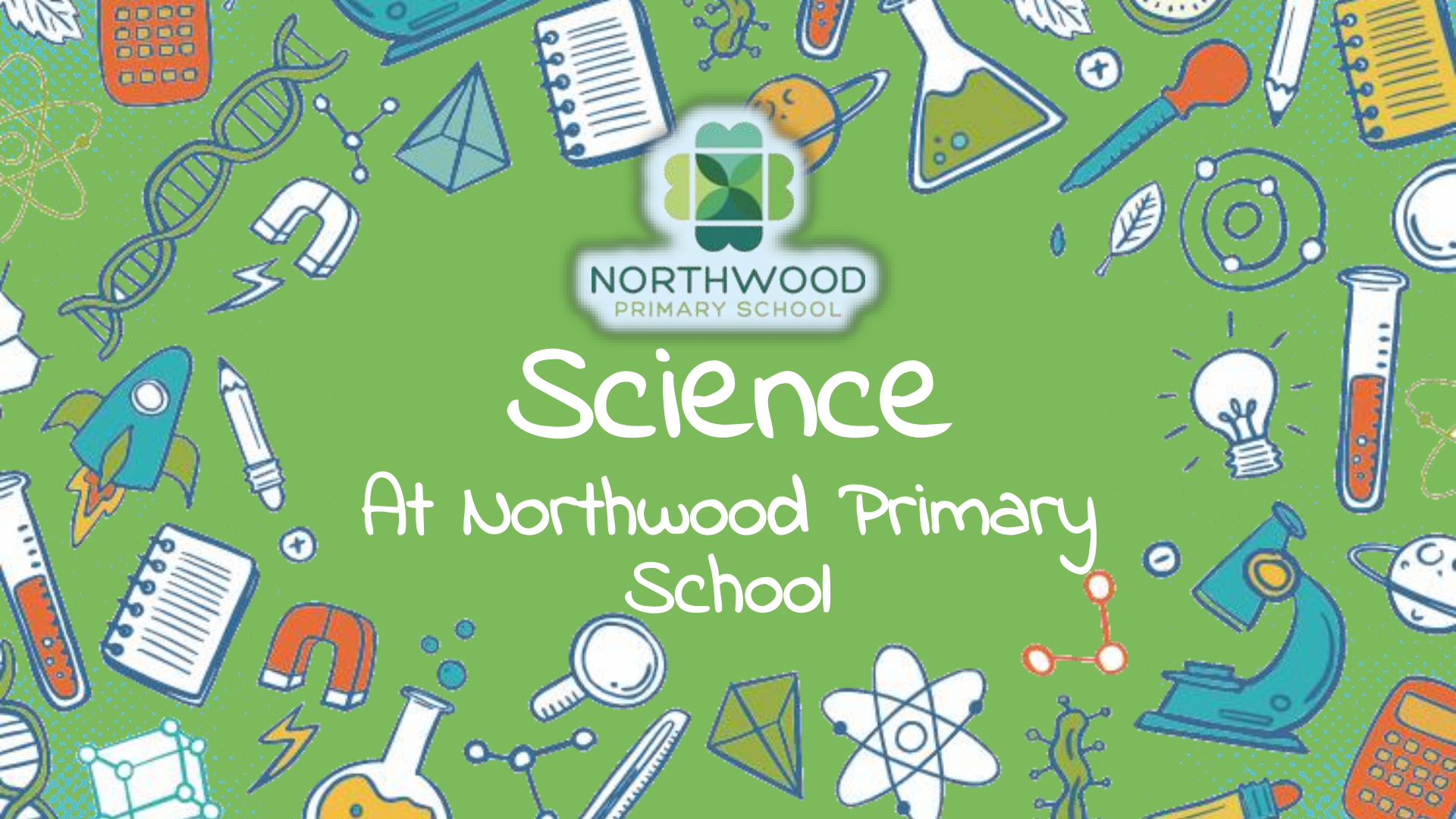

NORTHWOOD
PRIMARY SCHOOL
Science
At Northwood Primary School

The Intention of our Science Curriculum

Our Science curriculum provides the foundation for understanding the world through the specific disciplines of biology, chemistry and physics.

At Northwood, pupils are taught essential aspects of the knowledge, methods, processes and uses of science. Our pupils acquire a key body of knowledge and concepts which enable them to recognise the power of rational explanation, as well as developing a sense of excitement and curiosity about natural phenomena.

Our pupils are encouraged to understand how science can be used to explain what is occurring, predict how things will behave and analyse causes. Our principle aim is to develop children's knowledge, understanding and skills, as well as a sense of enjoyment. We encourage children to ask, as well as answer, scientific questions. Wherever possible we involve pupils in practical activities as these increase enthusiasm, motivation and provide first hand experiences.

Substantive Knowledge: Physics

The universe follows unbreakable rules that are all about forces, matter and energy.

Forces are different kinds of pushes and pulls that act on all the matter that is in the universe. Matter is all the stuff, or mass, in the universe.

Energy, which cannot be created or destroyed, comes in many different forms and tends to move away from objects that have lots of it.

Substantive Knowledge:

Chemistry

All matter (stuff) in the universe is made up of tiny building blocks.

The arrangement, movement and type of building blocks of matter and the forces that hold them together or push them apart explain all the properties of matter (for example, hot/ cold, soft/ hard, light/ heavy etc).

Matter can change if the arrangement of these building blocks changes.

Substantive Knowledge: Biology

Living things are special collections of matter that make copies of themselves, use energy and grow.

Living things on Earth come in a huge variety of different forms that are all related because they all came from the same starting point 4.5 billion years ago.

The different kinds of life, animals, plants and microorganisms, have evolved over millions of generations into different forms in order to survive in the environments in which they live.

Substantive and Disciplinary Knowledge

In our science curriculum, knowledge is carefully sequenced to reveal the interplay between substantive and disciplinary knowledge. This ensures that pupils at Northwood not only know the 'science'; they also know the evidence for it and can use this knowledge to work scientifically.


Disciplinary Knowledge: Thinking Scientifically

The 4 key areas of learning disciplinary knowledge

1

Knowledge of the methods that scientist use to answer questions – covers the diverse methods scientists use to generate knowledge, including the use of models, classification, description, pattern seeking alongside experimentation.

The 4 key areas of learning disciplinary knowledge

2

Knowledge of apparatus and techniques, including measurement – covers how to carry out procedures in the 'lab' and include accurate measurement and recording of data. Pupils learn that scientists put steps in place to reduce errors.

The 4 key areas of learning disciplinary knowledge

3

Knowledge of data analysis – covers how to process and present data in a variety of ways. Pupils learn about different tables and graphs.

The 4 key areas of learning disciplinary knowledge

4

Knowledge of how science uses evidence to develop explanations – covers how evidence is used to draw valid conclusions. Pupils need to recognise the distinction between correlation and causation and know that explanation is distinct from data and does not simply emerge from it.

Disciplinary Knowledge

Pupils learn how models, laws and theories develop over time, including the importance of technology and the role of significant scientists over time.

At Northwood we are aware we must teaching disciplinary thinking in science and how carrying out an investigation skilfully is linked to pupils' substantive knowledge.

Year 1 and Year 2

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

Asking simple questions and recognising that they can be answered in different ways.

Observing closely, using simple equipment.

Identifying and classifying.

Using their observations and ideas to suggest answers to questions.

Gathering and recording data to help in answering questions.

Year 3 and Year 4

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

Asking relevant questions and using different types of scientific enquiries to answer them.

Setting up simple practical enquiries, comparative and fair tests.

Make systematic and careful observations, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers

Identifying differences, similarities or changes related to simple scientific ideas and processes.

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.

Year 5 and Year 6

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

Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.

Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.

Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.

Using test results to make predictions to set up further comparative and fair tests.

Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a 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.

Substantive Knowledge

At Northwood we aim to ensure that our children move from being novice learners to expert learners in science. We enable this through our carefully organised and sequenced curriculum. We know that when knowledge is well structured, it becomes meaningful, flexible and easier to access. This knowledge can then be used to solve complex and interesting scientist problems without overloading children's working memory.

Substantive Knowledge overview - Year 1 and 2

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
Year 1	Chemistry - Everyday Materials 1. What are materials? 2. What are objects made from? 3. What are different materials like? 4. How do materials behave? 5. Let's Investigate - Which material makes the best umbrella? 6. Who is Samuel Fox?	Biology – Autumn and Winter 1. What is special about the four seasons? 2. What is the weather like in Autumn? 3. Let's Investigate – What colour are the leaves in Autumn? 4. How does the weather change in winter? 5. What is the weather like this week? 6. Who is Admiral Robert Fitzroy?	Biology - Animals including humans 1. Do you know what your body parts are called? 2. What are the five senses? 3. Let's Investigate – can you taste with your nose? 4. Which groups do animals belong to? 5. Do you know the parts of animals? 6. Who is Steve Backshall?	Biology – Plants 1. How do beans grow? 2. What are wild plants? 3. What plants can you find outside? 4. What are the parts of a plant? 5. Let's Investigate – How tall can a bean grow? 6. Who is Jane Colden?	Biology – Spring and Summer 1. What happened during spring time? 2. What is the weather like in Summer? 3. Let's Investigate – How many shade of green can I find? 4. How do I keep myself safe in the summer? 5. Who are Benjamin Green and Franz Greiter?
Year 2	Biology – Living things and their habitats 1. Is it living, dead or never been alive? 2. What lives in our local habitat? 3. What is a micro-habitat? 4. What are world habitats like? 5. What is a food chain? 6. Let's Investigate – Woodlouse experiment – Where does a woodlouse like to live? 7. Who is Bill Oddie?	Chemistry – Materials and their uses 1. What are materials used for? 2. How are materials used in and around school? 3. How suitable is a material? 4. Let's investigate- How can materials change shape? 5. Why recycle? 6. Who is John McAdam?	Biology - Animals including humans 1. How do animals change as they grow? 2. How do humans change as they grow? 3. What do I need to survive? 4. Why is healthy eating and exercise important? 5. Let's Investigate – Hand washing experiment – How can we make germs scatter? 6. Who is Joe Wicks?	Biology – The Environment 1. Let's Investigate – Which ice cube will melt the fastest? 2. Why is recycling so important? 3. Why should we save energy? 4. Why is the rainforest so important? 5. Which animals are endangered species? 6. Who is Greta Thunberg?	Biology – Plants 1. Which plants live in our local area? 2. Let's investigate (set up investigation): How do seeds and bulbs grow? 3. What is the life cycle of a plant? 4. What do plants need to stay healthy? 5. What plants do we eat? 6. Let's investigate: How big will my plant grow if it lives in the _____? 7. Who is Diarmuid Gavin?

Substantive Knowledge overview - Year 3 and 4

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
Year 3	Chemistry – Rocks 1. What are the different types of rocks? 2. How can we classify rocks? 3. How are fossils formed? 4. Who was Mary Anning? 5. How is soil formed? 6. Let's Investigate - Which soil is most permeable?	Biology - Animals including humans 1. How do plants and animals get the nutrients they need? 2. What diets do plants and animals have (omnivore, herbivore, carnivore)? 3. Why do we have a skeleton and what is its function? 4. What are our bones called? 5. Who was Marie Curie?	Physics – Forces 1. What are forces? 2. Let's Investigate – Which surface will the car move the fastest on? 3. Which objects are magnetic? 4. How strong are magnets? 5. How do magnetic poles work? 6. Who was Magnes?	Physics - Light and shadows 1. Why is light important? 2. Let's Investigate – Which surface is the best reflector of light? 3. Why are mirrors marvellous? 4. Why can the sun be dangerous? 5. How do shadows behave? 6. Who was Percy Shaw?	Biology – Plants 1. Can I name the parts of a plant? 2. What do plants need to grow well? (cress and or carrot tops) 3. Let's Investigate – How does water move around plants? 4. Why are flowers fantastic (including the life cycle of a flower)? 5. Who is David Austin?
Year 4	Physics – Sound 1. How are sounds made? 2. How do sounds travel? 3. How can we change the volume of a sound? 4. How can we change the pitch of a sound 5. Let's Investigate – Which straws make higher and lower pitches and why? 6. How can sounds change over distance? Let's Investigate – Can you still hear it? 7. Who was Alexander Graham Bell?	Chemistry - States of matter 1. What is a solid, liquid and a gas? 2. What are the properties of gases? 3. Let's investigate – which fizzy drink contains the most carbon dioxide? 4. How can we change the state of water? 5. Let's Investigate - How does washing dry outside? 6. What is the water cycle? 7. Who was Lord Kelvin of Scotland?	Biology - Animals including humans 1. What is the digestive system? 2. What happens to food in your mouth and why do we need teeth? 3. What happens in the stomach and who was William Beaumont? 4. Food's incredible journey. How can we make a stomach? 5. Let's Investigate – Are our digestive systems all the same length? 6. What is a food chain?	Physics – Electricity 1. What are electrical appliances and how do they work? 2. What are the dangers of electricity? 3. What is an electrical circuit? 4. Let's Investigate - what are conductors and insulators? 5. Let's Investigate - how does a plug work? 6. Who was Thomas Eddison?	Biology - Living Things 1. How can I group living things? 2. What are vertebrates and invertebrates? Do they live in the school grounds? 3. What is a classification key? 4. Let's investigate: Do man-made changes affect living things (school grounds)? 5. How do environmental changes affect living things? 6. Who is Gerald Durrell?

Substantive Knowledge overview - Year 5 and 6

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1
Year 5	Physics – Earth and space 1. What are spherical bodies? 2. What are the planets in our solar system? 3. What are geocentric and heliocentric theories? 4. How do day and night happen? 5. How does the moon move? 6. Let's Investigate – On which side of the school grounds would you put a wind turbine? 7. Who is Margaret Hamilton?	Chemistry – Properties and changes of materials 1. Let's Investigate – Can we catch a thief? 2. What are the properties of materials? 3. What are thermal conductors and insulators? 4. Which materials conduct electricity? 5. What happens when something dissolves? How can we separate mixtures? 6. What are irreversible changes?	Biology – Living things and their habitats 1. Let's Investigate – What happens to a plant cutting if it is place in water? 2. How are new plants made? 3. What is the life cycle of a mammal? 4. What is metamorphosis? 5. Are all life cycles the same? 6. What has happened to the plant cutting we placed in water? 7. Who is Jane Goodall?	Physics – Forces 1. Are there different types of forces? 2. What is gravity and how does it work? 3. Let's Investigate: What falls fastest? 4. What are the effects of water resistance? 5. What is friction? 6. Who was Sir Isaac Newton?	Biology - Animals including humans 1. What does a human timeline look like? 2. How do babies develop and grow? 3. What is puberty? 4. What changes take place in old age? 5. Let's Report: Gestation periods and life expectancy 6. Who was Leonardo DiVinci?
Year 6	Biology – Living things and their habitats 1. How do we classify plants and animals? 2. What is the Linnaean System? 3. What are the characteristics of living things? 4. Are all microorganisms harmful? 5. Let's Investigate: What lives in our school grounds? 6. Who was Libbie Hyman?	Biology - Animals including humans 1. What is the human circulatory system? 2. How do the different parts of the circulatory system work? 3. How are water and nutrients transported within animals and humans? 4. Let's Investigate: How does exercise affect our heart rate? 5. How important is a healthy lifestyle (including drugs and alcohol)? 6. Who was Alexander Fleming?	Physics – Electricity 1. What are the major discoveries in electricity? 2. What is the effect of different volts in a circuit? 3. Let's Investigate: Does wire length affect how components in a circuit work? 4. Who was Steve Jobs?	Physics – Light 1. How do we see? 2. How is light reflected? 3. What is refraction? 4. How does a prism work? 5. Let's Investigate: How do we see colour? 6. Who was Isaac Newton?	Biology – Evolution and inheritance 1. What is inheritance? 2. What is adaptation? 3. What is the theory of evolution? 4. How do we know about evolution (human and fossils)? 5. Let's Report: What is the impact of human intervention on adaptation and evolution? 6. Who was Charles Darwin?

Substantive Knowledge and Disciplinary Investigation overview - Years 1, 2 and 3

			Aut 1	Aut 2	Spr 1	Spr 2	Sum 1	Sum 2
Year 1	Substantive Knowledge	Topic	Chemistry - Everyday Materials	Biology – Autumn and Winter	Biology - Animals including humans	Biology - Plants	Biology – Spring and Summer	Super Science and Fantastic Fieldwork
	Disciplinary Investigation	Let's Investigate	Which material makes the best umbrella?	What colour are the leaves in Autumn?	Can you taste with your nose?	How tall can a bean grow?	How many shade of green can I find?	
Year 2	Substantive Knowledge	Topic	Biology – Living things and their habitats	Chemistry – Materials and their uses	Biology - Animals including humans	Biology – The Environment	Biology - Plants	Super Science and Fantastic Fieldwork
	Disciplinary Investigation	Let's Investigate	Where does a woodlouse like to live?	How can materials change shape?	How can we make germs scatter?	Which ice cube will melt the fastest?	How big will my plant grow if it lives in the _____?	
Year 3	Substantive Knowledge	Topic	Chemistry - Rocks	Biology - Animals including humans	Physics - Forces	Physics - Light and shadows	Biology - Plants	Super Science and Fantastic Fieldwork
	Disciplinary Investigation	Let's Investigate	Which soil is most permeable?	Do people with long legs jump the furthest?	Which surface will the car move the fastest on?	Which surface is the best reflector of light?	Why are flowers fantastic?	

Substantive Knowledge and Disciplinary Investigation overview - Years 4, 5 and 6

			Aut 1	Aut 2	Spr 1	Spr 2	Sum 1	Sum 2
Year 4	Substantive Knowledge	Topic	Physics - Sound	Chemistry - States of matter	Biology - Animals including humans	Physics - Electricity	Biology - Living Things	Super Science and Fantastic Fieldwork
	Disciplinary Investigation	Let's Investigate	Which straws make higher and lower pitches and why?	How does washing dry outside?	Are our digestive systems all the same length?	How does a plug work?	Do man-made changes affect living things?	
Year 5	Substantive Knowledge	Topic	Physics – Earth and space	Chemistry – Properties and changes of materials	Biology – Living things and their habitats	Physics - Forces	Biology - Animals including humans	Super Science and Fantastic Fieldwork
	Disciplinary Investigation	Let's Investigate	On which side of the school grounds would you put a wind turbine?	Can we catch a thief?	What happens to a plant cutting if it is place in water?	What falls fastest?	How do gestation periods and life expectancy change in different species?	
Year 6	Substantive Knowledge	Topic	Biology – Living things and their habitats	Biology - Animals including humans	Physics - Electricity	Physics - Light	Biology – Evolution and inheritance	Super Science and Fantastic Fieldwork
	Disciplinary Investigation	Let's Investigate	What lives in our school grounds?	How does exercise affect our heart rate?	Does wire length affect how components in a circuit work?	How do we see colour?	What is the impact of human intervention on adaptation and evolution?	

Significant People In Science - Year 1

As part of our science curriculum, we also learn about a range of significant people who have had an impact on the world and how we live our lives. As well as highlighting real-world examples of scientific success, learning about these significant people allows the children to recognise the endless future career and life possibilities that scientific knowledge can provide.

Samuel Fox - British Umbrella Inventor

Jane Colden - Botanist

Admiral Robert Fitzroy - Inventor of weather Forecasting

Steve Backshall - Naturalist

Significant People In Science - Year 2

Bill Oddie - Naturalist

John McAdam - Inventor of tarmac

Joe Wicks - Body Coach

Greta Thumberg - Environmental Activist

Diarmuid Gavin - Garden Designer

Significant People In Science - Year 3

Mary Anning - Geologist

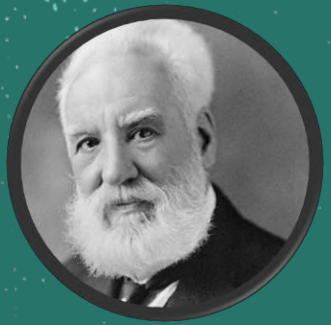
Marie Curie - Physicist and Chemist

Magnes - Founder of Magnets

Percy Shaw - Inventor of Cat's Eyes

David Austin - Rose Breeder

Significant People In Science - Year 4



Alexander Graham Bell - Inventor of the Telephone

Lord Kelvin of Scotland - Inventor of the Absolute Temperature Scale

Dr William Beaumont - Army Sergeant and first person to study human digestion

Thomas Edison - Inventor of the Lightbulb

Gerald Durrell - Conservationist

Significant People In Science - Year 5

Margaret Hamilton - Computer Scientist, developed on-board flight software for NASA

Dr Henry Faulds - development of fingerprinting

Jane Goodall - Conservationist

Sir Isaac Newton - Discoverer of Gravity

Leonardo Da Vinci - Scientist, Engineer and Inventor

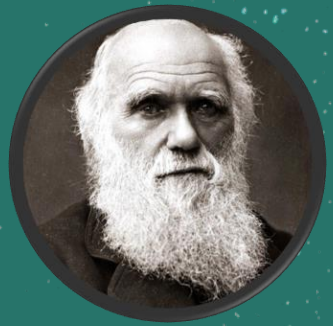
Significant People In Science - Year 6

Libbie Hyman- Zoologist

Alexandre Fleming - Discovered Penicillin

Steve Jobs - Engineer

Sir Isaac Newton - Physicist, investigated light and prisms



Charles Darwin - Developed the Theory of Evolution

Science Expectations and Consistencies

During Science teachers must;

- Every title is a question and the question must be answered by the end of the session. If unsure of an appropriate question then use a 'What…' question stem as these can be the most effective for children to answer. Keep the question simple.
- Teachers must use the subject specific focus of the Science lessons e.g. chemistry, physics or biology (see National Curriculum 2014 or school assessment system which clearly references the subjects) when introducing lessons.
- There is no expectation to use the scrapbooking approach to capture learning in Science, however there may be times when these techniques are the most appropriate.
- Teachers must explicitly teach about a scientist for every theme studied.
- There is no expectation to carry out a Post Learning Quiz, the school's assessment system is detailed enough.
- The 'Working Scientifically' strand of National Curriculum 2014 should be at the forefront of teachers minds when planning learning opportunities. This is a golden thread which will give children transferrable skills, especially when transitioning to secondary school.
- There must be at least one investigation for each unit of work using the agreed school investigation format.
- Subject specific vocabulary should be explicitly taught to children and children should be expected to use it, as well as vocabulary previously taught where appropriate.
- Opportunities to make explicit links with maths should be maximised to ensure children understand how maths can be used every day. Science investigations could become part of a maths lesson and vice versa.
- Teachers should reference fair testing and variables through investigative work, however, this does not need to be explicitly written by children as part of the work in their books. By Year 6 children need to have a deep knowledge of what a fair test is and be able to identify variables. The following definitions and mnemonic should be used with children.

Fair Tests and Variables

Fair test

A fair test is a test which controls all but one variable when attempting to answer a scientific question. Only changing one variable allows the person conducting the test to know that no other variable has affected the results of the test. To help remember how to conduct your fair test, learn the mnemonic:

Cows - Change one thing (independent variable)
Moo - Measure something (dependent variable)
Softly - Keep everything else the same (controlled variable)

Variable

In a fair test, any one of the elements of the test which could be changed is a variable. In a fair test, only one variable is allowed – all others have to be kept the same. For example, if testing whether seeds need warmth for germination, only the temperature could vary – any other elements which may influence germination, such as water or light, have to be kept constant.

Science Investigation format

Aim:
What the children are going to find out.
This may be in the form of a question which must be answered by the end of the investigation.

Equipment:
What the children will need.

Prediction (KS1, Y3 and Y4)/ Hypothesis (Y5 and 6):
What the children think will happen.

The experiment must now happen.

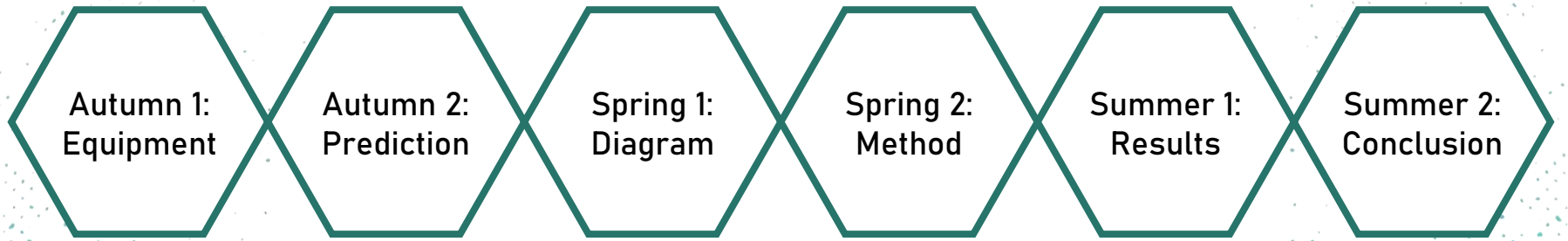
Diagram – Scientific drawing showing the equipment and how the experiment looked, including labels.
Method – A numbered list of the steps someone else would have to take to replicate the experiment, like a recipe. This should not be a description of the experiment but should be focussed, formal steps.
Results – This could be represented in a number of formats (eg a table, bar chart, diagram, written report, photograph etc) depending on the most appropriate tool to record the results. Children in KS1, Year 3 and Year 4 should be explicitly told why one format may be more appropriate than another. By Year 6, children should have been exposed to a number of ways to record and represent their results and be able to choose the most appropriate way for their experiment.
Conclusion – This should answer the aim using the results to inform the written outcome. From Y3 there must be reference made to the accuracy of the child's perdition. Where possible children should be building on their prior knowledge of Science.

Science Investigation format: Progression Year 1

In Year 1 the 'Let's Investigate' framework should be used with children. Teachers should focus on a new section each half term which they should leave blank for the children to complete (except for the aims), the teacher should complete the other sections as a model. Children should be taught the purpose of each section, even if that is not the focus for the half term.

Science Investigation format: Progression Year 2

In Year 2, the 'Let's Investigate' framework should be used with children. Teachers should focus on a new section each half term which they should leave blank for the children to complete (except for the aims), the teacher should complete the other sections as a model. Children should be taught the purpose of each section, even if that is not the focus for the half term.



Science Investigation format: Progression Year 3

In Year 3, the 'Let's Investigate' framework should be used with children. Teachers should focus on specific section each half term which they should leave blank for the children to complete (except for the aims), the teacher should complete the other sections as a model. Children should be taught the purpose of each section, even if that is not the focus for the half term.

Autumn 1: Equipment, Diagram, Results

Autumn 2: Prediction, Method

Spring 1: Conclusion

Spring 2: Focus on further consolidation

Summer 1 and 2:

The children complete the majority of the format independently. Those children requiring additional support can have a scaffolded format.
A teacher modelled example should be used alongside this to support children creating their own version.
Teachers should guide the writing of the method section as a class to support independence.

Science Investigation format: Progression Year 4

In Year 4, the ‘Let’s Investigate’ framework should be used with children. Teachers can choose to move away from the framework and write straight into books if the children are ready for this step. The aim is by the Summer Term that the vast majority of children will no longer need the ‘Let’s Investigate’ format, but all headings and content expected will be evidenced in books. Teachers should identify the sections which still need guiding and scaffolding, with the aim being that the vast majority of children can independently complete these sections by the end of the year.

Science Investigation format: Progression Year 5 and 6

In Year 5 and 6, children should be independently writing up investigations as per the schools headings in their books. Specific teaching of how to develop the conclusion section of the investigation should be a priority in the Autumn Term, as exampled in the 'Science Investigation Format Example' document.

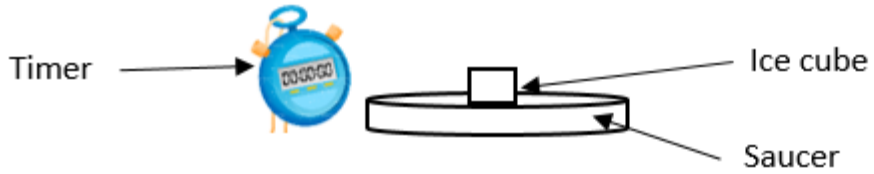
Progression in writing a conclusion

Progression in writing a conclusion should be modelled on the following examples (taken from the 'Science Investigation Format Example' document :

Conclusion:
Y1 example – It took 1 hour.
Y2 example – It took 1 hour because….
Y3 example – It took 1 hour because… with whole class discussion linked to prediction.
Y4 example – It took 1 hour because…I predicted…
Y5 example - It took 1 hour because…(this should link directly to the skills, knowledge and intended learning). I predicted…
Y6 example - It took 1 hour because…(this should link directly to the skills, knowledge and intended learning). I predicted…(reflection on prediction)

When planning for investigations to happen, teachers must continually refer to the Working Scientifically assessment criteria in the schools assessment documentation to ensure there is clear progression and consistency in approach.

Science Investigation Format Example

<u>Aim:</u> How long does it take for the ice to melt?
<u>Equipment:</u> Ice cube, saucer, timer
<u>Prediction (KS1, Y3 and Y4)/ Hypothesis (Y5 and 6):</u> I think it will take 7 hours for the ice to melt completely.
<u>Diagram:</u> 

Science Investigation Format Example

Method:

1. A
2. Numbered
3. List of
4. The steps
5. Someone else
6. Would have
7. To do to replicate
8. The experiment.

Results:

Time	Size of Ice Cube
2:00	1cm
2:15	0.8cm
2:30	0.6cm
2:45	0.3cm
3:00	0cm

Conclusion:

Y1 example – It took 1 hour.
Y2 example – It took 1 hour because….
Y3 example – It took 1 hour because… with whole class discussion linked to prediction.
Y4 example – It took 1 hour because…I predicted…
Y5 example - It took 1 hour because…(this should link directly to the skills, knowledge and intended learning). I predicted…
Y6 example - It took 1 hour because…(this should link directly to the skills, knowledge and intended learning). I predicted…(reflection on prediction)

Science in the outdoors

All science subjects have elements that are better taught outdoors. Environmental sciences are particularly relevant and demonstrate principles and practice that cut across biology, chemistry and physics. Children and young people can have a very different learning experience outdoors from that in the classroom. Outdoor learning frequently involves teamwork and a different ethos of working in a less structured environment. In sciences, this learning can lead to a lifelong interest in a particular aspect of the environment.

Science taught outdoors encourages a level of respect for the local natural world and beyond. It demonstrates the wonders of the environment and allows learners to learn to interact with the living world in a climate of managed risk. The learners' experience of observing class-based theoretical examples can be enhanced through real-world experiences.

Many basic scientific concepts can also be demonstrated through games. A simple walk around the school grounds can provide opportunities for learners to experience and observe a range of scientific principles and their applications.

Taking Science outdoors

Planet Earth can't be seriously studied without getting outside. Grounds can be used to explore biodiversity, interdependence, energy sources, the carbon cycle, photosynthesis, pollination, sustainability and the process of climate change. Much of this learning will be enhanced by creating a variety of habitat types. Boulders can illustrate major rock types and the process of fossilisation.

Where better to study the weather than outside? Build a weather station and measure rainfall, temperature and wind speeds. Create a sun dial and study the movement of the sun and shadows through the day and the year. Explore cloud formation and types and learn about the prevailing wind directions and the impact of wind direction on temperature and rainfall.

Explore the equations of motion on a larger scale. Investigate forces, resistance and aerodynamics with rockets, kites, paper planes, parachutes, levers and catapults. Experiment with different designs and learn how and why this impact on their performance. How could you estimate the speed of sound outdoors?

Taking Science outdoors

Create a fire pit to explore the science of fire and of cooking, as well as to create a focal point for storytelling.

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Growing anything in anything. Germinate broad bean seeds in jam jars in the classroom. Use the germinating seeds to identify the parts of the plant. At a suitable time, plant some seeds or plants outside in pots or the school garden. Discuss and plan how to look after the plants outside. What do they need to help them grow? How can pupils help them to grow?

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Send pupils out into the playground with cameras. Challenge them to photograph living and non-living things beginning with the letters in their school's name. Display their results with reasons for their choice. The same activity can be done on a walk or in a different environment.

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Take children and young people into the school grounds. Ask them to write down lots of questions about what they see, hear and feel outside within the space of a few minutes. With a partner or small group, share the questions and identify which ones are science-related. Put together a list from the whole class and decide which ones to research the answers to back in the classroom.

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Does the sun warm the tree trunks and cause the snow to melt around them? During snowy weather, send pupils out to find out if the snow is melting evenly around the playground. Look at the area around tree trunks and at the base of railings, the mounds of snow pushed up in the car park, next to busy paths etc. Have pupils take photos of their observations and explain them in terms of particles, the heat energy from the sun and changes of state. Try this with jars of warm water, poles of different materials etc.

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Use any opportunity to take children outside whenever possible.

Taking Science outdoors

Create a fire pit to explore the science of fire and of cooking, as well as to create a focal point for storytelling.

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Growing anything in anything. Germinate broad bean seeds in jam jars in the classroom. Use the germinating seeds to identify the parts of the plant. At a suitable time, plant some seeds or plants outside in pots or the school garden. Discuss and plan how to look after the plants outside. What do they need to help them grow? How can pupils help them to grow?

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Send pupils out into the playground with cameras. Challenge them to photograph living and non-living things beginning with the letters in their school's name. Display their results with reasons for their choice. The same activity can be done on a walk or in a different environment.

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Early Years: The Natural World

Our vision for excellence in our curriculum offer for our youngest children places a huge focus on the scientific concepts linked to the natural world. Both our indoors and outdoors environment are developed to provoke a range of concepts to promote curiosity, wonder, problem-solving and encourage our children to ask 'why?'.

This is implemented through a significant focus on growing anything in anything and aligns perfectly with our commitment to outdoor play and learning.

Children at the expected level of development by the end of Reception will:

- Explore the natural world around them, making observations and drawing pictures of animals and plants;

- 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;

- Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.