Science at Minsterley

INTENT STATEMENT

At Minsterley primary school we believe that learning is a change to long term memory. We intend to create knowledge through spaced repetition and backwards and forwards learning. Our curriculum is built around repeated opportunities to strengthen key concepts. Opportunities are provided to revisit these skills within different scientific contexts and other curriculum subjects.

The Science coordinator at Minsterley Primary is Jo Holloway BSc & MSc

The Science link governor at Minsterley Primary is Therese Hillier

The Science Curriculum

Statutory Requirements

Statutory requirements for the teaching and learning of Science are laid out in the National Curriculum in England Framework Document for Teaching, September 2014 and the Statutory framework for the Early Years Foundation Stage, 2021.

Early Years Foundation Stage (EYFS)

Children follow the statutory framework for the early years foundation (2021) programme for science 'understanding the world around us' which is taught as both a discrete subject and within the whole Early Years Curriculum to give children opportunities to use their scientific skills through play and in real life situations.

Key Stage 1 and 2

Across KS1 and KS2 we follow adpated medium-term plans for 'Plymouth Science Scheme of Work' (saved on School server), however teachers have the flexibility to adapt these plans to meet the needs of their class and ensure maximum progress and engagement of all pupils while at the same time ensuring full coverage of the Science National curriculum.

Long Term Plans

Due to the mixed year group classes at Minsterley Primary school, science units are taught by class. This ensures full coverage of the National curriculum by the end of each key stage for every child and builds in repeated opportunities to revisit scientific concepts and key skills. This is in line with our school's ethos regarding learning and with the educational thinking behind the EIF which identifies progress as knowing more and remembering more and the benefits of spaced learning.

KS1 Long Term Plans (linked to medium term plans)

KS1 Long Term Science Plan *These units need to be taught in order, but it doesn't matter if you start teaching the unit early i.e. Start a unit in Autumn term and finish in Spring term*

	Clee	Wrekin
Autumn	**Everyday materials** Y1/YR **Seasonal changes** Y1/YR	**Uses of Everyday Materials** **Seasonal changes & identify and naming plants** (1 x forest school session) **living and non-living** **Animals including humans part 1**
Spring	**Animals including humans** Y1/YR **Seasonal changes** Y1/YR	**Animals including humans** part 2 **Plants** part 1 **Seasonal changes & identify and naming plants** (1 x forest school session)
Summer	**Plants** Y1/YR Seasonal changes Y1/YR	**Plants** part 2 **Living things & their habitats** **Seasonal changes & identify and naming plants** (1 x forest school session)

KS2 Long Term Plans (linked to medium term plans)

KS2 Science LTP Minsterley Nov 23 *These units need to be taught in order, but it doesn't matter if you start teaching the unit early i.e. Start a unit in Autumn term and finish in Spring term*

	Lawley	Stiperstones	Long Mynd
Autumn	light (3) Sound (4)	States of Matter (4) Electricity (4)	Earth & Space (5) Light (6)
Spring	Forces & magnets (3) Rocks (3)	Properties & changes of materials (5) Forces (5)	Animals including humans (6) Electricity (6)
Summer	Plants (3) Animals inc humans (3)	Living things & their habitats (4) Animals including humans (4) Animals including humans (link to PSHE) (5)	Living things & their habitats (5) Living things & their habitats (6) Evolution & inheritance (6)

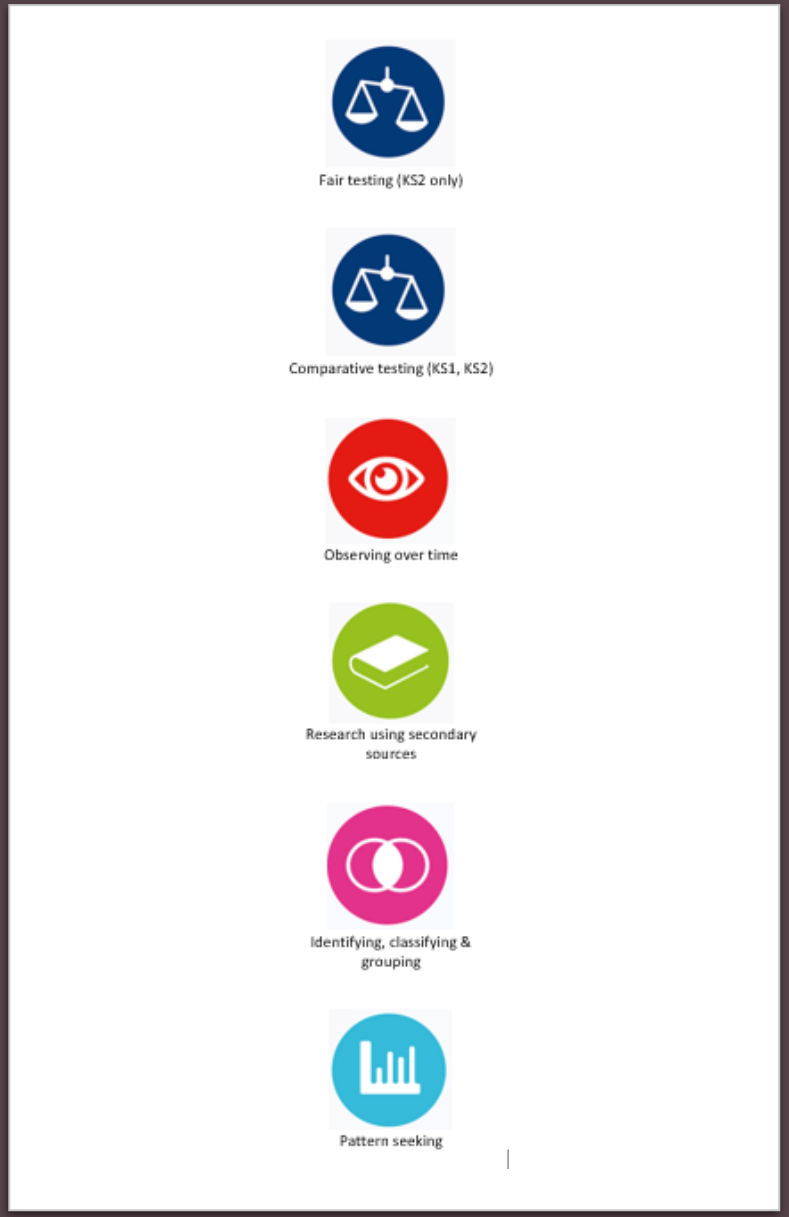
Scientists & Science Capital at Minsterley

Clee	Book & Science Capital		 Macintosh Tim Peake			
Wrekin	Book/ Science Capital	 Health care assistant	Mummy can I have a penguin story.	 John Dunlop Oliver Rackham		
Lawley	Book/ Science Capital					 Charlie Dimmock Carl Linnaeus George Washington Carver Alexander Humboldt Oliver Rackham  Physiotherapist
Stiperstones	Book/ Science Capital	 Dr Pearl Agyakwa		 Spencer Silver Arthur Fry	 Galileo	  Midwife
Long Mynd	Book/ Science Capital	 Neil Armstrong Buzz Aldrin Tim Peake Helen	 Optician		 Volta Faraday Recipient	 Jane Goodall David Attenborough   Darwin Palaeontologist  The Mollebird

See document – Science knowledge & skills coverage by class.

Working Scientifically

- **Key Stage 1 and 2**
- At Minsterley primary working scientifically is taught directly however this is done within the context of the scientific knowledge of the lesson.
- Children are taught to use the following types of scientific enquiry: fair testing (KS2 only), comparative testing, observing over time, identifying, classifying and grouping, pattern seeking and research using secondary sources.
- Children are encouraged to label and discuss the type of scientific enquiry sticker they are carrying out by placing the correct sticker in their books.
- Whilst carrying out practical work in science the children must be clear of the learning intention of the investigation.



Types of Scientific Enquiry

This is placed inside children's books to act as a prompt and to encourage children to identify and discuss the different types of enquiries they and scientists use to prove concepts and theories.

Types of scientific enquiry

Type of enquiry	Examples
Fair testing (KS2 only)	**Year 3:** How does the mass of an object affect how much force is needed to make it move? **Year 4:** How does the thickness of a conducting material affect how bright the lamp is? **Year 5:** How does the surface area of a container affect the time it takes to sink? **Year 6:** How does the voltage of the batteries in a circuit affect the brightness of the lamp? Fair tests have many similar features to comparative tests in that one variable is changed, another variable is measured, and any other variables are controlled. The difference is that in a fair test the variable that is changed is continuous rather than discrete. The results are often represented as a line graph or a scatter graph.
Comparative testing (KS1, KS2)	**Year 1:** Which materials are the most flexible? **Year 2:** Which shapes make the strongest paper bridge? **Year 3:** Which magnet is strongest? **Year 4:** Are two ears better than one? **Year 5:** Which shoe is the most slippy? **Year 6:** Which make of battery lasts the longest? Comparative tests have many similar features to fair tests in that one variable is changed, another variable is measured, and any other variables are controlled. The difference is that in a comparative test the variable that is changed is discrete rather than continuous, so you are comparing different cases/situations.
Observing over time	**Year 1:** What happens to materials over time if we bury them in the ground? **Year 2:** How long do bubble bath bubbles last for? **Year 3:** If we magnetise a pin, how long does it stay magnetised for? **Year 4:** How does the mass of an ice cube change over time? **Year 5:** How does a sugar cube change as it is put in a glass of water? **Year 6:** Does the temperature of a light bulb go up the longer it is on? Observing over time enquiries is where you observe change that takes place in seconds, minutes, hours, or days, or over longer periods of time, such as weeks or months. Mostly observing the natural world, but it can also be used when comparing materials and observing physical processes.
Research using secondary sources	**Year 1:** Which materials can be recycled? **Year 2:** How are plastics made? **Year 3:** How does a compass work? **Year 4:** Do all animals have the same hearing range? **Year 5:** How do submarines sink if they are full of air? **Year 6:** How do astronomers know what stars are made of? Use a range of secondary sources to help you find the answers to your 'big questions'. Alternatively, you could plan research tools, such as questionnaires and interviews, to collect your own data. Plus, you will learn to compare and evaluate information from different sources.
Identifying, classifying & grouping	**Year 1:** How can we sort the leaves that we collected on our walk? **Year 2:** How can we identify the trees that we observed on our tree hunt? **Year 3:** How many different ways can you group our seed collection? **Year 4:** What are the names for all the organs involved in the digestive system? **Year 5:** Can you identify all the stages in the human life cycle? **Year 6:** How would you make a classification key for vertebrates/invertebrates or microorganisms? In this type of enquiry, you make observations and measurements to help you look for similarities and differences. This will help you to organise things into groups and make connections.
Pattern seeking	**Year 1:** Do trees with bigger leaves lose their leaves first in autumn? **Year 2:** Do bigger seeds grow into bigger plants? **Year 3:** What colour flowers do pollinating insects prefer? **Year 4:** How has the use of insecticides affected bee population? **Year 5:** Is there a relationship between a mammal's size and its gestation period? **Year 6:** Do all flowers have the same number of petals? Pattern-seeking enquiries involve making measurements or observations to explore situations where there are variables that you can't easily control. You answer the 'big questions' by identifying patterns in the measurements and observations you record. Pattern-seeking enquiries are not fair or comparative tests, because certain variables can't be controlled.

Working Scientifically skills

To enable pupils to work independently while carryout the different enquiry types we teach the following skills when appropriate:

PLAN

- Ask questions
- Make predictions
- Decide how to carry out an enquiry

DO

- Take measurements
- Record data
- Present data

REVIEW

- Answer questions using data
- Draw conclusions
- Evaluate their enquiry

Each science lesson focuses on one of the above skills to ensure explicit teaching of that skill.

The progression and coverage of these skills can be seen in the slides below.

Working Scientifically skills KS1 Planning tool

These planning tools are used to provide a scaffold as and when required.

We are investigating ……

What is being changed?

What is being measured?

Our **question** is…

If we change ☐ what will happen to ☐ ?

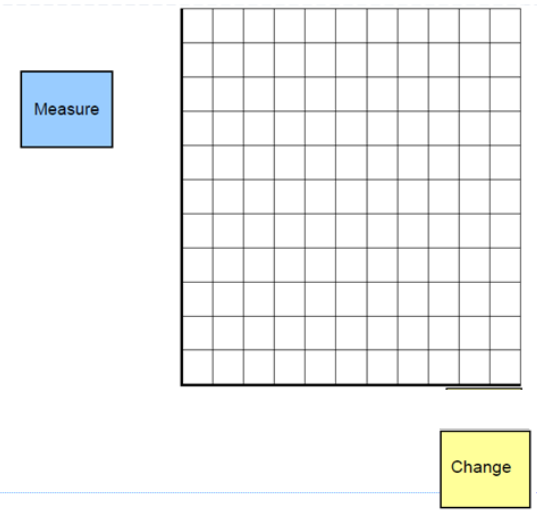
What is being kept the same?

☐ ☐ ☐ ☐

Table of results

We will **change** ☐	We will **measure/observe** ☐

A bar chart to show…..



Working Scientifically skills KS2 Planning tool

These planning tools are used to provide a scaffold as and when required.

PLAN

We are investigating .....

The **variables** we could change	The **variables** we could **measure/observe**
We **will** change	We **will** measure/observe

Our **question** is...

If we change ☐ what will happen to ☐ ?

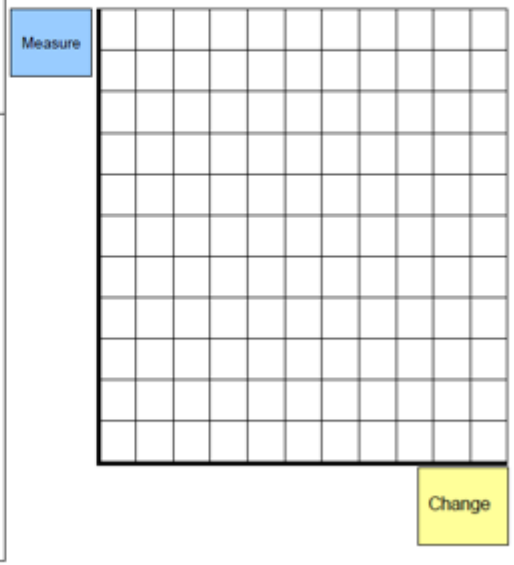
To make it a **fair test** we will keep these factors the same	Our **predictions** are.....

DO

Table of results

We will **change**	We will **measure/observe**

Our graph.....



REVIEW

Our question is...

When we change ☐ what will happen to ☐ ?

Which prediction most closely supports the results?	
☐	Can you **describe** how?
☐	Can you **explain** why?
☐	Can you **explain** why using scientific language?

Are there any unusual results? Can you explain why?

Have you answered the question?
What have you found out?
Our **conclusion** is.....

What can you do to improve your investigation?
How could you change your plan to obtain better results?

Cross-curricular Links

Maths and science naturally complement each other. Science generates data that can be collected, analysed and presented in various ways. When working scientifically, children are expected to search for patterns in the results they collect and to interpret evidence and draw conclusions. This provides lots of opportunities to use maths skills in science lessons and vice versa.

Examples:

- **Measuring cylinders** – measuring rainfall, measuring the amount of water absorbed by different types of material
- **Force meters** – measuring the force needed to pull a shoe across different surfaces
- **Metre rules** – measuring the range of an elastic band catapult or the height that a ball bounces
- **Time** – measuring how long it takes for a paper helicopter to fall or for sugar to dissolve
- **Temperature** – measuring how temperature changes in different parts of the school, or at different times of day. Measuring how long it takes for water to cool in a regular and insulated cup
- **Angles** – looking at the reflection of light on a mirror, investigating how adjusting the angle of a torch changes the size of a shadow or using angles to calculate the height of a tree.

Links are made between science and other curricular subjects where possible to enable children to make connections and also to provide opportunities for spaced learning. See ‘Science Knowledge & Skills Coverage’ document for more detailed cross curriculum links (Staff server).

Progression
How do we all know what went on in previous years?

At Minsterley we use progression documents for working scientifically (disciplinary knowledge) and progression of scientific knowledge (substantive knowledge). There is also a more detailed document which outlines exactly what has been taught before. This document enables teachers to deliver relevant retrieval tasks from the years below. These documents ensures that building blocks are met and allows staff to easily plan and deliver recap sessions to help children develop their long-term memory in relation to science.

Throughout the delivery of science knowledge (substantive knowledge) we have the key threads of: plants; animals including humans; life processes; living things and their habitats; materials; light & sound; electricity; forces and magnets.

Within working scientifically (disciplinary knowledge) we have the key threads of: **PLAN** (asking questions, making predictions), **DO** (setting up tests; observing and measuring; recording data) and **REVIEW** (interpreting and communicating results; Evaluating). Each lesson focusses one of these working scientifically skills.

Progression Working Scientific (Disciplinary)
How do we all know what went on in previous years?

PLAN (Working scientifically planning)

	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	KS3
Working Scientifically Planning **PLAN**	Explore the natural world around them (UtW). Listen attentively and respond to what they hear with relevant questions, comments and actions during whole class discussions and small group interactions; - Make comments about what they have heard and ask questions to clarify their understanding; (C&L) Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary; (C&L)	Ask questions based on exploration of the world around them. Respond to prompts by making some suggestions about how to find an answer. Talk about similarities and differences. Are aware that we use resources to answer questions using different types of enquiry (classify; comparative test; pattern seeking and observations over time).	Ask simple questions and recognise that they can be answered in different ways. Ask people questions and use simple secondary sources to find answers. Talk about similarities and differences. Are involved in planning how to use resources to answer questions using different types of enquiry (classify; comparative test; pattern seeking and observations over time).	Respond to suggestions of how to answer questions about the world around them and ask effective and relevant questions. Recognise when and how secondary sources should be used. Discuss and begin to set up the most appropriate type of scientific enquiry (classify; fair test; comparative test; pattern seeking and observations over time) to use to answer questions. Recognise that questions can be answered in different ways. Begin to recognise and identify the factors needed to make a test 'fair'. Identify the factors in a simple 'fair' test that we will measure (variables) and keep the same (control).	Raise own relevant questions and use different types of scientific enquiry (classify; fair test; comparative test; pattern seeking and observations over time) to answer questions. Recognise when and how secondary sources should be used. Make decisions about the most appropriate type of scientific enquiry (classify; fair test; comparative test; pattern seeking and observations over time) to answer questions and set these up. Recognise and identify the factors needed to make a test 'fair'. Identify the factors in a simple 'fair' test that we will measure (variables) and keep the same (control).	Explore ideas and raise a range of relevant questions. Recognise which secondary sources are most useful and begin to recognise the difference between fact and opinion. Select and plan the most appropriate type of scientific enquiry for answering a scientific question. Decide which variables to measure change and keep the same. Demonstrate how to change one factor (variable) whilst keeping others the same (control). Identify and use an appropriate unit to measure variables effectively.	Explore ideas and raise a range of different kinds of relevant questions based on accurate scientific principles. Recognise and use the secondary sources that are most useful separating opinion from fact. Select and plan accurately the most appropriate type of scientific enquiry (classify; fair test; comparative test; pattern seeking and observations over time) for answering scientific questions. Decide which variables to measure change and keep the same and demonstrate how to change one factor (variable) whilst keeping others the same (control). Identify and use an appropriate unit to measure variables effectively	Use simple models to describe scientific ideas. Explain how to construct a complex test. Plan different types of enquiries to answer questions and put measures in place to ensure accuracy and reliability. Select the most suitable variables to be investigated. Identify some variables that cannot be controlled or explain. Recognise some situations in which a fair test cannot be carried out.

Progression Working Scientific (Disciplinary)
How do we all know what went on in previous years?

DO (Making observations & taking measurements)

Making observations & taking measurements **DO**	Explore the natural world around them, making observations and drawing pictures of animals and plants; (UtW) Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class; (UtW) Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter. (UtW) Participate in small group, class and one-to-one discussions, offering their own ideas, using recently introduced vocabulary; (C&L) Compare quantities up to 10 in different contexts, recognising when one quantity is greater than, less than or the same as the other quantity; (NP)	Respond to prompts by making some suggestions about how to make an observation. Use senses and simple equipment to make observations. With support, decide how to sort and group objects, materials and living things. Talk about what happens and record using words and pictures. Begin to take measurements, initially by comparisons, the using non-standard units. Begin to record data in simple templates.	Make close observations. Carry out instructions for a simple investigation. Use simple features to compare objects, materials and living things. Begin to decide how to sort and group objects, materials and living things (identifying their own criteria). Talk about and record what is seen and observed, including changes over time. Use simple equipment e.g. magnifying glasses, digital microscopes, and take accurate measurements using simple equipment, e.g. cm and scales with one interval. Begin to identify and classify data and information. Record data using simple charts, tables, pictograms, tally charts and block graphs.	Describe what happens when taking part in simple investigations/fair tests. Begin to make decisions about what to observe, how long to observe for? Read simple scales and take accurate measurements using standard units, e.g. Thermometers, graduated beakers, stop watches and data loggers. Talk about criteria for grouping, sorting and classifying, use simple keys, Venn and Carroll diagrams. Record data using a range of charts, tables and block graphs and labelled diagrams.	Recognise when to set up simple practical enquires, comparative and fair tests. Make decisions about what to observe, how long to observe for, and the type of equipment needed. Make systematic and accurate observations and measurements. Use a range of measuring equipment appropriately including thermometers, data loggers, stop watches, trundle wheels etc. Use and design keys, Venn/Carroll diagrams for grouping, sorting and classifying. Gather, record, classify and present data in a variety of ways to help answer questions (including Venn and Carroll diagrams). Use and construct increasingly complex tables, line graphs and keys to record findings.	Recognise when and how to set up comparative and fair tests and begin to explain which variables need to be controlled and why. Make decisions about what to observe, what measurements to use and how long to measure them for. Choose appropriate equipment to make measurements, using standard units of measure and simple scales accurately and with precision. Use/develop keys and other information records to identify, classify and describe living things and materials and identify patterns. Gather, record, classify and present a range of data in different ways. Record data and results using scientific diagrams and labels, classification keys, tables, and bar and line graphs.	Recognise when and how to set up comparative and fair tests and clearly explain which variables need to be controlled and why. Make independent and well-founded decisions about what to observe, what measurements to use and how long to measure them for. Choose the most appropriate equipment (with a variety of intervals and units) to make measurements and explain how to use accurately and with precision. Repeating readings when appropriate. Use/develop keys to and other information records identify, classify and describe living things and materials and identify patterns. Gather, record, classify and present data in a wide range of ways. Use a wide range of methods to record data including line graphs, scientific diagrams, classification keys, scatter, bar and line graphs etc.	Recognise when and how to set up comparative and fair tests and clearly explain which variables need to be controlled and why. Record observations and measurements systematically. Choose the most efficient units of measurement and convert as and when appropriate. Present comparative data in a range of formats including, pie charts, line graphs and scatter grams etc. Label diagrams using appropriate scientific symbols, e.g. circuit diagrams in parallel.

Progression Working Scientific (Disciplinary)
How do we all know what went on in previous years?

REVIEW (conclusions, raising further questions & predictions)

Working Scientifically Conclusions & raising further questions, predictions **REVIEW**	Offer explanations for why things might happen, making use of recently introduced vocabulary (C&L) Express their ideas and feelings about their experiences using full sentences, (S)	Begin to use simple features to compare objects, materials and living things. Identify what has changed when observing objects, living things or events. Record observations using pictures, labels, photos and videos. Talk in simple terms about what might happen based own experiences.	Talk about describe and sort simple similarities and differences, begin noting patterns and relationships. Record and communicate findings in a range of ways using simple scientific language. Talk about what has been found out and how it was discovered. Talk in simple scientific terms about what might happen and why? (prediction)	Begin to look for patterns and decide what data to collect to identify them. Talk about data collected from observations and measurements, using drawings, labelled diagrams, notes, simple tables and keys, standard units and simple equipment including data loggers. Begin to draw and express some conclusions, by looking at changes, patterns, similarities and differences in data and relate to simple scientific ideas. Begin to identify new questions arising from data, make new predictions for new values within or beyond the data collected. Report on and begin to use scientific evidence to support findings	Look for patterns and decide on the range of data needed to identify them. Collect data from observations and measurements, using notes, simple tables and standard units, using drawings, labelled diagrams, keys, bar charts and tables. Identify changes, patterns, similarities and differences in data in order to draw conclusions and relate to simple scientific ideas and processes. Suggest improvements and identify new questions arising from data, make new predictions for new values within or beyond the data collected. Report on findings from enquires including oral and written explanations. Use scientific evidence to support findings.	Decide how to record data from a choice of familiar approaches. Use relevant scientific language to communicate findings and justify scientific ideas. Begin to also report on relationships and degrees of trust in results. Look for different relationships in data and begin to identify evidence that refutes or supports ideas. Make practical suggestions about how working methods could be improved. Use results to identify when further tests and observations might be needed. Make general statements such as: 'the hotter the water, the faster the sugar dissolves'	Decide in detail how to record data accurately from a choice of familiar approaches. Use relevant scientific language and illustrations to discuss, communicate and justify findings and scientific ideas including relationships, explanations and degrees of trust in results. Look for a range of different relationships in data and begin to identify evidence that refutes or supports ideas. Identify when tests need to be repeated in order to attain reliable results. Use test results to make predictions and set up further comparative and fair tests. Use scientific evidence to support or refute findings from investigations and explorations, making increasingly measured general statements. Talk about how scientific ideas have developed over time.	Use quantitative and qualitative data to support conclusions. Use scientific knowledge and understanding to challenge the conclusions of others. Identify a range of scientific evidence that has been used to support or refute ideas or arguments. Identify when tests need to be repeated in order to attain reliable results. Use test results to make predictions, supported by relevant and accurate evidence to set up further comparative and fair tests.

Progression Scientific Knowledge (Substantive)
How do we all know what went on in previous years?

Example document for the thread 'Animals including humans'.

	Clee class		Wrekin class	Lawley Class	Stiperstones Class	Long Mynd Class	KS3
Year Group	EYFS	Year 1	Year 2				
Animals including humans. 	**The Natural World** Explore the natural world around them, making observations and drawing pictures of animals. Begin to make sense of their own life-story and family's history. Begin to understand the key features of the lifecycle of a plant and animal. **People, culture and communities** Describe their immediate environment using knowledge from observation, discussion, stories and non-fiction texts and maps. **Personal, social and emotional development** Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.	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	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.	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. Identify that humans and some other 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. Construct and interpret a variety of food chains, identifying producers, predators and prey. Describe the changes as humans develop from birth to old age.	Describe the differences in the lifecycles of a mammal, an amphibian, an insect and a bird. Describe the life processes of reproduction in some plants and animals. (living things and habitats) Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. Identify and name the main parts of the human circulatory system and describe the function of the heart, blood vessels and blood. Describe the ways in which nutrients and water are transported within animals, including humans	. Explain how and why our muscles use oxygen. Explain in detail the impact of diet, exercise, drugs and lifestyle on the way the body functions. Name all the main food groups and explain how they are used by the body.

‘What exactly has been taught before?’ Is a more detailed document which enables teachers to deliver relevant retrieval tasks from the years below linked to a thread..

Example document for the thread ‘Everyday Materials, Earth & Space, Rocks & Soils’. continued

	EYFS	Clee	Wrekin	Lawley	Stiperstones	Long Mynd	KS3/GDS
Plants	 Sorting seeds  Planting shed  Magnifying glasses  Investigating and sorting  Flower labelling  explore CP- sorting seed activity would be a good observation point. children can use mark making table to draw their seeds and observations over time. use plant sorting tuff tray to sort dissected plants into leaves, petals, roots, seed, stem.	-Identify fruits and where they grow -Observation of fruits and veg -Growing potatoes. -Order how seeds grow. -What do plants need to grow? -Plant diary Plant hunt in local environment. -Identify parts of a plant. -Plant dissection -Plant modelling -Leaf walk -ID leaves using ID sheet and group leaves. -Why do leaves fall off trees test. -Deciduous vs evergreen **Can name trees and other plants they see regularly.** **Can describe key features of the trees and plants e.g. shapes of leaves/colour of the flower/blossom.** **Can point out trees which lost their leaves and those who keep them all year.** **Can point to and name parts of a plant.** **Can use simple charts to sort. Can use photos to talk about how plants change**	. Identify parts of the plant-. - lifecycle of a sunflower and strawberry. Observing seeds and observational drawings. Classifying seeds. Investigation into plant growth using different soils. Investigating bulbs and recording seed growth/germination. Conditions for growth experiment- cress. Plants in different climates, how do plants adapt to their environment? Explore famous botanists. Outdoor learning- tree survey **Can describe how plants that have grown from seeds and bulbs have developed over time.** **Can identify plants that grew well in different conditions.** **Can spot similarities and differences between bulbs and seeds.** **Can nurture seeds and bulbs into mature plants identifying the different requirements of different plants.**	Labelling a plant. Functions of the plant. Labelling the male and female parts of the plant. Plant dissection and drawings. What do plants need to grow? recap. Experiment into the requirements of plant growth using pansys. Investigation on how water and nutrients transport through stem using carnations and celery. Photosynthesis. Recap on sunflower lifecycle and what germination means. Focus on pollination and pollination drama. Why are bees important? Fertilisation and seed dispersal. Focus on the different ways seeds are dispersed. Children make their own seed dispersed by wind. What is a botanist? - children learn about different botanists. Children go on a seed hunt to see what they can find in their environment. **Can explain the function of the parts of a flowering plant.** **Can describe the life cycle of flowering plants, including pollination, seed formation, seed dispersal and germination.** **Can give different methods of pollination and seed dispersal, including examples.** **Can explain observations made during investigations.** **Can look at features of seeds to decide on method of dispersal.**		Pollination vs fertilisation. Recap on pollination. Pollination drama recap. Sexual and asexual reproduction. School group survey for different types of plants. Children research how different plants reproduce. Investigate how to grow new plants from different parts of the parent plant. Children carry out a fair test to grow their own plant.	Describe using accurate scientific vocabulary the features of a plant, such as the function of a stamen. Describe and explain the main functions of a plant and its organs. Discuss photosynthesis,

Progression in Scientific Vocabulary
How do we all know what went on in previous years?

Example page from ‘Minsterley progression of science knowledge’.

Each thread has a section which includes key vocabulary.

	Clee class		Wrekin class	Lawley Class	Stiperstones Class	Long Mynd Class
Year Group	EYFS	Year 1	Year 2			
Animals including humans Key vocabulary	Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, heart,	Head, body, eyes, ears, mouth, teeth, leg, tail, wing, claw, fin, scales, feathers, fur, beak, paws, hooves, reptile, amphibian, mammal, omnivore, carnivore, herbivore, all senses.	Offspring, grow, adults, nutrition, reproduce, survival, water, food, air, exercise, hygiene, survival, exercise.	Nutrition, nutrients, carbohydrates, sugars, protein, vitamins, minerals, fibre, fat, water, skeleton, bones, muscles, support, protect, skull, ribs, spine, muscles, joints.	Digestive system, digestion, mouth, teeth, saliva, oesophagus, stomach, small intestine, nutrients, large intestine, rectum, anus, incisor, canine, herbivore, omnivore. Puberty, vocabulary linked to describe a range of sexual characteristics.	Heart, pulse, rate, pumps, blood, blood vessel, transported, lungs, oxygen, carbon dioxide, nutrients, water, muscles, cycle, circulatory system, diet, exercise, drugs, lifestyle.

The EEF have reported that the strongest factor affecting pupils’ science scores is their literacy score therefore it is important that we enable children to have a good understanding of scientific vocabulary. This will provide the children with a better ability to prepare and engage with scientific reports.

What our scientists can do …..

This is what our scientists can do

Clee		Wrekin	Lawley	Stiperstones	Long Mynd	KS3
Foundation/ EYFS	Year 1					
Children will ask questions about the environment including the weather outside. They will be able to suggest what they might wear. They will develop an understanding of growth, decay and changes over time and show care and concern for living things and the environment. They will use their senses when walking around and investigating. They will develop questioning and curiosity through play and understand the concept of forces and electricity through twisting, pushing, slotting and magnetic toys and seeing the effects of pushing different buttons to make sounds and movements. They can talk about similarities and differences between living things and materials and make simple observations about animals.	Children will be asking questions about the local environment including plants and animals found there including how they can look after them. They will observe and talk about the weather and changes. They will explore different materials using scientific language to describe them.	Children will be asking questions about the local environment including plants and animals found there including how they can look after them. They will observe and talk about the weather and changes. They will explore different materials using scientific language to describe them. Children will be asking questions about the local environment including discussing how plants grow, survive, germinate and reproduce. They investigate different habitats (incl. micro) and observe how different animals depend on each other and its life processes. They understand basic needs of animal survival including exercise and nutrition. They can identify properties of materials and state why they are suited to purpose. They can name some scientists who have developed new materials.	Children will be asking questions about the local environment and using their observation skills to identify parts of a flower and know how water transports around the plant. Children will understand the lifecycle of a plant by drawing diagrams and using research to find the function of each part. Children will know that humans and animals have skeletons and understand why. They know how humans get nutrients. Children will use representations to understand how we hear through vibrations. They will carry out comparative and fair tests to compare and classify rocks and soils based on their properties.	Children will be asking questions about the local environment and observe how the environment can change along with the dangers this can cause. They will understand the functions of the teeth and the importance of oral hygiene. Children will know about how the digestive system works. Children will be grouping, identifying and classifying living things and materials and using classification keys. Children will understand the water cycle and effect of heat with evaporation and condensation as well as materials changing state. Children will use representations to know how to create simple circuits including a switch. Comparative and fair tests will be used to test conductivity of materials. Children will understand the changes that occur in humans from birth to old age and understand reproduction in plants and animals. Children will be able to explain the uses of everyday materials and describe some reversible and irreversible changes. They will be able to present their results from fair tests using tables and charts. They will be able to recall animals from the 5 vertebrate group and some from non-vertebrate groups including their key characteristics. Children will be able to use classification keys to identify unknown plants. They will have an understanding of forces including gravity, air resistance, water resistance and friction. They will be able to mechanisms such a levers, pulleys and gears to explain forces and making jobs easier.	They explore different lifecycles and can understand the similarities and differences between mammals, amphibians, insects and birds. Children will use diagrams to show the movement of the Earth and the moon and can explain how different time zones occur. They explain day and night. Children will understand how the circulatory system works and will be able to use this to explain the positive and negative effects of diet, exercise, drugs and lifestyle on the body. They will understand how plants and animals are suited to their environment and the process of evolution. They will know what fossils are and can use research and observations to show that things lived billion years ago. Children will use diagrams to explain how light travels and understand shadows. They will be able to make simple circuits using recognised symbols in their drawings. They can conduct a range of fair tests identifying cause and effect when testing brightness of a bulb or volume of a buzzer. Children will be able to conduct a range of investigations with accuracy using repeat measurements and using a range of equipment. They will use scientific theory to refute or support their arguments.	Use simple models to describe scientific ideas. Explain how to construct a complex test. Plan different types of enquiries to answer questions and put measures in place to ensure accuracy and reliability. Select the most suitable variables to be investigated. Identify some variables that cannot be controlled or explain. Recognise some situations in which a fair test cannot be carried out. Recognise when and how to set up comparative and fair tests and clearly explain which variables need to be controlled and why. Record observations and measurements systematically. Choose the most efficient units of measurement and convert as and when appropriate. Present comparative data in a range of formats including, pie charts, line graphs and scatter grams etc. Label diagrams using appropriate scientific symbols, e.g. circuit diagrams in parallel. Use quantitative and qualitative data to support conclusions. Use scientific knowledge and understanding to challenge the conclusions of others. Identify a range of scientific evidence that has been used to support or refute ideas or arguments. Identify when tests need to be repeated in order to attain reliable results. Use test results to make predictions, supported by relevant and accurate evidence to set up further comparative and fair tests.

Science Equipment

Science resources are mainly stored in the main corridor but a list is saved on the staff server in the subject leader file.
Here are a few examples:

Data Loggers	Thermometers	Newton meters	Measuring jugs	Stop watches
Digestive system & teeth models	Solar system models	scales	Pipettes	Magnifying glasses

What would you expect to see in a science lesson at Minsterley?

- Teaching in line with NC and LTP
- High expectations with good pace ‘Teach to the top’
- Opportunities are provided to revisit previous learning (know more, remember more).
- Activities are carefully selected to match the learning intention of the lesson and connections to previous learning are made (both scientific knowledge and working scientifically).
- Opportunities are provided to build on the understanding of selected scientific vocabulary across the school including EYFS where this vocabulary is used to describe and categorise the natural world.
- When working scientifically is being specifically taught, the children are clear about the link to the learning intention (scientific/substantive knowledge) of the lesson. The children will be clear how their practical work connects to the theory they have just been taught.
- Misconceptions are pre-empted and addressed quickly.
- Independent and responsible learners who can talk confidently about science.
- Live/self and peer marking
- Teachers using formative assessment and adjusting teaching and planning accordingly.

Anticipating misconceptions

In line with EEF recommendations here at Minsterley we strive to identify possible misconceptions at the planning stage, where teachers can pre-empt the stumbling blocks that the children might face and address it from the beginning of the lesson rather than reacting during, or often after, a task to the misconception.

Misconceptions are address is several ways: discussion, what is the same/different questions, multiple choice questions, prove it questions.

On the staff server in the subject leader file is document which links expected misconceptions to each of the science teaching units on the LTP this will help teachers to identify/pre-empt misconceptions.

Examples:

Clee	Wrekin	Lawley	Stiperstones	Long Mynd
1.3 Some children think that an object and the material it is made from are the same thing	2.5 Pupils sometimes use circular arguments when matching a material property and its use, e.g. we use wood for making tables because wood is a good material to make tables from. The misconception that an object and the material it is made from are the same thing should have been dealt with in Year 1.	3.6 Children sometimes think that all rocks must be heavy. They often believe that soil must have always been in its present form.	4.6 Children sometimes use the word solid to mean heavy, not flexible, or in one big piece. It is then difficult for them to classify substances such as flour, or salt as a solid. Children often confuse melting and dissolving. Children also sometimes believe that gases are not matter because most are invisible, and that gases do not have mass.	5.3 It is not self-evident that the Earth is a planet orbiting the sun. The Sun's apparent movement across the sky shows it rising, coming up, going down, setting going behind clouds etc. whilst we are in one place, all of which imply that it is the Sun rather than the Earth that is moving. Children sometimes think there is no gravity on the Moon or that things will float away on the Moon because there is no air to hold them down. They often think that we have summer when the Earth is close to the Sun rather than because of the tilt of the axis. If this were so all the Earth would have summer at the same time.

How do we make sure that pupils remember what they have been taught?

- The sequence of science lessons within our science curriculum build logically on what has been learned before and enables pupils to build and strengthen their knowledge.
- Time is used well, moving on when pupils are ready, but allowing enough repetition and practise.
- The use of ‘RT’ (retrieval tasks), Kahoot quizzes etc enables revisiting away from the point of teaching and provides opportunities to apply learning to different contexts.

Staff CPD

- Science update 02.02.23 Elanor Atkinson
- Working scientifically + shared book look (staff meeting) 23.01.23
- Purposeful practical science Nov 22 Eleanor Atkinson
- Science update 30.11.22
- Science update 09.06.22 led by Eleanor Atkinson science coordinator attended.
- Types of scientific enquiry Staff meeting led by JH to all teaching staff March 2022
- Jasper Green Science Ofsted review online all teaching staff
- Outstanding subject leadership in science led by Diane Pye all teaching staff

Assessment at Minsterley

Summative Assessment

- KS2 End of unit assessment (written questions, Google Quiz) which include questions linked to both scientific knowledge and working scientifically

Why do Summative assessments?

- To inform future planning
- Highlight common misconceptions
- Pin point weaknesses especially with focus children
- Provides children with opportunity to practise previous learning

Assessment at Minsterley

Formative Assessment

- Mind map start of each unit
- TAPS (used to assess a specific aspect of working scientifically)
- Questioning/paired discussion during whole class teaching
- White board work/practical work
- Live marking
- Challenges, quizzes, Kahoot, Quiz Shed
- Teacher observations

Why do formative assessments?

- Highlight the need for same day intervention/other intervention/preteach
- Highlight the need to have focused ‘live marking’
- Inform future planning
- Highlight common misconceptions
- Provide opportunities for pupils to practise previous learning

Supporting SEN pupils in science at Minsterley

In line with our school SEND policy our overarching aim within science lessons is to create an atmosphere of encouragement, acceptance, respect for achievements and sensitivity to individual needs, in which all pupil can thrive.

The link below provides various ways in which we can support SEND pupils to achieve to the best of their abilities within science.

https://pstt.org.uk/application/files/7415/0538/3452/Supporting_SEND_pupils_in_science.pdf

How will you see us supporting children with SEND in science?

- We have high expectations for all pupils.
- Specific focus children during both whole class teaching and independent work
- Additional adult support (preteach, support within the lesson, same day intervention, targeted intervention)
- Working straight onto a worksheet to aid with structure and layout; presenting work through the use of the ipads and chromebooks e.g. typing, voice notes and video recordings.
- Use of technology e.g. videos linked to concept, science hint sheets, science vocabulary word bank, access to STEM sentences.
- Differentiation when need but this runs alongside high expectations for all.
- Adult scribe, adult to hold a discussion about their learning.
- Mixed ability and flexible grouping

Science Action Plan

Intended outcomes:

1. To ensure a clear and well planned out science curriculum across school that ensures knowledge is transferred into long term memory.

- To ensure monitoring closely links to subject area development and that it is constant across school.

Intended Impact

To continue to develop the curriculum offer at Minsterley Primary School to ensure learning is transferred into long term memory to create knowledge through spaced repetition and backwards and forwards learning in all areas of the curriculum.

Science Monitoring at Minsterley

Science books are monitored at least half termly by science co-Ordinator

Staff training needs are monitored by science co-ordinator

Science Policy reviewed Feb ‘22 (staff server/website)

Resources list (saved on sever/speak to science coordinator or head for future purchases)

Managing teacher workload is through the purchase of ‘Engaging Science scheme’, used as a skeletal plan.

Subject leader attends all updates