



Science

Curriculum Overview

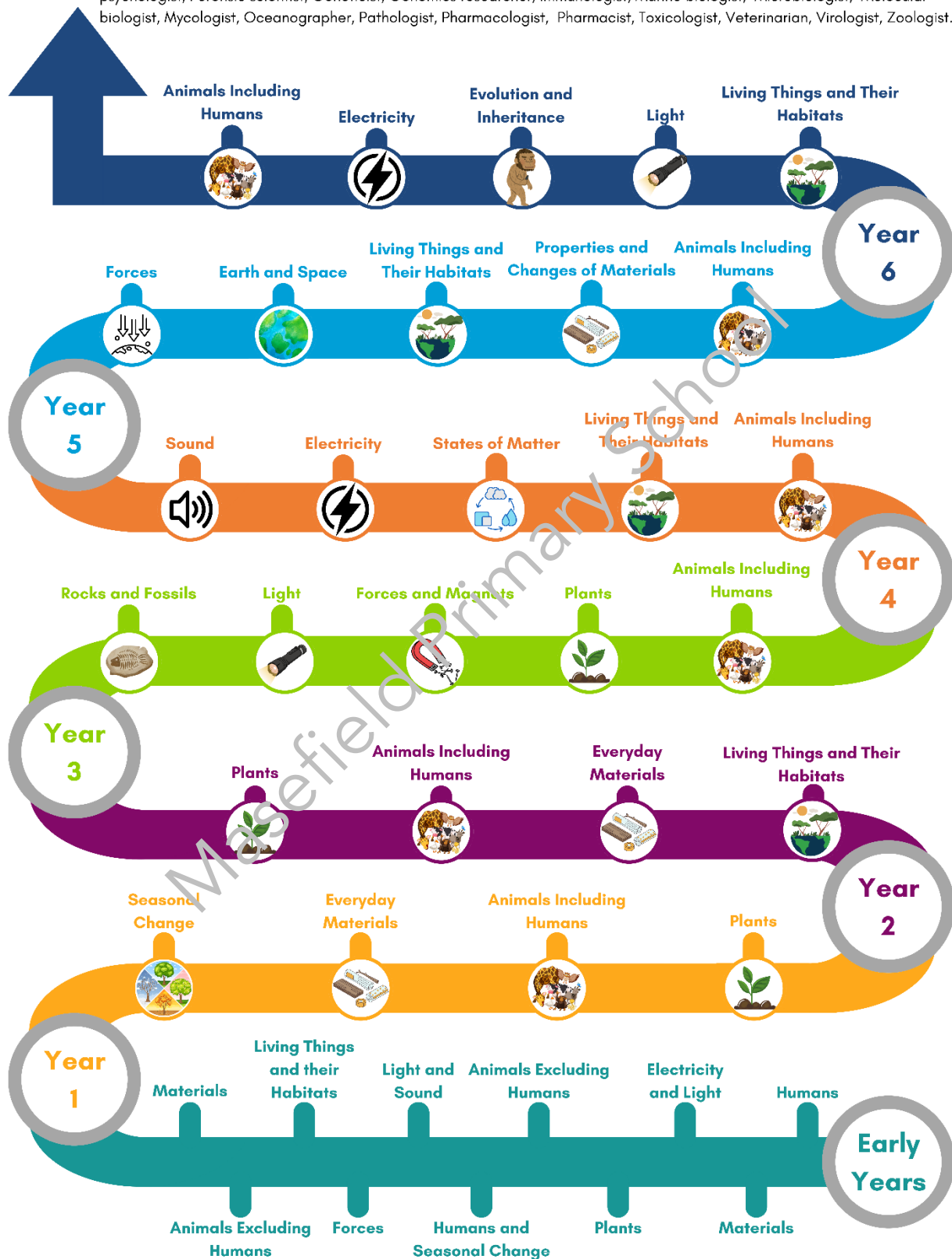
Masefield Primary School



Science

Science Careers

Agricultural scientist, Archaeologist, Bioinformatician, Biomechanics engineer, Biomedical engineer, Biomedical researcher, Biomedical scientist, Biophysicist, Biostatistician, Biotechnologist, Botanist, Cell biologist, Conservationist, Cryobiologist, Cytologist, Data analyst, Earth scientist, Ecotoxicologist, Embryologist, Endocrinologist, Entomologist, Forensic psychologist, Forensic scientist, Geneticist, Genomics researcher, Immunologist, Marine biologist, Microbiologist, Molecular biologist, Mycologist, Oceanographer, Pathologist, Pharmacologist, Pharmacist, Toxicologist, Veterinarian, Virologist, Zoologist.



“Science is a beautiful gift to humanity, we should not distort it,”

- A . P . J . Abdul Kalam

Science National Curriculum in England

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

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics.
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them.
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Early Years

Understanding the World (Early Learning Goal: The Natural World)

- 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.

Key Stage 1

The principal focus of science teaching in Key Stage 1 is to enable pupils to experience and observe phenomena, looking more closely at the natural and humanly - constructed world around them.

They should be encouraged to be curious and ask questions about what they notice.

They should be helped to develop their understanding of scientific ideas by using different types of scientific enquiry to answer their own questions, including observing changes over a period of time, noticing patterns, grouping and classifying things, carrying out simple comparative tests, and finding things out using secondary sources of information.

They should begin to use simple scientific language to talk about what they have found out and communicate their ideas to a range of audiences in a variety of ways. Most of the learning about science should be done through the use of first-hand practical experiences, but there should also be some use of appropriate secondary sources, such as books, photographs and videos.

'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary at a level consistent with their increasing word reading and spelling knowledge at Key Stage 1.

Lower Key Stage 2

The principal focus of science teaching in Lower Key Stage 2 is to enable pupils to broaden their scientific view of the world around them.

They should do this through exploring, talking about, testing and developing ideas about everyday phenomena and the relationships between living things and familiar environments, and by beginning to develop their ideas about functions, relationships and interactions.

They should ask their own questions about what they observe and make some decisions about which types of scientific enquiry are likely to be the best ways of answering them, including observing changes over time, noticing patterns, grouping and classifying things, carrying out simple comparative and fair tests and finding things out using secondary sources of information.

They should draw simple conclusions and use some scientific language, first, to talk about and, later, to write about what they have found out.

'Working scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read and spell scientific vocabulary correctly and with confidence, using their growing word reading and spelling knowledge.

Upper Key Stage 2

The principal focus of science teaching in Upper Key Stage 2 is to enable pupils to develop a deeper understanding of a wide range of scientific ideas.

They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically.

At Upper Key Stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates.

They should also begin to recognise that scientific ideas change and develop over time.

They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.

'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.

Pupils should read, spell and pronounce scientific vocabulary correctly.

Statement of Intent for Science

Science embodies the acquisition of knowledge and understanding of the natural world and beyond through the process of rigorous testing, observation and experimentation, which constantly challenge and build upon prior discoveries. This process results in technological advancements through the application of Science within engineering, which in turn has a profound impact on the world around us. Consequently, we believe that it is our duty to further develop this Science capital through the study of a diverse range of scientists, noting how these key individuals contributed to their fields.

Our Science Curriculum challenges us to develop children who understand what Science is, what it is for and its relevance in the world around us. We aim to nurture and develop their inquisitive nature in order to advance their knowledge using scientific vocabulary in order to discuss and confidently question the world around them, as they explore new concepts using a practical, 'hands-on' approach through scientific enquiry. Overall, we strive to expose the children to have a deeper understanding of the world, widening their opportunities for science capital and fostering a life-long love of Science and STEM.

At Maselfield, Science is taught as a discrete subject in order that the development of knowledge, vocabulary and scientific enquiry skills are taught both meaningfully and explicitly. Naturally, links are made to other areas of the curriculum, especially English, Mathematics, Design Technology and Computing, but this does not dilute the quality and entitlement of high quality Science teaching.

The school's long-term plan for Science follows the Key Stage 1 and Key Stage 2 National Curriculum (2014) and sets out the content of teaching within in each year group. This is supported by the school's Science progression document which demonstrates learning outcomes and expectations for Biology, Chemistry, Physics and Working Scientifically within each Science stand and subsequent units of work. Short term planning details how this content is developed over a series of lessons within the unit of work. The organisation of the Science curriculum provides structured opportunities for pupils to:

- Develop and use key scientific vocabulary within their correct contexts.
- Explore concepts and dispel common misconceptions through the use of investigation.
- Explore the world around them, developing their understanding of key physical and biological processes.
- Approach Science through practical scientific enquiry, through the process of enquire, explore, record and explain.
- Opportunities for working scientifically are provided, using a combination of observation over time, pattern seeking, identifying, classifying and grouping, comparative and fair testing and research using secondary sources of information.
- Devise their own lines of enquiry, which can be planned and subsequently implemented.
- Understand the essential role of Mathematics as a quantifiable source of evidence for scientific understanding.
- Understand the role of Science in the wider world, including its cultural impact on our everyday lives.
- Develop their Science capital through their understanding of the work of scientists and naturalists, from a range of times and cultures, understanding how their discoveries contribute to the cumulative nature of scientific understanding. This is covered through year-group unit linked scientists.

Teaching and Learning in Science

In addition to the conscious structure and design of the Science curriculum, great consideration has been paid to the design of the implementation of the curriculum in the classroom. Teaching delivery will vary according to the activities being undertaken, but will follow the principles set out in the Teaching, Learning and Implementation policy and will include class, group and individual instruction and guidance, exposition and demonstration, and the use of questioning and discussion. The following resources and approaches are adopted across all year groups in order to ensure effective delivery of the intended curriculum.

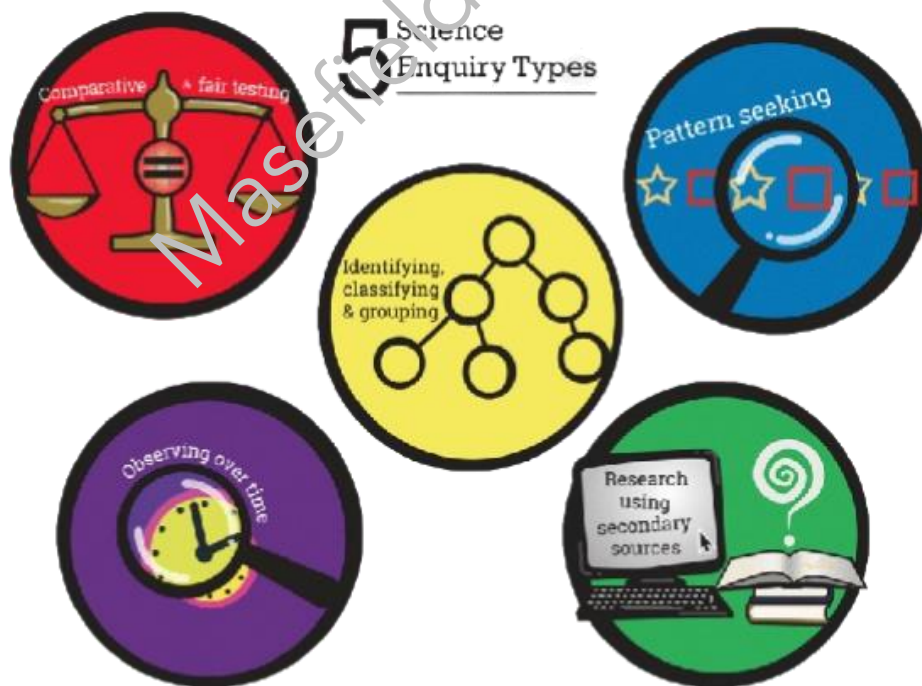
The teaching of scientific knowledge and working scientifically are, where possible, taught in unison, rather than as separate entities, within the majority of Science lessons.

The school's vocabulary progression document (Science) provides a clear focus for the development and exploration of key words, working in conjunction with knowledge organisers, classroom displays of key vocabulary and the use of varied concept and vocabulary exploration activities.

For consistency of approach, the use of Lancashire Planning Posters (physical and electronic) are used to support the teaching of planning practical investigations, guiding pupils to generate focussed scientific enquiry questions.

All year groups undertake a biographical study of a famous scientist linked to specific, identified units of work outlined in the Science long-term plan.

Scientific Enquiry



Working Scientifically

Asking questions

Asking questions that can be answered using a scientific enquiry.



Making predictions

Using prior knowledge to suggest what will happen in an enquiry.



Setting up tests

Deciding on the method and equipment to use to carry out an enquiry.



Observing and measuring

Using senses and measuring equipment to make observations about the enquiry.



Recording data

Using tables, drawings and other means to note observations and measurements.



Interpreting and communicating results

Using information from the data to say what you found out.



Evaluating

Reflecting on the success of the enquiry approach and identifying further questions for enquiry.



Knowing More and Remembering More in Science

At Masefield, we recognise the importance of retrieval practice in making learning more efficient. Retrieval practice allows our teachers to identify and address gaps in knowledge and check for misunderstandings, whilst simultaneously allowing children to make and strengthen connections between their knowledge and providing firmer foundations for future learning. In Science, all teachers follow these agreed procedures to support the consolidation of prior learning and the incremental development of new learning:

The beginning of every unit

In order to assess prior knowledge, the teacher will present the children with the previous years' LbQ question set for that topic where applicable.

This low stakes quiz allows children the opportunity to recall and strengthen relevant prior knowledge which then can be built upon over the upcoming lessons. This also allows teachers the opportunity to identify and address any gaps in prior knowledge or misconceptions so that they can accurately adapt their teaching to ensure that children build a strong knowledge of the required content.

The beginning of every lesson

At the beginning of every lesson, the teacher will refer back to the previous lessons within the sequence of learning. This provides children the opportunity to recall prior knowledge and make connections between this and the new learning in the current lesson.

The end of each unit

At the end of each unit, the teacher will present the children with the LbQ question set for that unit. This is a low stakes quiz which will assess the children's knowledge of the required content in each unit.

This allows children yet another opportunity to recall and strengthen their learning from this unit. It also provides teachers with a clear picture of children's understanding, which will inform their summative assessments for the unit. This allows the teacher another opportunity to address gaps in knowledge or misconceptions.

Friday Flashbacks

Through Friday Flashbacks, the teacher will present the children with the LbQ question sets for all the units taught so far that year. These are low stakes quizzes will assess the children's knowledge of the required content in each unit.

This allows children multiple further opportunities to recall and strengthen their learning from previous units. It also provides teachers with a clear picture of children's understanding and how their knowledge and skills are developing incrementally. It allows them multiple further opportunities to address gaps in knowledge or misconceptions.

Teaching and Learning Delivery Model: Building Knowledge through Challenge

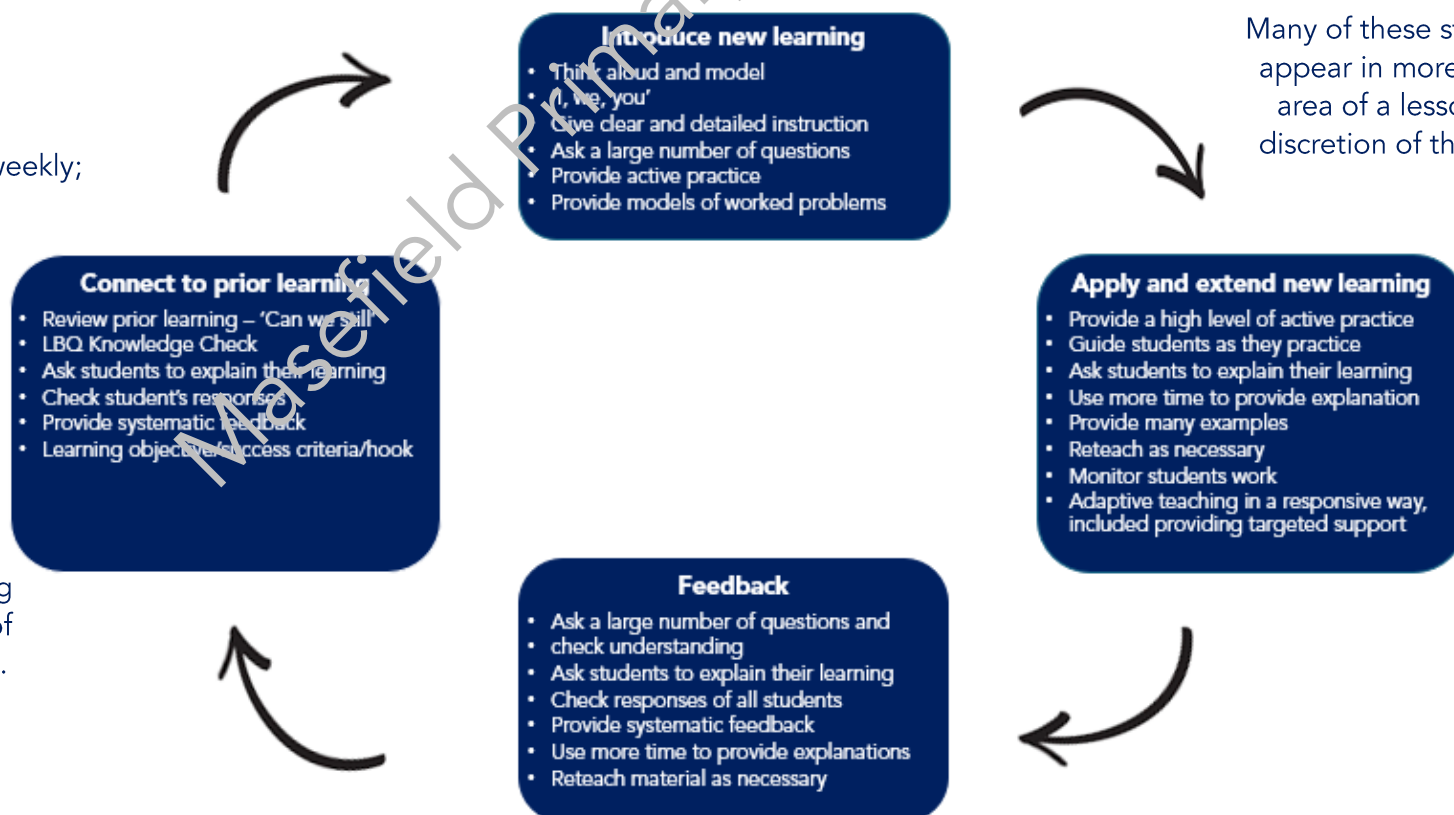


Teachers	Lessons	Learning Opportunities
<ul style="list-style-type: none"> ✓ Have high expectations for all groups of children ✓ Have strong subject knowledge ✓ Promote independence ✓ Promote confidence ✓ Offer praise and encouragement ✓ Are enthusiastic and positive about learning ✓ Model good learning ✓ Offer high quality conversation and talk 	<ul style="list-style-type: none"> ✓ Have a distinct knowledge base ✓ Are purposeful ✓ Are memorable ✓ Are active ✓ Are engaging ✓ Are focussed ✓ See children and teachers working as a learning team 	<ul style="list-style-type: none"> ✓ Increase knowledge ✓ Develop basic skills ✓ Meet children's individual learning needs ✓ Broaden and extend experiences ✓ Offer an opportunity to try new things ✓ Are cross curricular if appropriate ✓ Offer first hand experiences through trips or visitors

There shall be no bad books!

- Vocabulary lesson;
- Regular foundation lessons – weekly;
- New page for each lesson;
- Marking grid for Seesaw work.

Each lesson may not be a complete cycle of the learning sequence but over a period of time all areas will be covered.



Many of these steps would appear in more than one area of a lesson at the discretion of the teacher.

Adaptive Teaching

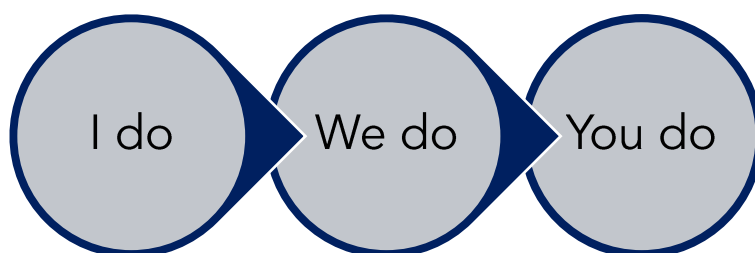


"We are what we repeatedly do. Excellence, then, is not an act, but a habit."

What is Adaptive Teaching and why do we do it?

With adaptive teaching, all pupils are given one explicit instructional goal. They all access the same ambitious curriculum. The teacher teaches to the top and scaffolds pupils who need support to reach that level. When not needed, the teacher removes scaffolds or fades them out.

This approach promotes high achievement for all and doesn't cap opportunities or aspirations.



Explicit Instruction

Adaptive practice:
Pre-teach or TA support during modelling.

Shared Instruction

Check:
Use this section to check pupils' understanding. Can they do it with the structure in place?

Independent Practice

Reflect and Respond:
Allow students who have successfully completed the 'We Do' to move on independently. Group together those who are still struggling and complete work with adult support.

Before the lesson...

Lower ability pupils	Pupils with a low reading age	SEND pupils	EAL pupils
Do they need a pre-teach? Can they complete this when they arrive?	Do they need a keyword and definition list? Are they having 1:1 reading – could this be part of a foundation subject lesson or reading lesson?	What resources will they need to support them in successfully completing the task (task sheet, checklists, mind maps etc.)? Communicate with TA beforehand to co-ordinate effective support.	Do they need translated resources? Laptops?

During the lesson...

CHECK	ENOUGH CORRECT	Practise, consolidate, move on
REFLECT	NOT ENOUGH CORRECT	Re-explain, more questioning, further chunking, modelling, further scaffolding, check your question then re-check for understanding.
RESPOND		
Further support...	Refer to Adaptive Teaching booklet, mini-whiteboards, LBQ, targeted support, additional practice, modelling (I do, we do, you do), breakdown content (chunking).	



SEND – Adaptive Teaching Strategies to support and scaffold

- Adjust the level of challenge – e.g. provide sentence stems and question prompts to support thinking, allow children to present their work in different ways (mind maps, collaborative work).
- Clarify/simplify a task or provide numbered steps with visual representations (objects, pictures, signs, photos).
- Use bold essential content from curriculum document.
- Re-explain a concept or explain it in a different way.
- Give additional (or revisit) examples.
- Use peer tutoring/collaborative learning (everyone must participate – give them roles).
- Provide additional scaffolds - e.g. – pre-teach vocabulary, 'I do, we do, you', chunk learning into smaller chunks and break learning down into key knowledge, provide worked examples, provide sentence starters for writing, use media (photographs, film) and hands on resources, where possible.
- Set clear targets/expectations.
- Provide prompts/sentence stems – e.g. provide/develop with children steps to success for children to work from, question prompts to support with thinking and reduce cognitive overload.
- Improve accessibility (e.g. proximity to speaker, visibility of whiteboard, read a text to the pupil) – e.g. – child-friendly texts/media, where possible. When researching, use child appropriate websites.
- Consider pace - (extra time for responses to questions, contributing to class discussions and to complete activities).
- Provide vocabulary with visual images – e.g. - explicitly teach vocabulary at the beginning of a unit alongside a picture of the key word, use photographs to represent the word when using it during the unit.
- Check understanding and reinforcing as needed through repetition, rephrasing, explaining and demonstration – e.g. use of mini-plenaries to check understanding (quick quizzes).
- Have alternative ways to record learning, e.g. oral, photographic, video, highlighting text, mind maps, etc. – e.g. give children a variety of ways to record their work (recording themselves, use of technology, mind maps), allow children to be creative in the ways that they present their work – they do not all have to be the same.
- Pre-teach vocabulary, key content etc.



More Able – Adaptive Teaching Strategies to stretch and challenge

- Identify and account for prior knowledge – a child who has extensive prior knowledge could be asked to present some of the knowledge they have to the class; explain something they understand easily to a child who doesn't 'get it' so quickly – e.g. – peer modelling, a more able child could present interesting facts that they already know to the children, more able children given more challenging enquiry based questions to extend their learning.
- Build on interests to extend - read widely around a subject outside of lesson time by providing them with information about suitable material, e.g. give them suitable higher-level texts to read – e.g. – Use of History Pupil Leaders to develop love of History, questions to research for home learning, projects to complete for home learning.
- Depth of content - consider what you can add to create depth, e.g. digging into an area more deeply, going laterally with a concept, or asking pupils to use more complex terminology to describe abstract ideas.
- Use questioning techniques to boost thinking – ask open-ended questions which require higher-order thinking - e.g. – How.....Why.....What does this source tell us?
- Consider learner roles – ensure they are appropriately challenged through the role they are given so they can make an effective contribution; argue in favour of a viewpoint that is different to their own, e.g. argue the opposite position to that which they actually hold, during a class debate, take on a more supportive 'tutor' role during group work.
- Mastery - more intensive teaching, tutoring, peer-assisted learning, small group discussions, or additional homework. e.g. - analyse and interpret sources (questions – what's this? What can we say for certain? What can we infer? Does this new source strengthen, amend or completely change our thinking? What doesn't the source tell us?
- Adapted success criteria/choice of task – offer a choice of tasks with a different level of challenge.
- Feedback – framing feedback so pupils must take responsibility for improving their own learning – e.g. extend more able learners through open-ended questions when providing feedback.



Learning by Questions – Using EdTech to support Teaching and Learning



What is Learning by Questions?

Pupils' use iPads and progress at their own pace and level through high quality Question Sets and receive immediate automatic feedback as they answer. Teachers receive live analysis and results are saved to support assessment and planning. Data is stored automatically to support lesson planning.

Why do we use it?

Learning by Questions (LbQ) is fully embedded into Masfield's curriculum journey. This evidence based and award winning teaching & learning tool has been fundamental in the significantly above average results at Masfield over the last few years. All teachers and pupils have accounts that allow access to all resources.

What support do I get?

- Tracked classes set up in the first week of the academic year.
- Every member of staff (teachers and TAs) will receive regular CPD on LbQ, including meeting updates, 1:1 CPD, in class coaching and observations.
- Question Sets are ready made for all subjects, including every foundation subject unit from Year 1 to Year 6.

Using LbQ in Maths

- 3 tasks completed daily as morning maths - LbQ tasks that start with 'practise'. Basic skills and previous learning only.
- Used as a teaching and learning tool – not assessment.
- Intervention screen should be used regularly to assess pupils understanding and address misconceptions immediately.
- Green button (play) should be used regularly to involve and engage all learners in the lesson.
- Pupils should not get an incorrect answer more than 3 times. The teacher or TA should intervene before this or the pupil must ask for support.
- LbQ to be used as part of the deeper learning within lessons.
- An application of the learning within the lesson must be shown in maths book (usually reasoning and problem solving).

Using LbQ in Reading

- Used for intervention sessions.
- Used as part of reading in foundation subjects.



Using LbQ in Science

- Vocabulary question set to be completed before Science Unit.
- Previous topic (if appropriate) to be completed before Science Unit (e.g Year 4 Light question set to be completed before teaching of Year 6 Light topic).
- Investigation question set available to support teaching of fair testing.
- Knowledge Review question set to be used at end of topic – or once teaching sequence completed.

Using LbQ in Foundation Subjects

- Question Sets to be completed at the end of learning and during knowledge days.
- Refer to Knowledge Day Overview document for Question Set Record.

Overview of Science Content

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
EYFS: Nursery	<u>Humans</u>	<u>Materials (including changing materials)</u>	<u>Electricity and Light</u>	<u>Plants</u>	<u>Animals Excluding Humans</u>	
EYFS: Reception	<u>Humans and Seasonal Change</u>	<u>Light and Sound</u>	<u>Forces</u>	<u>Living Things and Their Habitats</u>	<u>Animals Excluding Humans</u>	<u>Materials (including changing materials)</u>
Year One	<u>Physics: Seasonal Change</u>	<u>Chemistry: Everyday Materials</u>	<u>Biology: Animals Including Humans</u>		<u>Biology: Plants</u>	
Year Two	<u>Biology: Living Things and their Habitats</u>	<u>Chemistry: Uses of Everyday Materials</u>	<u>Biology: Animals Including Humans</u>		<u>Biology: Plants</u>	
Year Three	<u>Chemistry: Rocks</u>	<u>Physics: Light</u>	<u>Physics: Forces and Magnets</u>	<u>Biology: Plants</u>	<u>Biology: Animals Including Humans</u>	
Year Four	<u>Physics: Sound</u>	<u>Physics: Electricity</u>	<u>Chemistry: States of Matter</u>	<u>Biology: Living Things and their Habitats</u>	<u>Biology: Animals Including Humans</u>	
Year Five	<u>Physics: Forces</u>	<u>Physics: Earth and Space</u>	<u>Biology: Living Things and their Habitats</u>	<u>Chemistry: Properties and Changes of Materials</u>	<u>Biology: Animals Including Humans</u>	
Year Six	<u>Biology: Animals Including Humans</u>	<u>Physics: Electricity</u>	<u>Biology: Evolution and Inheritance</u>		<u>Physics: Light</u>	<u>Biology: Living Things and Their Habitats</u>

3 and 4 Year Olds	<ul style="list-style-type: none">• Use all their senses in hands-on exploration of natural materials.• Explore collections of materials with similar and/or different properties.• Talk about what they see, using a wide vocabulary.• Plant seeds and care for growing plants.• Understand the key features of the life cycle of a plant and an animal.• Begin to understand the need to respect and care for the natural environment and all living things.• Explore and talk about different forces they can feel• Talk about the differences between materials and changes they notice.
Reception	<ul style="list-style-type: none">• Explore the natural world around them.• Describe what they see, hear and feel whilst outside.• Recognise some environments that are different from the one in which they live.• Understand the effect of changing seasons on the natural world around them.
Early Learning Goals	<ul style="list-style-type: none">• 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.

Nursery: Humans

Curriculum Content

Understanding the World

- Use all their senses in hands-on exploration of natural materials.
- Begin to make sense of their own life-story and family's history.
- Understand the key features of the life cycle of a plant and an animal.

Personal, Social and Emotional Development

- Be increasingly independent in meeting their own care needs, e.g. brushing teeth, using the toilet, washing and drying their hands thoroughly.
- Make healthy choices about food, drink, activity and toothbrushing.

Expressive Arts and Design

- Create closed shapes with continuous lines and begin to use these shapes to represent objects.
- Draw with increasing complexity and detail, such as representing a face with a circle and including details.

Substantive Knowledge

- Learn about the life cycles of humans
- Learn about how to take care of themselves
- Learn about their senses

Encouraging scientific enquiry Classification

Sort images of humans according to their age.

Sort using different senses. Which do you like/not like?

Observing over time

How does a baby change over time?

Researching using secondary sources

Find out about the human life cycle from an expectant mother, a parent with a baby and an elderly person.

Prior Learning

- Explore natural materials, indoors and outside. (Birth to three)
- Make connections between the features of their family and other families. (Birth to three)
- Notice differences between people. (Birth to three)

Future Learning

- Talk about members of their immediate family and community. (Reception)
- Name and describe people who are familiar to them. (Reception)
- Describe what they see, hear and feel whilst outside. (Reception)
- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 – Animals, including humans)

Key Vocabulary

grow,
change,
baby,
toddler,
child,
adult,
old person,
smell,
taste,
touch,
feel,
hear,
see,
blind,
deaf

Reception – Throughout the Year

Seasonal Changes

The Big Idea: There are four seasons in a year. Spring, Summer, Autumn and Winter. Each season is different and there are different signs that help us to identify which season we are in.

Prior Knowledge Requirements:

- Understand the key features of the life cycle of a plant and an animal. (Nursery)
- Begin to understand the need to respect and care for the natural environment and all living things. (Nursery)
- Understand the key features of the life cycle of a plant and an animal. (Nursery – Plants & Animals, excluding humans)

Future Learning:

- Observe changes across the four seasons. (Y1 – Seasonal changes)
- Observe and describe weather associated with the seasons and how day length varies. (Y1 – Seasonal changes)

Curriculum objectives:

Revisited and explored throughout the year

Understanding the World

- Explore the natural world around them.
- Describe what they see, hear and feel whilst outside.
- Understand the effect of changing seasons on the natural world around them.

Context for Study:

This unit is taught throughout the year. Children will have some basic understanding of the environment from their learning in Nursery. This unit will prepare children for learning in Year 1 where they will observe changes across the four seasons.

Vocabulary:

Spring
Winter
Cloudy
Cold
Storm
Hail
Icy
Windy
Young

summer
seasons
hot
shower
thunder
sleet
frost
rainbow
plants

autumn
sunny
warm
raining
lightning
snow
puddles
animals
flowers

Developing a sense of the natural world

Throughout the year pupils will study discrete scientific content through the units in the EYFS.

In addition to this we recognise that pupils will learn a lot through exploring books and reading stories. Within our book talk sessions pupils read a range of texts which expose them to the wider world around them. Discussions will take place in the moment and will vary depending on the children's interests and their prior knowledge.

Teachers will develop scientific knowledge and scientific enquiry within conversations as opportunities arise for example children will seek out patterns whilst playing in the maths area or in the water tray. Children will notice changes by observing over time when playing in the outdoor provision. Staff will draw children's attention to these things as they play.

Continuous provision plays a huge part in learning in Reception. The environment will be set up to allow children to learn through play. Carefully planned role play areas will provide experiences to expose children to science. For example setting up a shop with fruit and vegetables to talk about harvest.

Sequence of Learning

Step
1

Retrieval of previous learning

- Talk about seasons – what do the children already know?
- **Classification:** Show the children pictures and objects from different seasons. Sort and classify these objects.

Step
2

Summer

- Talk about Summer and the signs that the children have seen that tell them it is Summer
- Talk about the weather, animal and plant life around them
- Talk about what will happen as Summer turns to Autumn

Step
3

Autumn

- Talk about Autumn and the signs that the children have seen that tell them it is Autumn
- Talk about the weather, animal and plant life around them
- Talk about the leaves changing colour, why this happens and what happens next

Sequence of Learning

Step 4

Autumn/Winter

- **Researching using secondary sources:** Find out about how animals behave in different seasons.
- Find out about the weather and seasons.
- Talk about hibernation and why animals hibernate.

Step 5

Winter

- Talk about Winter and the signs that the children have seen that tell them it is Winter
- Talk about the weather, animal and plant life around them
- Talk about the changes that the children can see in the trees and plants around them

Step 6

Spring

- Talk about Spring and the signs that the children have seen that tell them it is Spring
- Talk about the weather, animal and plant life around them
- Talk about lifecycles in plants and animals – **changes over time:** plant beans and observe their growth

Step 7

Observing over time

- How does a puddle change over time?
- How does a snowman change as it melts?
- How does the natural world change with the seasons?

Year One Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Physics: Seasonal Change	Chemistry: Everyday Materials	Biology: Animals Including Humans		Biology: Plants	
Scientific Enquiry	Is the weather the same everyday?	*Do all materials float?	Are all animals totally different?		What parts is a plant made of?	
Key Scientist	Robert Fitzroy		**Biography: Steve Irwin			
LBO Assessment	Year 1 Seasonal Change LBO Assessment	Year 1 Everyday Materials LBO Assessment	Year 1 Animals Including Humans LBO Assessment		Year 1 Plants LBO Assessment	

*Undertake a full practical investigation

**Undertake a biographical study of a famous scientist

Year One Literature Spine

To support the teaching of Science here at Masefield, we have developed a collection of books that all children in our school are to experience and enjoy. We aim to immerse our children in a range of texts, specifically chosen by our staff to ensure that children hear the best stories read aloud to them by their teachers for pleasure, to excite and inspire our children and support the development of knowledge and skills in Science.

Seasonal Change



Everyday Materials



Animals Including Humans



Plants



Year One – Spring

Biology: Animals, Including Humans

The Big Idea:

Animals are a type of life which are found almost everywhere in the world. There are many different types, coming in many shapes and sizes. Some are domesticated and are farmed or even kept as pets.

Prior Knowledge Requirements:

- The names of common farm animals and their young
- Animals need food, water, shelter and warmth to keep healthy
- How chickens and frogs grow from eggs.

Common Misconceptions:

Some children may think:

- only four-legged mammals, such as pets, are animals
- humans are not animals
- insects are not animals
- all 'bugs' or 'creepy crawlies', such as spiders, are part of the insect group
- amphibians and reptiles are the same.

National Curriculum objectives:

- 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.

Context for Study:

This unit is the first of eight science units where pupils study animals, including humans, as part of the discipline of biology - the study of living organisms. From Reception, pupils can name common animals and their babies. Pupils also know that animals live in particular habitats and know some common features of mini beasts. In Year 1, pupils further develop their knowledge of animals as they are introduced to the concept of 'families' and how animals are grouped according to their shared properties including fish, amphibians, reptiles, birds and mammals. Pupils learn the key features of each animal family and group them into their correct families. New learning includes identifying and naming a variety of common animals that are carnivores, herbivores and omnivores. Pupils identify, name, draw and label the basic parts of the human body. Pupils also learn about the senses. This unit is the precursor to work studied in Year 2 where pupils learn about how animals, and humans, grow and change. Pupils study life cycles of humans and animals such as butterflies, chickens and frogs.

Vocabulary:

Mammal: Warm-blooded creatures which have fur, breathe air and give birth to live young (no eggs).

Fish: A scaly skinned creature with a spine (back bone) which swims under water and breathes using gills.

Reptile: Cold-blooded animals which mostly lay eggs and have hard, dry scales covering their body. Most live on land, but some, such as the turtle, live in water. All reptiles breathe air.

Bird: Feathered animals which have warm-blooded and lay eggs. Most, but not all, species of birds can fly.

Amphibian: These creatures begin life in water as eggs, have a tadpole-like stage before spending most of their adult life on both land and in water. They have both lungs and gills. Example: Frog

Herbivore: Animals which only eat plants.

Carnivore: Animals which hunt and eat other animals (meat).

Omnivore: An animal which eats both meat and plants.

Nocturnal: Animals which spend most of their lives awake during the night and sleeping during the day.

Human: Another word for people. Humans belong to the group of animals called mammals.

Pet: An animal which lives with people in their homes.

Senses: We use our senses to discover what is around us. There are five senses – sight, hear, smell, taste and touch.

Sequence of Learning

Step
1

Retrieval of previous learning

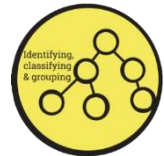
- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).



Step
2

Group animals by their body type.

- Know that we can group animals based on a range of features and characteristics.
- Sort animals into a range of groups. E.g. animals with fur, animals that live in water.



Step
3

Are all animals totally different?

- Pupils will know that animals are grouped together in 'families' based on shared properties. They will name the groups fish, amphibians, reptiles, birds and mammals.

Mammals	Fish	Bird	Reptile	Amphibian
Mouse	Carp	House Sparrow	Common lizard	Common toad
Fox	Stickleback	Blackbird	Adder	Common frog
Badger		Magpie	Grass snake	Smooth newts
Squirrel	<u>Wider World</u>	Starling		
Hedgehog	Cod	Robin	<u>Wider World</u>	
	Salmon		Iguana	<u>Wider World</u>
<u>Wider World</u>		<u>Wider World</u>	Chameleon	Poison dart frog
Elephant		Flamingo	Crocodile	
Tiger		Penguin	Alligator	
Gorilla		Macaw		
Lion		Pelican		
Orangutan		Emu		

- Know the features of a fish - gills, scales, fins, water dwelling
- Know the features of mammals - hair or fur, babies drink mother's milk, live on land or water
- Know the features of amphibians - live on land or water when adults, soft skin, lay eggs in water, live in water when young
- Know the features of reptiles - dry scaly skin, lay eggs on land
- Know the features of birds - wings, feathers, beak/bill, hatch from eggs, most can fly but some can't (e.g., ostrich, penguin, kiwi)



Sequence of Learning

Step 4

Identify carnivores, herbivores and omnivores.

- Know that herbivorous animals eat plants; a carnivorous animal eats other animals; omnivorous animals eat both animals and plants
- Know that a cat is an example of a carnivore; that a rabbit is an example of a herbivore; know that many humans are examples of omnivores (though not vegetarians)



Step 5

Scientist Study- Steve Irwin

- (1962-2006) Australian television personality, environmentalist and wildlife expert nicknamed 'The Crocodile Hunter.'
- He ran a zoo in Queensland, Australia with his family called Australia Zoo.
- Steve died in 2006 when he was stung by a sting ray.



Step 6

Label the main parts of the human body.

- Identify and label main parts of the human body
- Know why we need the following body parts - ears, mouth, eyes, nose, tongue.
- Know that the brain controls the body and is where you think and remember things.
- Know the location of the brain.



Sequence of Learning

Step 7

Explain what part of the body is to do with which sense

- Know that we have five senses - smell, taste, touch, sight, hearing
- Know that the following body parts are linked to the senses.

Sense	Part of the body
sight	eyes
smell	nose
touch	hands, feet, arms, legs etc
hearing	ears
taste	tongue



Step 8

Assessment

- LBQ Question Set – Y1 Animals including Humans
- Information Text

Year Two Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Biology: Living Things and their Habitats	Chemistry: Uses of Everyday Materials	Biology: Animals Including Humans		Biology: Plants	
Scientific Enquiry	Is everything on earth alive?	What material would make a good...?	Do all animals start off small?		*Do plants grow the same amount each day?	
Key Scientist		**Biography: John Boyd Dunlop	Joan Beauchamp Procter			
LBO Assessment	Year 2 Living Things and their Habitats LBO Assessment	Year 2 Uses of Everyday Materials LBO Assessment	Year 2 Animals Including Humans LBO Assessment		Year 2 Plants LBO Assessment	

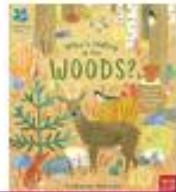
*Undertake a full practical investigation

**Undertake a biographical study of a famous scientist

Year Two Literature Spine

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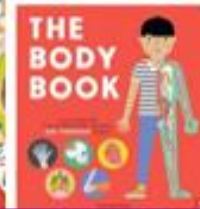
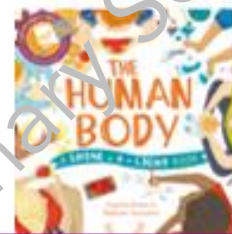
Living things and their habitats



Everyday Materials



Animals Including Humans



Plants



Year Two – Summer

Biology: Plants

The Big Idea:

Plants are a type of life found throughout the world. They range in size from grass up to huge trees. They are usually green and have leaves, which capture sunlight to help them grow.

Prior Knowledge Requirements:

- Plants can grow.
- The names of some common garden plants (e.g. poppy, rose) and some common wild plants (e.g. daisy, dandelion, nettle).
- Deciduous trees lose their leaves in the autumn every year.
- Evergreen trees have green leaves all year round.
- The parts of a plant may include: petals, fruits, roots, bulbs, seeds, stem, trunk and branches.

Common Misconceptions:

Some children may think:

- plants are not alive as they cannot be seen to move
- seeds are not alive
- all plants start out as seeds
- seeds and bulbs need sunlight to germinate

National Curriculum objectives:

- Observe and describe how seeds and bulbs grow into mature plants
- Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy.

Context for Study:

This unit follows on from learning in Reception about the seasons and changes that happen to the plants during those seasons. They have also recognised some fruits and vegetables and named the basic parts of a plant. In year 1 the pupils learned about the names of common plants and trees and how to identify them by their leaves. They learn about the terms 'evergreen' and 'deciduous'. In year 2 pupils will recap common plants and trees studied in year 1 before moving onto how plants grow (including germination and pollination), what they need to grow healthily and differences between bulbs and seeds. This unit includes an investigation about growing healthy plants. This is the precursor to work studied in Year looking more at what plants need to grow healthily. They will also study water transportation and the process of the life cycle of the plant including pollination, seed formation and seed dispersal. In Year 6, pupils continue to study plants by studying plant classification for flowering and not flowering plants.

Vocabulary:

Plant: A living thing which uses energy from the Sun to make its own food (sugar). They grow from seeds and bulbs.

Roots: The part of a plant found (mostly) underground. They hold (anchor) the plant in place and soak up (absorb) nutrients and water from the soil to help the plant grow.

Bulb: These are underground masses of food storage from which plants grow.

Seeds: Seeds are formed within the fruits of flowering plants. New plants grow (germinate) from these.

Blossom: The mass of flowers created by a tree or plant. Blossom is usually found in Spring.

Stem: The part of a plant which supports the leaves and flowers. Water and food are transported (moved around) inside the stem.

Trunk: The trunk is the stem of a tree. It is thicker, woody and stronger, holding up the crown (branches) of the tree.

Leaves: Mostly green parts of the plant used to capture sunlight to help the plant grow.

Woodland: A woodland is a habitat where trees are the main (dominant) type of plant.

Deciduous: These are trees which shed (drop) their leaves in the Autumn and grow new ones in Spring. Example: Oak.

Evergreen: These trees and plants do not lose their leaves in Autumn, instead they keep them all year round. Example: Conifer.

Sequence of Learning

Step 1

Retrieval of previous learning

- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate).



Step 2

Label the main parts of a plant and explain their function

- Know the names of common trees and plants from Y1 curriculum
- Plants: daisy, white clover, poppy, nettle, ivy, bramble, dandelion and grass and introduce new species daffodils, roses, thistle and shamrock.
- Trees - oak, elm, maple, silver birch, sycamore, horse chestnut.
- Know the parts of a plant as roots, stem, flower, leaves (revision from Y1)
- Know that roots support the plant in the ground and absorb water and nutrients needed for growth.
- Know that nutrients are substances that help plants and animals to grow.
- Know that the stem holds the flower and leaves up to the sunlight and carries water and nutrients to the leaves.
- **Know that leaves are made to catch sunlight and change the sun's energy into energy for the plant to use to grow. They are the only living things that can do this.**
- Know that the flower is where seeds are made. Know that bees and insects help this process by carrying pollen from one flower to another. This is called pollination.



Sequence of Learning

Step 3

Sequence the different stages in a plant's life

- Know that plants grow from seeds or bulbs. Identify pictures of seeds and bulbs.
- Know that seeds are sown and bulbs are planted.
- Know that when a seed germinates it starts to grow. This process is called germination.
- As a plant grows it becomes a seedling before becoming an adult plant.
- Know that a shoot is a new part of a plant that grows.
- Know that seeds and bulbs have a store of food inside them.
- Understand why a circle diagram is used to understand the life cycle of a plant.



Step 4

Explain how flowering plants reproduce

- Know that the flower is where seeds are made.
- When an insect enters the flower, some pollen might stick to it. When the insect flies to another flower, the pollen might fall off into the flower. When pollen from one flower goes into another flower, the flower is pollinated.
- Once a flower has been pollinated, it has enough material to produce a seed. The seed is capable of growing into another



Step 5

Consider what plants need to grow well.

- Know that plants need the following to grow and be healthy:
 - Water
 - Air
 - Warmth
 - Light
 - Nutrients ('food' absorbed by the roots)
- Know that healthy plants are green and strong unhealthy plants are often pale, yellowy and weak.



Sequence of Learning

Step 6

Do plants grow the same amount every day?

- Chn measure the height of a growing plant over a period of days and weeks
- Know that variables are the elements of an experiment that can be changed.
- Know how to conduct an experiment to demonstrate the effects of water on plant growth.
 - 1. Seed A should have no access to water.
 - 2. Seed B should have access to water twice a day.
 - 3. Seed C should have access to water once a day.
 - 4. Seed D should have access to water once a week.
- Pupils use what they know about what plants need to grow to predict what will happen for each container.
- Know that the experiment must have other variables the same e.g. temperature.
- Know how to use a measuring cylinder to measure a liquid.
- Know that they must check the size of the plants regularly and over a long period of time.
- Know how to use a ruler to measure height of a plant in cm. Know how to describe the health of the plant through careful observation of colouring and stem strength.



Step 7

Assessment

- LBQ Question Set – Y2 Plants
- Information Text

Year Three Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Chemistry: Rocks and Fossils	Physics: Light	Physics: Forces and Magnets	Biology: Plants	Biology: Animals Including Humans	
Scientific Enquiry	Are all rocks made in the same way?	Why do shadows change during the day?	*Are all metals attracted to magnets?	Do all plants need exactly the same things?	How does our body move and stand up?	
Key Scientist	**Biography: Mary Anning		Michael Faraday	Beatrix Potter		
LBO Assessment	10669: Fossil Formation 10927: Rock properties and uses	11262: Light and Dark 11253: Shadows	10894: Forces 11256: Magnets	11258: What Plants Need to Grow 10500: Life Cycle of a Flowering Plant	10560: Different Animal Diets 10605: Skeletons, Muscles and Joints 11498: Food and Diet: Food Groups	

*Undertake a full practical investigation

**Undertake a biographical study of a famous scientist

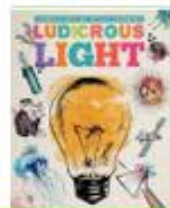
Year Three Literature Spine

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Rocks and Fossils



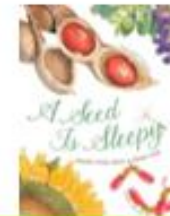
Light



Forces and Magnets



Plants



Animals Including Humans



Chemistry: Rocks

The Big Idea:

Rocks are formed in the Earth's crust and they have different properties. Soils are formed from the breakdown of rocks and decaying organic matter. Fossils are formed when dead animals are trapped within rocks.

Prior Knowledge Requirements:

- What materials some objects are made from
- How to give simple descriptions of materials
- Which materials are made/ natural
- The properties of common materials
- How the shape of solids can be changed by squashing, bending, twisting and stretching

Common Misconceptions:

Some children may think:

- rocks are all hard in nature
- rock-like, man-made substances such as concrete or brick are rocks
- materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'
- certain found artefacts, like old bits of pottery or coins, are fossils
- a fossil is an actual piece of the extinct animal or plant
- soil and compost are the same thing.

National Curriculum objectives:

- Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
- Describe in simple terms how fossils are formed when things that have lived are trapped within rock. Recognise that soils are made from rocks and organic matter.

Context for Study:

This unit is the third of five science units where pupils study materials as part of the discipline of chemistry - the identification of the properties a substance is made from. Pupils have a secure knowledge of the properties of materials and can identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses. Previous learning includes comparing how things move on different surfaces. Pupils know that squashing, bending, twisting and stretching can change the shapes of some solid objects. This year 3 unit builds on pupils' knowledge of properties of materials as pupils learn about rocks and soils. New learning includes comparing and grouping together different kinds of rocks on the basis of their appearance and simple physical properties. The knowledge acquired of rocks and soils during this unit will help pupils understand the significance of the life and works of palaeontologist Mary Anning. Later in the year, during a separate Year 3 forces unit, pupils further develop their knowledge as they compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials. This unit is the precursor to work studied in Year 4 as pupils study materials in terms of solids, liquids and gases.

Vocabulary:

Rock/Stone: A hard material formed out of minerals in the Earth's crust. There are three types of rocks: sedimentary, igneous and metamorphic.

Layers: A thickness of material which sits upon other materials beneath it.

Organic Matter: Organic matter is matter that has come from a recently living organism. It is capable of decaying.

Permeable (Absorbs Water): Allows water to soak into it.

Impermeable (Waterproof): Water cannot soak into the material, instead, it simply runs off of the surface.

Soil: Soil consists of a mix of organic material (decayed plants and animals) and broken bits of rocks and minerals.

Fossil: A fossil is the preserved remains or traces of a dead organism.

Sedimentary Rocks: Sedimentary rocks are made when sand, mud and pebbles get laid down in layers. **Igneous Rocks:** Igneous rock is formed when magma cools and solidifies, it may do this above or below the Earth's surface.

Metamorphic Rocks: When a rock experiences heat and pressure, it becomes a metamorphic rock. All metamorphic rocks start as another type of rock.

Magma: Hot, liquid rock found within the Earth's mantle. When magma comes to the surface of the crust, it is called lava.

Sequence of Learning

Step 1

Retrieval of previous learning

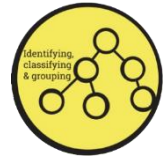
- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate: 10626).



Step 2

Observe and describe the properties of rocks

- **Know the three natural types of rocks: igneous, sedimentary and metamorphic.**
- Know that the Earth has a solid crust made up of tectonic plates with molten rock beneath. Igneous rocks are formed from the heat of lava or magma. They have large crystals. e.g. Granite and basalt
- Sedimentary rocks are formed from sediment (small pieces of rock and earth that settle at the bottom of a liquid i.e. water) being compressed by the weight of the liquid above and cementing over time. They are made of small grains. e.g. Limestone (chalk), coal and sandstone.
- Metamorphic rocks are formerly igneous or sedimentary rocks that have been changed at a chemical level due to intense heat from magma. e.g. Marble and slate.



Step 3

Are all rocks made in the same way?

- Know how to use a magnifying glass to identify features of the rock types.
- Identify if the rocks have grains or crystals.
- Know how to test a range of rocks for:
 - Permeability/impermeability (waterproof - pour a small amount of water and observe it is absorbed or runs off)
 - Strength (hard or soft - use a coin or similar object to scratch the rock and observe whether particles are easily dislodged).
- To decide which rock group the rock belongs to based on the properties.



Sequence of Learning

Step 4

Match rocks to their properties and suggest uses for them

- Sedimentary rocks are formed by loose material settling and being compressed into layers of rock.
- Metamorphic rocks have been subjected to great heat and pressure over a long period of time, causing them to change.
- Igneous rocks are formed at very high temperatures, often deep within the Earth.
- **Rocks have different properties, and therefore different applications**
- **Examine pictures of familiar rocks e.g. chalk, diamond, sandstone and match them to their descriptions and physical properties.**
- Suggest potential uses for a range rocks.



Step 5

Scientist Study: Mary Anning

- Know that Mary Anning is famous for finding many important fossils.
- Know that she was born in 1799 in Lyme Regis, Dorset which is near the coast.
- Know that 200 million years ago Dorset was beneath the sea.
- Know that her fossils helped us to understand more about prehistoric animals.
- Know the term palaeontology means 'a person who studies fossils'
- Know the term dinosaur comes from the Greek word deinos (terrible) and sauros (lizard) which, put together, makes 'terrible lizard.'
- Know that dinosaurs are actually reptiles not lizards.
- Learn about the discovery of the ichthyosaur skull and a complete plesiosaur and how this changed the view of the prehistoric (pre-written history) natural world.
- Know that previously people did not believe in dinosaurs as real, as there was no evidence. It also helped people realise the world was much older than previously thought.
- Video clips:

<https://www.bbc.com/ideas/videos/the-girl-who-helped-discoverdinosaurs/p06bfr1s>

<https://www.bbc.co.uk/programmes/p015gn8>



Sequence of Learning

Step 6

Explain how fossils are formed

- Know that a fossil is the hard remains of a prehistoric animal or plant that are found inside a rock
- Know that fossils are comprised of body fossils (animal bones) and chemical fossils (that contain carbon and prove life once existed such as imprints in the ground and leave trace fossils behind) and understand how fossils are formed.
- Know that fossils are only found in sedimentary rock and go through the same process of compression and cementation in the ground over long periods of time.
- Know that it is very rare for living things to become fossilised. Usually after most animals die their bodies just rot away and nothing is left behind. However, under certain special conditions, a fossil can form.
- Know the sequence of fossil formation as:
 - 1. Animal dies and is buried by sediment
 - 2. Soft parts of the animal decay or decompose
 - 3. More sediment builds up around the animal and is compressed to form rock
 - 4. Bones start to be dissolved by water underground
 - 5. Minerals in the water then turn to rock



Sequence of Learning

Step 7

Investigate what soils are made from

- Know that soil is a mixture of air, water, broken down rock matter and other organic material (dead or living animal tissue)
- Know the names of common soil types: sand, clay and silt.
- Know that sandy soil is dry and gritty, and does not hold onto water.
- Silty soil is richer in nutrients and smoother to the touch. It has smaller particles (a tiny piece of matter) and it can retain water for longer but will eventually start to lose this.
- Clay soil has the smallest particles and so absorbs more water. It is silky when wet but smooth and solid when dry. It contains the most nutrients as they cannot escape in water. Know that topsoil is dark in colour and high in organic matter
- Know that subsoil usually appears to be lighter in colour and has a sticky texture
- Know that bedrock is the solid rock in the ground which supports all the soil above it.



Step 8

Assessment

- LBQ Question Set
 - 10669: Fossil Formation
 - 10927: Rock properties and uses
- Information Text

Year Four Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Physics: Sound	Physics: Electricity	Chemistry: States of Matter	Biology: Living Things and their habitats	Biology: Animals Including Humans	
Scientific Enquiry	How do instruments make different sounds?	Does electricity flow easily through all objects?	**Does water always evaporate at the same speed?	Are some animals more alike than others?	Digestion Investigation	
Key Scientist		Benjamin Franklin		**David Attenborough		
LBO Assessment	11251: Sound 11272: Changing the Volume of a Sound 11257: Changing the Pitch of a Sound	10893: Electrical Circuits	10638: Processes of Changing State 10642: Properties of Solids, Liquids and Gases 11250: The Water Cycle	10548: Parts of a Food Chain 10496: Classification Keys and Grouping Organisms 10608: Environmental Changes in Habitats	10452: The Human Digestive System 10455: Types and Functions of Teeth	

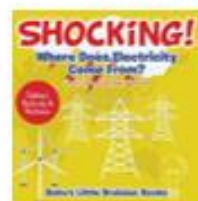
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Year Four Literature Spine

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Sound



Electricity



States of Matter



Living Things and Their Habitats



Animals Including Humans



Physics: Electricity

The Big Idea:

Electricity is the flow of electrons within materials. As they move, they generate electrical power which can be used to make things work. Electricity flows through closed / complete circuits, using wires to connect a power source to components such as bulbs.

Prior Knowledge Requirements:

- Through play know which devices use electricity (battery and mains) and that the electricity provides the energy for the device to work.
- Know some everyday devices which use electricity
- Sources of light and sound may need electricity to work

Common Misconceptions:

Some children may think:

- electricity flows to bulbs, not through them
- electricity flows out of both ends of a battery
- electricity works by simply coming out of one end of a battery into the component.

National Curriculum objectives:

- Identify common appliances that run on electricity.
- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
- Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.
- Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit recognise some common conductors and insulators, and associate metals with being good conductors.

Context for Study:

This unit is the first of two science units where pupils learn about electricity as part of the discipline of physics - the study of the processes that shape our world and how we use it. Children will have limited prior knowledge before studying this unit. During this Year 4 unit, pupils identify common appliances that run on electricity and construct a simple series electrical circuit, identifying and naming its basic parts. Pupils investigate whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery. Pupils recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. They recognise some common conductors and insulators, and associate metals with being good conductors. The knowledge acquired in this unit will help pupils to compare and group together everyday materials on the basis of their properties, in terms of conductivity, in Year 5. This is the precursor to work studied in Year 6 when pupils use recognised symbols when representing a simple circuit in a diagram.

Vocabulary:

Electricity: The flow of electrons through conducting materials such as metal.

Electrical Appliance: A machine which is powered by electricity.

Mains: The electricity source from sockets within homes. This supply is more powerful than batteries and is generated by power stations.

Electrical Circuit: A device linked to a cell (battery) by wires in a closed / complete circuit. It must be complete, with no breaks or gaps in connections.

Cell/ Battery: A device that is used to generate electricity, or one that is used to make chemical reactions possible by applying electricity.

Positive/Negative: The two, oppositely charged ends of a cell (battery).

Crocodile Clip: A metal, toothed clip used to join wires to electrical components.

Bulb: An electrical device designed to create light.

Switch: A device which allows the controlled breaking and completion of circuits in order to turn things on/off.

Buzzer: An electrical device which makes a buzzing sound.

Sequence of Learning

Step

1

Retrieval of previous learning

- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate: 11034).



Step

2

Explore methods of powering electrical appliances

- Know appliances that run on electricity in school and at home and those that do not.
- Know the difference between mains electricity and battery powered electricity.



Step

3

Identify situations when electricity can be dangerous.

- Know that electricity is dangerous, and know how to be safe using it.
- Identify the hazards that might be faced in the home.
 - 1. Overloaded plug extension sockets,
 - 2. Exposed wires,
 - 3. Damaged sockets,
 - 4. Wires left along the carpet for people to trip over,
 - 5. Electrical appliances and wires near water,
 - 6. Placing metal into electrical appliances or open sockets
- Know how to prevent these hazards and know not to touch anything they feel is unsafe.



Sequence of Learning

Step 4

Create a simple circuit

- Know how electricity travels through a circuit, and the various components that create a circuit (Battery, cell, open and closed switches, buzzer, lamp, motor, wire and voltmeter.) Note: all batteries are cells, but not all cells are batteries.
- A cell is a power source, a battery is a power source that uses chemical reactions to generate power.
- Know how to create simple circuits using a battery, a bulb and a switch.
- Know that an open switch will not complete the circuit and that a closed switch will complete the circuit.
- Know that electricity must be able to flow around the circuit for components to work.
- Know that the word current describes the flow of electricity in a circuit.



Step 5

Does Electricity flow easily through all objects?

- Chn to create a small circuit to test whether objects are conductors or insulators (e.g. circuit with bulb which lights when a gap in the circuit is bridged.)
- Know that conductors allow electricity to pass through them and that insulators prevent the passage of electricity.
- Identify materials that are conductors and insulators.
- Know that metals such as copper, iron and steel make good conductors. Know that wood, plastic, paper and rubber are insulators.



Sequence of Learning

Step 6

Explain how an electrical switch works.

- Know if the following circuits work or not.
 - 1. A complete circuit without switches.
 - 2. A circuit with wires not connected to the cell on one side.
 - 3. A complete circuit with an open switch.
 - 4. A complete circuit with a closed switch.



Step 7

Assessment

- LBQ Question Set
 - 10893: Electrical Circuits
- Information Text

Masefield Primary School

Year Five Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Physics: Forces	Physics: Earth and Space	Biology: Living Things and their habitats	Chemistry: Properties and Changes of Materials	Biology: Animals Including Humans	
Scientific Enquiry	*How do parachutes work?	What shape is the moon and does it change?	If life has existed for billions of years, why are there still people alive today?	Is it possible to separate materials?		
Key Scientist	**Isaac Newton Galileo Galilei	Galileo Galilei		Marie Curie		
LBO Assessment	11255: Friction 10171: Gravity and the Difference Between Weight and Mass	10652: Earth, Sun and Moon 11261: Our Solar System 10654: Relative Movement of the Moon and Earth	10570: Comparing Life Cycles of Different Animals 11259: Parts of a Flower 10557: Plant Reproduction	10666: Irreversible Changes 10662: Separating Solutions 10698: Dissolving 10661: Reversible Changes	10575: Life Cycle of a Human	

*Undertake a full practical investigation

**Undertake a biographical study of a famous scientist

Year Five Literature Spine

To support the teaching of Science here at Masefield, we have developed a collection of books that all children in our school are to experience and enjoy. We aim to immerse our children in a range of texts, specifically chosen by our staff to ensure that children hear the best stories read aloud to them by their teachers for pleasure, to excite and inspire our children and support the development of knowledge and skills in Science.

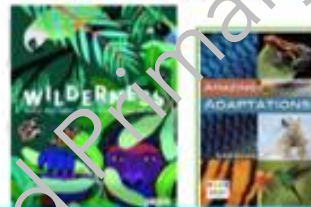
Forces and Magnets



Earth and Space



Living Things and Their Habitats



Properties and Changes of Materials



Animals Including Humans

Year Five – Spring 1

Biology: Living Things and their Habitats

The Big Idea:

All living things have life-cycles, where they are born, live and ultimately die. In order for different species to pass on their genetic code (DNA), they must reproduce, with males and females forming offspring. Some plants can reproduce on their own. Different organisms have different life-cycles, including those who undergo partial or complete metamorphosis – a change in body morphology (looks).

Prior Knowledge Requirements:

- Animals can be grouped into vertebrates (and then further into fish, reptiles, amphibians, birds and mammals) and invertebrates
- Some examples of life cycles (including those of plants)
- The processes of dispersal, fertilisation and germination
- Reproduction is one of the seven life processes.
- Parts of a plant, their features and what their functions are.
- The work of David Attenborough.

Common Misconceptions:

Some children may think:

- all plants start out as seeds
- all plants have flowers
- plants that grow from bulbs do not have seeds
- only birds lay eggs.

National Curriculum objectives:

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird
- Describe the life process of reproduction in some plants and animals.

Context for Study:

This unit is the fifth of six science units where pupils learn about plants and animals as part of the discipline of biology- the study of living organisms. Pupils have a secure knowledge of the functions of the different parts of flowering plants and the requirements of plants for life and growth. They know how water is transported within plants and the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. Pupils can identify and name a variety of living things in their local and wider environment and use classification keys to help group plants and animals. In Year 5, pupils revise their prior knowledge of food chains, identifying producers, predators and prey. This unit builds on pupils' understanding of how environments can change and that this can sometimes pose dangers to living things. Pupils identify how animals and plants of the Amazon rainforest are adapted to suit their environment in different ways and that adaptation may lead to evolution. New learning includes knowing particular species of animals and plants of the Amazon rainforest and describing the differences in the life cycles of a mammal, an amphibian, an insect and a bird. Pupils further develop their knowledge of the seven life processes. The knowledge acquired in this unit will help pupils understand the life process of reproduction in some plants and animals. This is the precursor to work studied in Year 6 when pupils study Linnaean classification, adaptations and sexual reproduction in plants and animals.

Vocabulary:

Life Cycle: The series of changes in the life of an organism including reproduction

Reproduce: To have off-spring.

Sexual Reproduction: Offspring get genes from both mum and dad, inheriting a mix of features from both.

Sperm/Egg: The male and female cells used in reproduction. They carry DNA.

Fertilises: The fusion (joining) of pollen or sperm to the egg to create a new cell with DNA from both parents. This grows into the new organism.

Live Young: Born without the need for eggs (most mammals).

Metamorphosis: The process of complete change in body type and shape during a life-cycle.

Plantlets: New plants growing asexually from the end of runners.

Runners: Horizontal stems, which grow across the ground. Part of asexual reproduction. Plantlets grow from these.

Asexual Reproduction: Offspring get genes from one parent so are clones of their parents

Bulbs: An underground storage structure, from which new shoots and roots grow, forming new plants.

Cuttings: Stems of plants cut and regrown into full plants. Cuttings can be combined to create new plants.

Pollination: The process of pollen (male) making contact with the style (female part) of a flower. A pollen tube is grown, down which the pollen grain travels to fertilise the egg in the ovule.

Sequence of Learning

Step 1

Retrieval of previous learning

- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate: 10577 & 10492).



Step 2

Explain and describe the importance of ecosystems

- Know that an ecosystem is 'all the plants and animals that live in a particular area together and the relationship between them and the environment'.
- Know that a tropical rainforest is an ecosystem consisting of 'wet, warm forest all year round'.
- Understand the term biodiversity as 'the variety of animals and plant life in a particular ecosystem'.
- Know that rainforests are home to approximately 50% of all living things on earth.
- Know the names of a range of species of animals which live in the Amazon rainforest and whether they are herbivores, carnivores or omnivores. E.g. giant anteater, green iguana, tapir, anaconda, poison dart frog, sloth, macaw, jaguar, armadillo, howler monkey, piranha, hummingbird, leaf cutter ants, porcupine, tarantula and toucan.
- Know the names of a range of species of plants which live in the Amazon rainforest and identify images of these e.g. rubber tree, orchid, cacao, giant water lilies and banana tree.



Sequence of Learning

Step 4

Compare the life cycles of different animals.

- Revise the seven life processes (from Y2) are:
- Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion and Nutrition.
- Describe the differences in the life cycles of a mammal, an amphibian, and a bird

Life Cycles Jaguar (mammal)

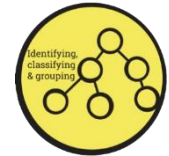
- Live young > kitten > adult
- Placental mammals, including humans, are nourished in the womb by a placenta.

Poison dart frog (amphibian)

- frog spawn > tadpole > froglet > adult frog
- <https://nationalaquarium.wordpress.com/2013/07/16/the-life-cycle-of-poison-dart-frogsexplained/>
- Some amphibians undergo metamorphosis during their life cycle, but some, such as the axolotl, do not.
- Amphibians must lay their eggs in water.

Toucan (bird)

- Birds lay eggs.
- Eggs do not start to develop until the parent incubates them.



Sequence of Learning

Step 5

Compare the life cycles of different insects.

- Know that the life cycle of an insect consists of four stages: egg, larva, pupa, and adult. Fertilized eggs produce female ants (queens, workers, or soldiers); unfertilized eggs produce male ants.
- Egg: Ant eggs are oval shaped and tiny (they are about 1 mm long)
- Larva: The worm-like larvae have no eyes and no legs. The larvae molt (shed their skin) many times as they increase in size.
- Pupa: After reaching a certain size, the larva spins a silk-like cocoon around itself (against a solid object) and pupates. During this time the body metamorphoses (changes) into its adult form.
- Adult: The pupa emerges as an adult. The entire life cycle usually lasts from 6 to 10 weeks.
<http://www.enchantedlearning.com/subjects/insects/ant/leafcutter.shtml>



Step 6

Explain how animals reproduce

- Know that almost all large animals reproduce sexually. This means that a male and female are needed to produce offspring.
- Know that offspring inherit the traits of their parents.
- Know that when a sperm cell fertilises an egg, the resulting zygote can grow into an embryo
- Explain the process of sexual reproduction in animals.



Sequence of Learning

Step 7

Describe how flowering plants reproduce.

- Know that the flower is the reproductive part of a flowering plant.
- Know that the main parts of a flower include the petal, anther, sepal, carpel, stigma, style, ovary, pollen grain, pollen tube and ovule.
- Complete an explanation text showing how flowering plants reproduce



Step 8

Investigate whether a new plant will grow from cuttings.

- Know that a piece broken off from a plant can grow into another individual. This is a form of asexual reproduction.
- Cuttings removed from a plant develop into genetically identical individuals (clones).
- Investigate which parts of a plant (e.g. stem, flower, root etc). will grow into a new individual



Step 9

Assessment

- LBQ Question Set
 - 10570: Comparing Life Cycle of Different Animals
 - 11259: Parts of a Flower
 - 10557: Plant Reproduction
- Information Text

Year Six Overview

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Biology: Living Things and their habitats	Physics: Electricity	Biology: Evolution and Inheritance		Physics: Light	Biology: Animals Including Humans
Scientific Enquiry	*Is our heart rate always the same?	Is it possible to change how bright a light bulb is?	Why do species of animals look so different?		Why can I hear round corners but not see round corners?	What makes bread rise?
Key Scientist			**Charles Darwin Jane Goodall			Carl Linnaeus
LBO Assessment	11263: The Human Circulatory System 11264: The Heart and the Blood	11045: Cells and Circuits	10643: Evolution		11214: How Light Travels and How We See	10480: Grouping Organisms, Plants, Animals and Microorganisms

*Undertake a full practical investigation

**Undertake a biographical study of a famous scientist

Year Six Literature Spine

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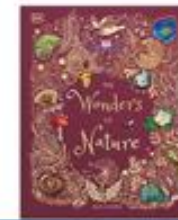
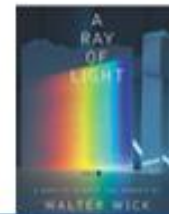
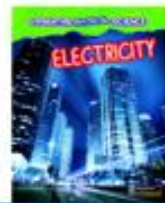
Animals Including
Humans

Electricity

Evolution and
Inheritance

Light

Living Things and
Their Habitats



Physics: Light

The Big Idea:

Light travels in waves from primary and secondary sources in straight lines. It can be reflected off of surfaces or refracted to change direction. The visible spectrum is the light which can be seen when it travels into the human eye. Shadows are formed when light is blocked by opaque objects.

Prior Knowledge Requirements:

- What a light source is
- Shiny materials do not make light but do reflect it.
- Why we need light
- Shadows are caused when certain materials block light

Common Misconceptions:

Some children may think:

- we see objects because light travels from our eyes to the object.

National Curriculum objectives:

- Recognise that light appears to travel in straight lines
- Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes use the idea that light travels in straight lines.
- Explain why shadows have the same shape as the objects that cast them.

Context for Study:

This unit is the second of two science units where pupils learn about light as part of the discipline of physics - the study of the processes that shape our world and how we use it. Pupils have a secure knowledge of the terms opaque, transparent and translucent; what plants need, including light, to grow well and how energy from light is the start of a food chain. Previous learning includes knowing that light from the sun can be dangerous and that there are ways to protect their eyes. Pupils also know we need light in order to see things and that dark is the absence of light. This unit builds upon pupils' prior knowledge that shadows form when the light from a light source is blocked by an opaque object. Pupils already know that light is reflected from surfaces and it can be separated into a prism of colours. New learning includes knowing how light appears to travel in straight lines. Pupils learn that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes. This new knowledge acquired in Year 6 is used to explain why shadows have the same shape as the objects that cast them and that those objects are seen because they give out or reflect light into the eye.

Vocabulary:

Visible Light Rays: One of the characteristics of light is that it behaves like a wave. Light can be defined by its wavelength and frequency. The frequency is how fast the wave vibrates up and down.

Primary Light Source: Light, or illumination, is a form of energy that travels in waves, like sound from a source. Primary sources of light create the light itself, such as a candle or the Sun.

Secondary Light Source: These sources of light do not create light, instead they reflect light from primary light sources. Examples: The Moon and mirrors.

Dark / Darkness: An absence of light.

Transparent: The property of materials which lets light pass through. The image is clear.

Translucent: The property of materials which lets some light pass through. The image is blurry.

Opaque: The property of materials which does not let light pass through.

Shiny Surface: Surfaces which reflect light.

Matt Surface: Surfaces which do not reflect light.

Shadow: An area of darkness formed when light cannot pass through opaque objects.

Reflect: Light waves bounce off of surfaces in straight lines.

Straight Lines: Light always travels in straight lines. It does not bend.

Sunlight: The light produced by our nearest star, the Sun.

Filters: A filter is a transparent material that absorbs some colours and allows others to pass through.

Sequence of Learning

Step 1

Retrieval of previous learning

- Introduce and explore knowledge organiser.
- Teach new Vocabulary (inc LBQ vocabulary question set where appropriate: 11254).



Step 2

Explain how we see light sources and non-light sources.

- Know that light travels in straight lines from its source.
- Know that some light sources are natural (stars, sun, fire, lightning, bioluminescence) and some are man-made (torch, light bulb, digital screen, laser pointer)
- Know that light either travels in a straight line directly from the source or by reflecting off a surface into our eye.
- Know how to draw arrows to show light entering the eye from a light source or reflection.



Step 3

Explain how reflection causes light to change direction.

- Know that reflection is when light bounces off a surface, changing the direction of a ray of light.
- Know that all objects reflect light; smooth and shiny surfaces reflect all the rays of light at the same angle, rather than scattering the rays of light like rough or dull surfaces.
- Know that when rays of light reflect, they obey the law of reflection: The angle of incidence always equals the angle of reflection.
- Children use a simple grid and position mirrors at 45° angles to make light travel through a maze.



Sequence of Learning

Step 4

Explain how light can travel around corners

- Know that a periscope is a device made from 2 angled mirrors that enables the user to see around obstacles.
- Rays of light are reflected off the mirrors, causing light rays to change direction.
- Construct their own simple periscope.
- Create labelled diagrams that show the path that the light took to reach the eye.

Step 5

Label the main parts of the human eye and explain their functions.

- Know the main parts of the human eye, including the cornea, iris, pupil, lens, retina and optic nerve.
- Explain the function of each part of the eye.
- Know that the amount of light entering the eye is controlled by the pupil, which is surrounded by the iris – the coloured part of the eye.
- Know that the pupil dilates when it is darker to let more light into the eye.
- The pupil constricts when it is bright to reduce the amount light entering the eye



Step 6

Explain how the shape and size of a shadow are determined

- Know that a shadow is formed when light is blocked by an opaque object.
- Understand that as light travels in straight lines shadows have the same shape as the objects that cast them.
- Children conduct an investigation to explore what happens to its shadow when an object is moved towards a light source.



Step 7

Explain how white light is made up of a spectrum of different colours

- Know that white light is a combination of different colours, and that these colours exist on the visible light spectrum.
- Know how white light can be split up into its component colours.
- Use a prism and a light source to create a rainbow effect and discuss how it is caused.
- Know that a range of colours can be combined into white light.



Step 8

Assessment

- LBQ Question Set
 - 11214: How Light Travels and How We See
- Information Text

Masefield Primary School