

Science Handbook

Approved by: Headteacher & SLT

Last reviewed: April 2022

Next review: July 2023

Intent

To give children a Science curriculum which enables them to confidently explore and discover the world around them so that they have a deeper understanding of the world they live in through pupil led investigations.

Implementation

Why has the specific content knowledge been selected?

The National Curriculum provides the foundations for understanding the world through the specific disciplines of Biology, Chemistry and Physics. Through questioning, investigating and analysing, children at Gaskell will develop the skills needed to become inquisitive learners whilst learning about key scientific processes. In order to expand our children's vocabulary, encourage divergent thinking and provide opportunities for pupil-lead investigations, we have put together a curriculum that is well-sequenced, with clear progression and end points which will inspire and enhance long term memory.

Why is it taught in the order that it is?

The Science curriculum at Gaskell follows a sequence of knowledge and concepts. A gradual build-up across years allows these scientific concepts to become more embedded in our children's long term memory whilst also avoiding misconceptions. Our Science curriculum focuses on many topics linked to the three strands on science. In EYFS/KS1, children are encouraged to explore, observe and question through topics such as Plants, Animals and Materials. This naturally progresses through to KS2 where children are taught to explain, conclude and predict scientifically; learning about topics such as Electricity, Forces and Space. Animals and Humans is a topic which runs through the Gaskell curriculum and has a focus in every year.

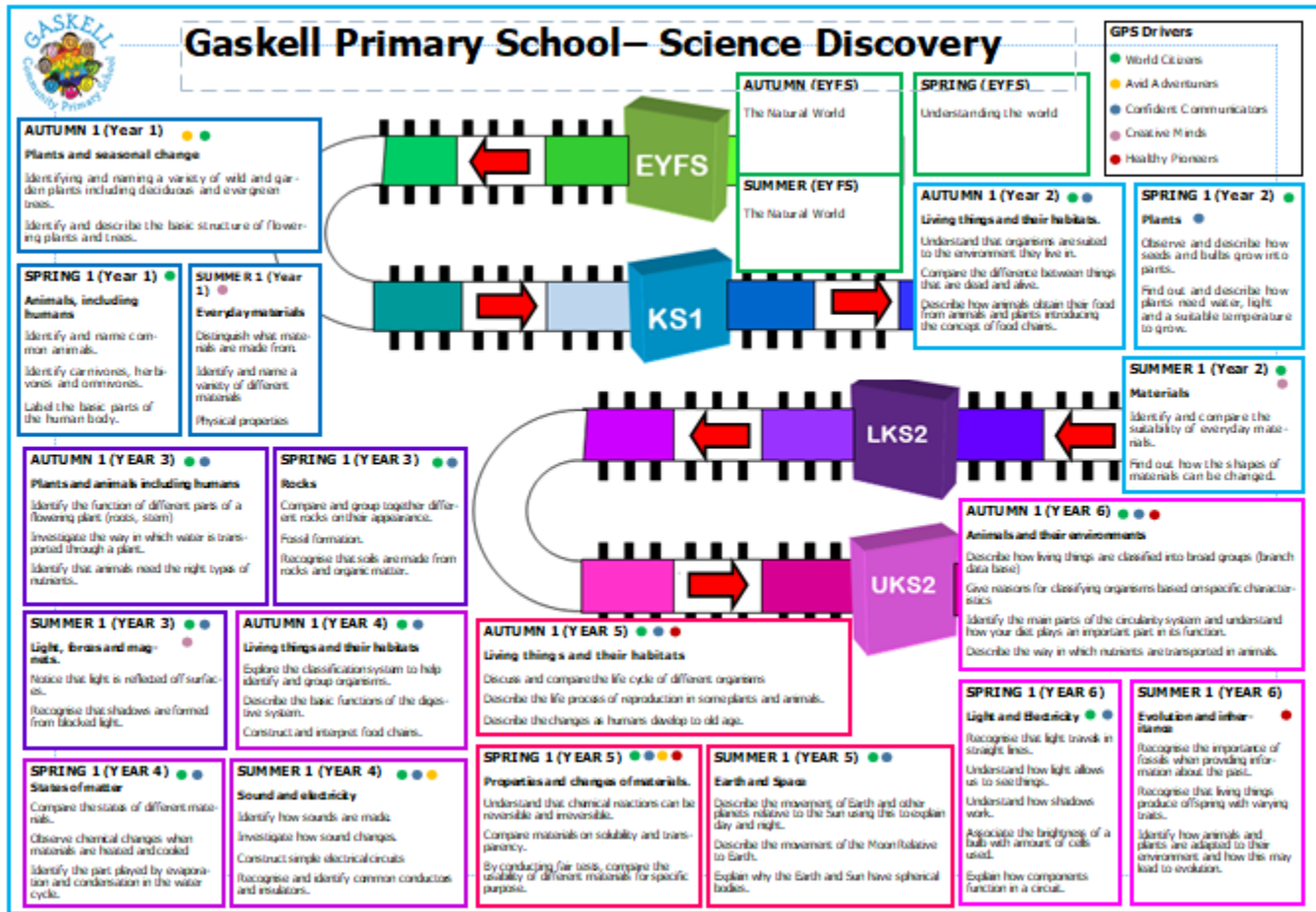
How are Science lessons taught at Gaskell Primary School?

At Gaskell, Science lessons are taught in such a way that by the end of each topic, the children are confident with their key vocabulary, have learnt and explored different scientific concepts and have had an opportunity to investigate a particular area of learning. Through constant questioning and recapping, the children can confidently progress through Gaskell developing key concepts and skills. As well as this, throughout each science topic, there is a book link which either helps support scientific understanding or is linked to a specific scientist. This aims to further support our children's understanding of science through the love of reading.

Impact

We ensure that children at our school are equipped with the scientific skills and knowledge that will enable them to be ready for the curriculum at Key Stage 3 and for life as an adult in the wider world. We want our children to have a passion for Science, and to understand the prospect that they could have a career in this particular field. By the end of year 6, we want our children to be able to confidently question, analyse and investigate scientifically and apply these skills to many different scientific concepts.

Curriculum Structure






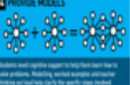







There are key themes that run through the Science curriculum including Living things and their environments, Plants and Animals (including humans), Materials and Light and Electricity. Throughout each year, content from each of these topics are appropriately taught in such a way that the children are able to build their understanding both academically and through learning specific scientific skills.

How do I sequence Science lessons at Gaskell?

- The first lesson of any Science Topic should include a 'hook' aimed at inspiring and grabbing the children's interests. This should be followed by a vocab focus, where the children should be introduced to the key vocabulary linked to their topic. This should be displayed on the Science Working Wall.
- Lessons 2-5 should provide children the opportunity to question, and investigate their science topic whilst learning the information and knowledge required in reference to the National Curriculum. <https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study>
- Lesson 6-7 should give an opportunity for the children to present, investigate or evaluate an aspect of their topic in the form of a recorded end point.

Planning

When planning Science at Gaskell, both Rosenshein’s principles and Gaskell’s drivers are embedded throughout all lessons to ensure that children understand that when they leave Gaskell, they have experienced essential life skills such as being a confident communicator and healthy pioneers. Below, is the template used to plan a unit of Science where both can be clearly identified and implemented into every lesson.

Rosenshine Principles	 <small>10 WEEKLY & MONTHLY REVIEW</small> <small>The effectiveness of learning is greatly enhanced by reviewing what has been learned. Reviewing should be done frequently and should be done in a variety of ways.</small>	 <small>11 NEW MATERIAL IN SMALL STEPS</small> <small>To make learning easier, new material should be presented in small steps. Each step should be mastered before moving on to the next step.</small>	 <small>12 ASK QUESTIONS</small> <small>The most excellent teachers spend more than half the class time asking, answering, and clarifying questions. Students learn by asking questions and by answering questions.</small>	 <small>13 PROVIDE MODELS</small> <small>Students learn through models. Models help them to understand abstract concepts. Models can be physical objects, diagrams, or mental images.</small>	 <small>14 GUIDE STUDENT PRACTICE</small> <small>Students need additional time to practice, discuss, and receive feedback on what they have learned. Practice should be done in a variety of ways.</small>	 <small>15 CHECK STUDENT UNDERSTANDING</small> <small>Teachers should check for understanding frequently and in a variety of ways. This can be done through questions, observations, and student work.</small>	 <small>16 SCAFFOLDS FOR DIFFICULT TASKS</small> <small>Effective environments support student learning. They can include modeling, modeling together, and providing additional support for students who are struggling.</small>	 <small>17 INDEPENDENT PRACTICE</small> <small>Independent practice provides reinforcement – a necessary process for new material to be learned successfully. The amount of independent practice should increase over time.</small>
Week 1 To know vocab linked to my topic. 	Quick recap of last Science Topic	Introduce children to new vocab (Hook)	Children are to write a question on a post it note. What would you like to know about your new topic?		Display visual aids to support children’s understanding.	Vocab Bingo	Demonstrate using a Dictionary.	Children are to work independently when defining words.
Week 2 To know how light travels through air. 	Vocab recap – hide the definition game.	Show children video showing light travelling through air. Explain to children why this happens and support explanation with a diagram.	How does light travel? How are we able to see things? How fast does light travel?	Show children diagram showing light travelling in straight lines	Provide some children with diagram that can be annotated or completed	Get children to complete the lines. Allow children to explain to partner how light travels through air.	When explaining how light travels, provide children with vocab bank to support their explanation.	Children are to either draw lines on diagram or write up explanation in their books.
Week 3 To prove that light travels in straight lines. (investigation) 	Display diagram on board. With a partner, children are to articulate the movement of light from the light source to the object	Allow time for children to come up with and investigation to prove that light travels in straight lines.	How can we test this hypothesis?	Provide children with an investigation planning sheet.	Guided some children by helping them with their hypothesis and method.	Allow time at the end for children to explain their experiment and findings	Provide an investigation planning sheet.	Children are to create an investigation that they are going to plan and carry out to show light travels in straight lines.

Investigations are extremely important in Science as it can help when embedding long term memory. For each topic, teachers should aim to carry out at least two investigations. In KS2, teachers should encourage pupil lead investigations or should promote independence when planning and carrying out investigations – however this may need some scaffolding and support. As well as subject knowledge, it is vital that the children are able to develop their skills when working scientifically.

Vocabulary progression through Science

By the end of each Topic, the children at Gaskell should be able to confidently define and use vocab words linked to the subject they are learning and working scientifically (skills). Both should be taught at the start of every Topic and should be recapped during weekly and monthly reviews. Below, this vocabulary-breakdown sheet should be referenced when planning and should be constantly revisited throughout the year.

Year	Working Scientifically	Topic	Key Vocab
1		Plants	deciduous, evergreen, tree, leaf, flower (blossom), petal, fruit, bulb, seed, roots, stem, trunk, branches
		Animals, including humans	amphibians, fish, reptiles, mammals, birds, herbivore, omnivore, carnivore head, nose, ear, neck, shoulder, arm, elbow, wrist, hand, back, chest, hip, leg, knee, ankle, foot, wing, beak, tail, fin, sight, smell, touch, taste, hearing
		Everyday materials	hard, soft, tough, smooth, shiny, dull, bendy, stiff, wood, plastic, glass, paper, metal, rock
		Seasonal changes	season, spring, summer, autumn, winter, month, year, day, night, sun, moon, light, dark
2	Question, answer, observe, observing, equipment, identify, sort, group, compare, differences, similarities, describe, measurements, test, results, secondary sources record – diagram, chart	Plants	growth, germinate, light, temperature reproduction pollinate, fertilise, seed, food, reproduce, adult, baby, offspring, kitten, calf, puppy, food chain, prey, predator, camouflage, protection, exercise, hygiene, balanced, diet
		Animals, including humans	properties, solid, waterproof, absorbent, opaque, transparent, squish, bend, flexible, twist, stretch, push, pull, roll, slide, bounce, block, fabric, elastic, foil
		Everyday materials	living, dead, habitat, microhabitat, woodland, meadow, hedgerow, pond
		Living things and their environment	

Year	Working Scientifically	Topic	Key Vocab
3	oral and written explanations, conclusion, prediction, criteria, classify, changes, data, contrast, evidence, improve, secondary sources, guides, keys, construct, interpret research – relevant question equipment – thermometer data – gather, standard units, record, classify, present record – drawings, labelled diagrams, keys, bar charts, tables	Plants	air, water, transportation, nutrients, soil, reproduction, seed formation, seed dispersal, pollination
		Animals including humans	position, skull, bones, muscles, movement, support, protection, nutrition
		Rocks	sediments, granite, marble, pumice abrasion, crumple, sedimentary, layer, sediment, igneous, magma, lava, gas bubbles (tiny holes/spaces) metamorphic, change, squeeze, pressure, acids, organic matter, fossil, crystal
		Light	light source, mirror, reflect, refractive, reflection, shadow, blocked, transparent, translucent, opaque
4		Forces & magnets	force, contact, surface, magnetic, attract, repel, poles
		Living things & their habitats	vertebrates, invertebrates, environment, habitat, classification key
		Animals including humans	mouth, tongue, teeth, oesophagus, stomach, small intestine, large intestine, nutrients, alcohol, caffeine, nicotine, miles, predator, consumer, apex, predator
		States of matter	solid, liquid, gas, evaporation, condensation, particle, temperature, freezing, heating
		Sound	vibration, wave, volume, pitch, tone, insulation
		Electricity	distance, battery power, main power, circuit, switch, cell, battery, wire, bulb, switch, break in circuit, conductor, insulator

Year	Working Scientifically	Topic	Key vocab
5	plan, variables, measurements, accuracy, precision, repeat readings, predictions, further comparative and fair test, identify, classify and describe, patterns, systematic, quantitative measurements report data – scientific diagrams, labels, classification keys, tables, scatter graphs, bar graph and line graphs report and present – conclusions, causal relationships, explanations, degree of trust, oral and written display and representation evidence – support, refute, ideas or arguments biology, physics, chemistry	Living things and their environment	life process, reproduction, offspring,
		Animals including humans	womb, fetus, embryo, gestation, baby, toddler, teenager, elderly growth, development, puberty
		Properties and changes to materials	hardness, transparency, conductivity (electrical, thermal) solubility, solution dissolve, filter, evaporate, sieve, reversible, irreversible
		Earth and space	Earth, sun, moon, solar system, axis of rotation, day, night, phases of the moon, star, constellation
6		Forces	air resistance, water resistance, friction, gravity lever, gear, pulley, Newtons
		Living things and their environment	characteristic, classification, organism, micro-organism
		Animals including humans	function, circulatory system, heart, valve, blood vessel, vein, artery transport, oxygenated, deoxygenated, identify, drug
		Evolution and inheritance	adaptation, evolution, characteristic, reproduction, genetics, survival
		Light	refraction, reflection, spectrum, rainbow
		Electricity	circuit - series, parallel voltage, volts, amps

Recording Science/Assessment

To ensure consistency across school, Science at Gaskell follows a structured sequence of lessons which allows lots of opportunities for children to work scientifically.

Lesson 1 – Hook and Vocab lesson (Seesaw)

The purpose of this lesson is to inspire and excite the children through an effective hook. This should then develop into vocab focus where the children are first introduced to the key terms for their topic. Both the hook and vocab activity should be recorded through **Seesaw** and vocab words displayed on the **Science working wall** – vocab words should be referred to every lesson.

Lesson 2/3/4/5 – Subject content and investigations (Seesaw)

These lessons should be recorded through **Seesaw**. Videos and voice notes are a great way of recoding the children evaluating and explaining what they have learnt. If work sheets have been used, children should use their I Pads to upload a picture of their work to **Seesaw**. Any posts should have the learning intention as a comment underneath.

Lesson 6/7 – End point/assessment (Science books and Seesaw)

The last lessons of a topic should allow children time to plan and produce an end point. This can be teacher or pupil-lead. End points should showcase the information that the children have learnt in a creative and interesting way. Plans for an end point and end points should be recorded in **Science books** and posted on **Twitter**. By the end of the year, there should be 5 end points displayed in each Science book.

