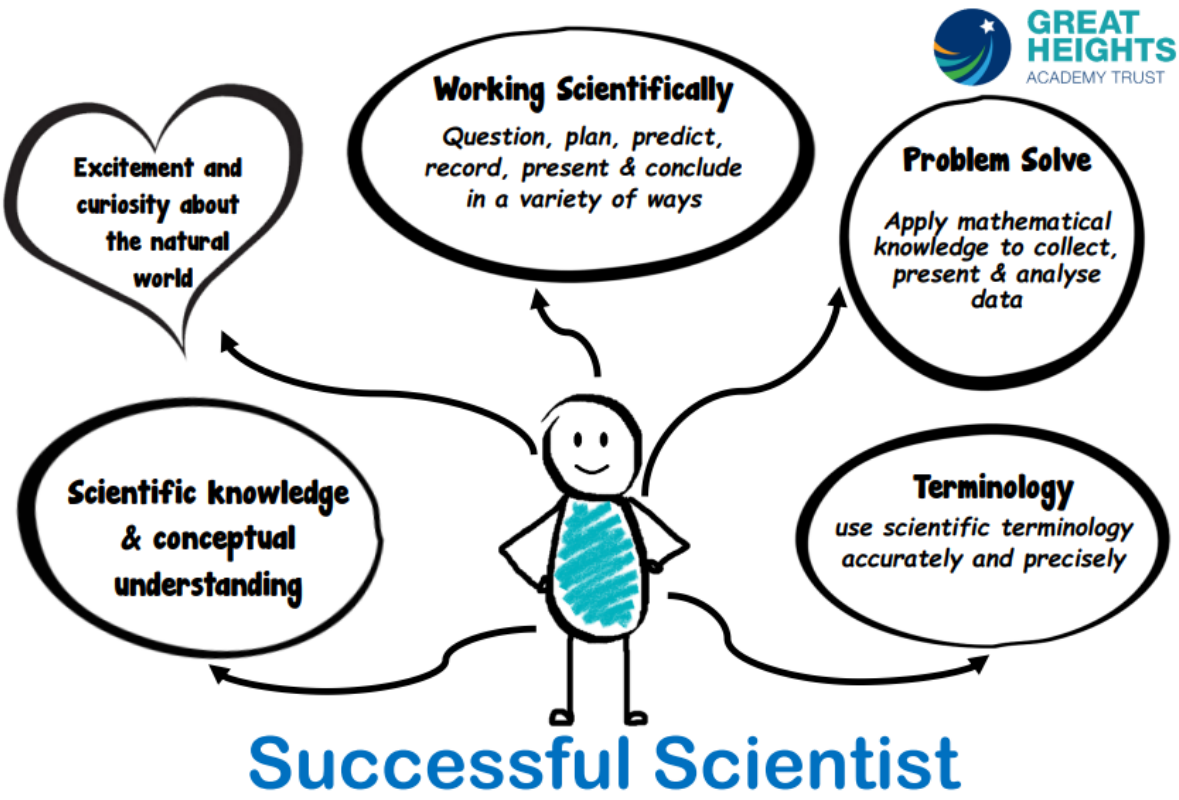
Intent

Science Curriculum Statement

The 2014 National Curriculum for Science aims to ensure that all pupils:

● 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 skills required to understand the uses and implications of science, today and for the future.

At Raynville, we aim to inspire and challenge our children in their scientific learning, and foster a healthy curiosity about the world around us. We want our children to become independent, resilient leaners and we provide a rich and inclusive curriculum to facilitate this. Our Science curriculum aims to inspire children in their STEM learning, promoting respect for our world. We believe science encompasses the acquisition of knowledge, concepts, skills and positive attitudes. The curriculum is designed to ensure that children can acquire key scientific knowledge through practical experiences: using equipment, conducting experiments, building arguments and explaining concepts confidently.



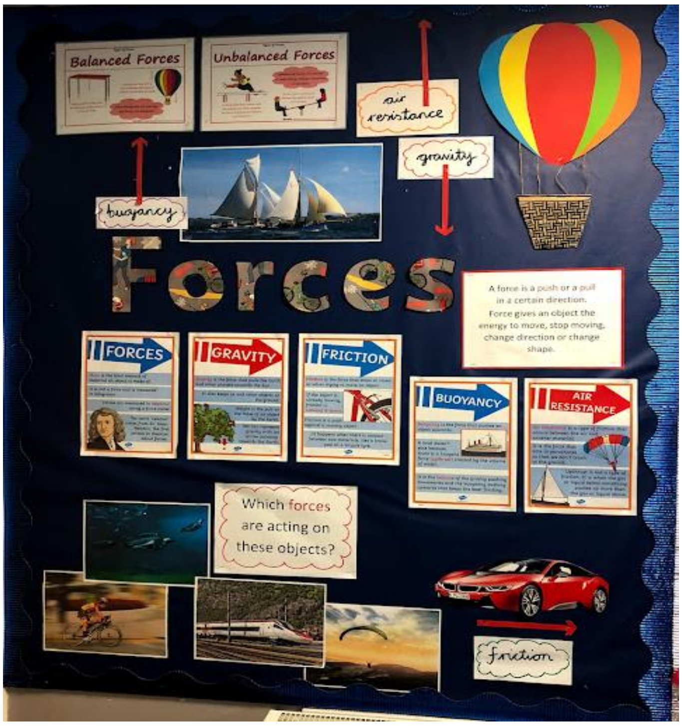
Implementation:

Science Teaching and Learning:

Throughout the whole School:

- Every Science lesson is to begin with an ‘enquiry question’ that enables all children to access learning that is challenging during the lesson. These are to be presented beneath the date at the start of each new piece of work. There is no need to write or print WALTs or LOs on worksheets.
- Science lessons are to be as practically-based as possible, with an emphasis on ‘hands-on’ learning through experiments and investigation. Children will conduct their own experiments, either individually or as part of a pair/group, and where this is not possible/safe a teacher demonstration of a practical experiment will take place instead.
- The vocabulary, facts and information from the Knowledge Organiser are to be used in lesson time and in oral and written responses to tasks.
- The ‘Working Scientifically’ skills run throughout each topic, and are covered over the course of each year.
- Lessons should not be differentiated unless there is an obvious need to do so (EAL, SEN or other specific learning need). In Science teaching, it is important that teaching is pitched as much as possible to ensure that **all** children can access **all** of the content during lessons.
- Active Listening and Skilled Speaking will be promoted in every lesson in line with school policy. It is very important that children can explain why they are investigating something and what the outcome was.
- Presentation must be excellent in all units of work, in all lessons and at all times.
- All Science work will be completed in Science books. Where a sheet of paper is used, this will be neatly glued in to the Science book.
- Each classroom will have a Science display which will be on the topic being studied currently in that half term. This will be used as a stimulus for the topic, and may include photographs, pictures, diagrams, books, artefacts, enquiry questions, challenge activities and key information (from the Knowledge Organiser).


The Beagle was a British naval vessel, aboard which Charles Darwin served as naturalist on a voyage to South America and around the world (1831-36). The specimens and observations accumulated on this voyage gave Darwin the essential materials for his theory of evolution by natural selection.
Who were Charles Darwin and Mary Anning?
Mary Anning, a pioneering palaeontologist and fossil collector, became known around the world for finds she made in Jurassic marine fossil beds in the cliffs at Lyme Regis, Dorset, England.
What is inheritance and can I identify inherited characteristics?
EVOLUTION AND INHERITANCE
fossil
How do plants and animals adapt to suit their habitats?
offspring
How do animals' adaptations secure their survival?
natural selection
evolution
habitat
Animals and plants adapt to their environment; over time adaptation may lead to EVOLUTION.
environment
evolve
adaptation
adaptive traits
variation
inherited traits


Balanced Forces
Unbalanced Forces
air resistance
gravity
buoyancy
Forces
A force is a push or a pull in a certain direction. Force gives an object the energy to move, stop moving, change direction or change shape.
FORCES
GRAVITY
FRICTION
BUOYANCY
AIR RESISTANCE
Which forces are acting on these objects?
friction


Food Chains
science
food chain
omnivore
herbivore
carnivore
Raspberries (producer)
Mouse (consumer)
Fox (predator)
Acorn (producer)
Red squirrel (consumer)
Owl (predator)
producers
consumers
predators

Key Stage 1

The principal focus of science teaching in key stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly-constructed world around them. Children are encouraged to be curious and ask questions about what they notice. We help them 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.

Children 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 is done through the use of first-hand practical experiences, but we also make use of appropriate secondary sources, such as books, photographs and videos. 'Working scientifically' is described separately below, but is always taught through and clearly related to the teaching of substantive science content in our curriculum. Children are taught to read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

Working Scientifically in Key Stage 1:
During years 1 and 2, pupils are taught to use the following practical scientific methods, processes and skills:

- ♣ 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.

Lower Key Stage 2

The principal focus of our science teaching in lower key stage 2 is to enable pupils to 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 are taught to draw simple conclusions and use some scientific language to talk and write about their findings. 'Working scientifically' is always taught through substantive science content in the curriculum. Children read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

Working Scientifically in Lower Key Stage 2:
During years 3 and 4, pupils are taught to use the following practical scientific methods, processes and skills:

♣ 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.

Upper Key Stage 2:

The principal focus of science teaching in upper key stage 2 is to enable children to 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 also begin to recognise that scientific ideas change and develop over time. They 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. Children 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. 'Working and thinking scientifically' is described separately below, but is always taught through and clearly related to substantive science content in our curriculum. Pupils should read, spell and pronounce scientific vocabulary correctly.

Working Scientifically in Upper Key Stage 2:

During years 5 and 6, children are taught to use the following practical scientific methods, processes and skills:

♣ 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

Curriculum coverage throughout school – see **Appendix 1**

Progression of skills throughout school – see **Appendix 2**

Impact

Science Assessment:

- Every Science topic will have a **'Front Cover'** with the tile of the unit, enquiry questions, objectives for the unit and the 'Working Scientifically' objectives listed. This will be glued in to the Science book at the start of each unit.

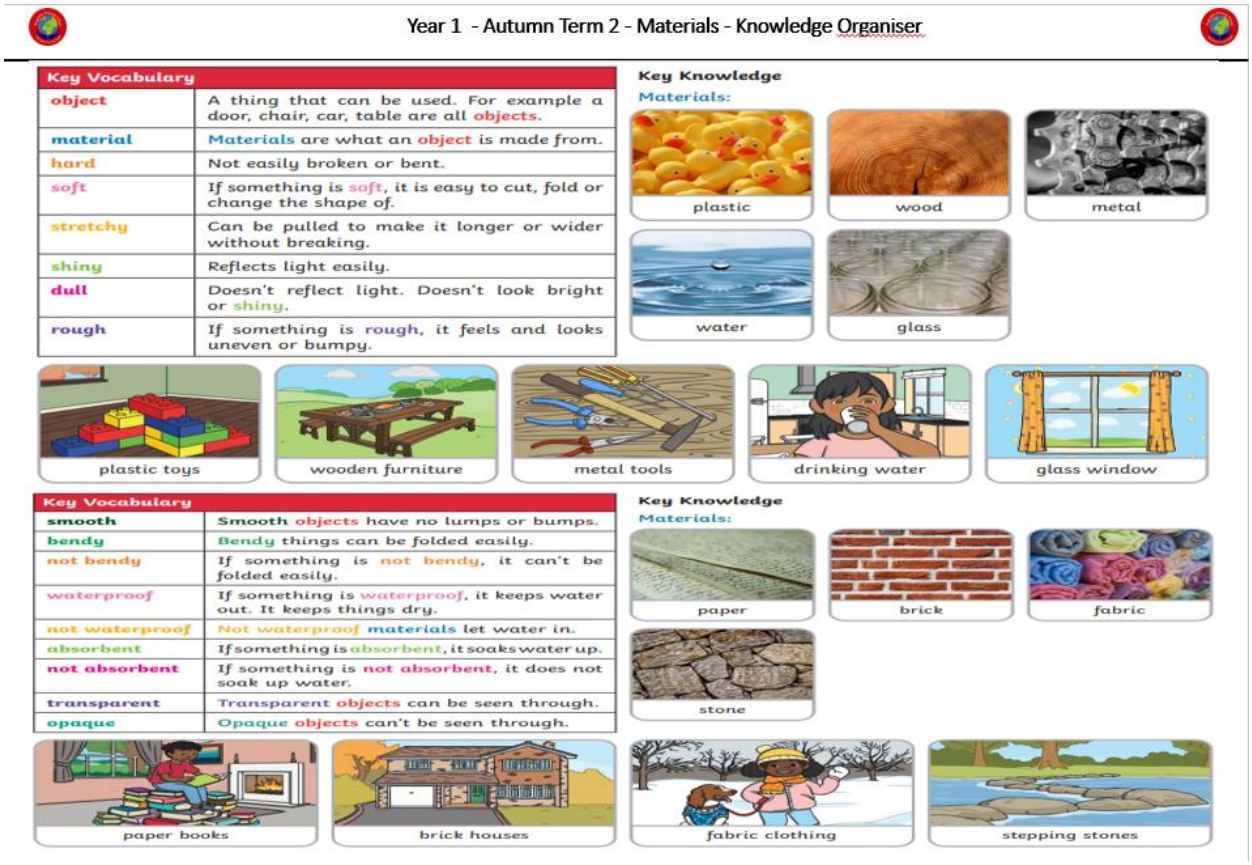
National Curriculum Objectives for this topic:
▪ associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
▪ compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
▪ use recognised symbols when representing a simple circuit in a diagram.

Enquiry Questions	Assessment
What do I know about electricity?	
How do we scientifically show electrical circuits?	
What makes a complete circuit?	
Does the amount of cells affect the brightness of the bulbs?	
Is the brightness of the bulb affected when more bulbs are added?	
Does the thickness of the wire affect the speed of the motor?	

- After each enquiry, the teacher must highlight the **enquiry question** at the start of the piece of work and on the front cover in GREEN if

the pupil has achieved the learning expected for the lesson, or ORANGE if they have not met the learning for the lesson.

- All children are expected to know **most** of the facts stated on the **Knowledge Organiser** for the unit being studied and be able to use the vocabulary in speech and writing.



Year 1 - Autumn Term 2 - Materials - Knowledge Organiser

Key Vocabulary	
object	A thing that can be used. For example a door, chair, car, table are all objects.
material	Materials are what an object is made from.
hard	Not easily broken or bent.
soft	If something is soft, it is easy to cut, fold or change the shape of.
stretchy	Can be pulled to make it longer or wider without breaking.
shiny	Reflects light easily.
dull	Doesn't reflect light. Doesn't look bright or shiny.
rough	If something is rough, it feels and looks uneven or bumpy.

Key Knowledge

Materials:

plastic

wood

metal

water

glass

plastic toys

wooden furniture

metal tools

drinking water

glass window

Key Vocabulary	
smooth	Smooth objects have no lumps or bumps.
bendy	Bendy things can be folded easily.
not bendy	If something is not bendy, it can't be folded easily.
waterproof	If something is waterproof, it keeps water out. It keeps things dry.
not waterproof	Not waterproof materials let water in.
absorbent	If something is absorbent, it soaks water up.
not absorbent	If something is not absorbent, it does not soak up water.
transparent	Transparent objects can be seen through.
opaque	Opaque objects can't be seen through.

Key Knowledge

Materials:

paper

brick

fabric

stone

paper books

brick houses

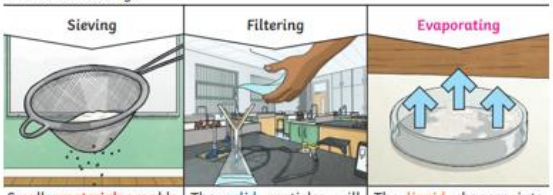
fabric clothing

stepping stones

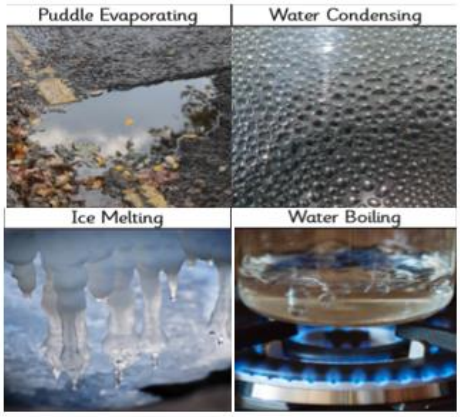
Year 5 - Autumn 2 – Properties and Changes of Materials Part 1 - Knowledge Organiser

Reversible Changes

Reversible changes, such as mixing and dissolving solids and liquids together, can be reversed by:



Sieving	Filtering	Evaporating
Smaller materials are able to fall through the holes in the sieve, separating them from larger particles.	The solid particles will get caught in the filter paper but the liquid will be able to get through.	The liquid changes into a gas, leaving the solid particles behind.



Key Knowledge

Different materials are used for particular jobs based on their properties: electrical conductivity, flexibility, hardness, insulators, magnetism, solubility, thermal conductivity, transparency.

For example, glass is used for windows because it is hard and transparent. Oven gloves are made from a thermal insulator to keep the heat from burning your hand.

Key Vocabulary

filtering	Removing small particles of insoluble material or undissolved material from a liquid, usually by using a barrier with very small holes such as filter paper.
sieving	Removing particles of insoluble or undissolved material from a liquid, usually by using a barrier with small to medium-sized holes.
melting	The process by which a solid turns into a liquid due to an increase in energy in its particles.
irreversible change	A chemical change where new materials are created and the original materials cannot be recovered.
reversible change	A chemical change where no new materials are created, and the original materials can be recovered.
conductor	A conductor is a material that heat or electricity can easily travel through. Most metals are both thermal conductors and electrical conductors.
insulator	An insulator is a material that does not let heat or electricity travel through them. Wood and plastic are both thermal and electrical insulators.
transparency	A transparent object lets light through so the object can be looked through, for example glass or some plastics.

- Children will regularly use the **Science Investigation Sheet** to structure their experiments, and will complete a write-up using this format at least once every half term. There are 3 levels of this (Y1/2, Y3/4, Y5/6), and these build on prior learning across the phases. This structure enables children to ask a question, make a prediction, decide on their equipment, conduct the experiment, record results, present data and draw conclusions from their findings. They can also link their conclusion to their prediction to see how accurate they were.

Science Investigation Plan
Aim
Prediction
Equipment
Method
Fair Test
Results
Conclusion

- Spelling mistakes should focus on the correct spelling of scientific vocabulary, but should be limited to 3 per piece of work.
- All planning, Knowledge Organisers, Front Covers and resources are saved in the Science Folder on the Shared Area, along with photographic or video evidence of Science teaching and learning.

Resources:

Resources are stored in the KS2 building in the Science Store, and in specific topic boxes in classroom cupboards. Planning, policy documentation, proformas and evidence are stored on the whole-school shared area (S:drive – Whole School Resources – Science). In addition to practical resources, we endeavor to use a range of ICT resources to effectively enhance our curriculum wherever possible.

Monitoring and Evidence:

- Science book scrutiny is conducted every half term to look for coverage and progression in each class.
- Pupil interviews are conducted and analysed to inform future teaching and experiences.
- This evidence is stored electronically on school's S:drive.