Experience overview

The WeDo 2.0 projects are developed with the National Curriculum requirements for science at Key Stage 2 in mind.

These practices represent the expectations of the Curriculum, in that pupils develop scientific knowledge and conceptual understanding, as well as practical skills. The practices are not to be seen as separate, rather as an interconnected set of expectations for pupils.

Cross-curricular themes are also important, and teachers are encouraged to explore the connections to other subject areas.

Elements of the National Curriculum for Computing, Geography and Design & Technology are interwoven throughout the document and are used within the WeDo 2.0 curriculum.

The "habits of mind," as outlined in *Engineering Habits of Mind* (EHoM) and defined by the National Academy of Engineering (NAE) and the National Research Council (NRC), are an important part of project-based learning.

The habits of mind are centred on the fact that science is about the attitudes, values, and skills that determine how people learn and acquire knowledge about the world.

According to both the NAE and NRC, there are six habits of mind that are essential for science and engineering growth:

1. Systems thinking
2. Creativity
3. Optimism
4. Collaboration
5. Communication
6. Ethical considerations

The WeDo 2.0 curriculum projects are built around the habits of mind and interconnected throughout the curriculum.

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Develop science and engineering practices with WeDo 2.0

WeDo 2.0 projects will develop science practices. They provide opportunities for pupils to work with and develop ideas and knowledge, and to gain an understanding of the world around them.

The progression and difficulty level of the projects allows pupils to develop competency while exploring and learning about key science topics. The projects have been carefully chosen to cover a wide variety of topics and issues.

WeDo 2.0 projects develop eight science and engineering practices:

1. Ask questions and solve problems.
2. Use models.
3. Design prototypes.
4. Investigate.
5. Analyse and interpret data.
6. Use computational thinking.
7. Engage in argument from evidence.
8. Obtain, evaluate, and communicate information.

The guiding principle is that every pupil should engage in all of these practices across the projects in each year group.

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Science practices and the engineering habits of mind

The science and engineering practices serve as the common thread throughout the curriculum, and all requirements should, in essence, be taught through them. While the academic definition of each process is important, it is probably a good habit to verbalise the practices in a way that is understandable to pupils at that level.

The following points identify the basic principles of these practices and give examples of how they are used in WeDo 2.0 projects.

1. Ask questions and define problems.
This practice focuses on simplistic problems and questions based on observational skills.

2. Develop and use models.
This practice focuses on pupils' prior experiences and the use of concrete events in modelling solutions to problems. It also includes improving models and new ideas about a real-world problem and solution.

3. Plan and carry out investigations.
This practice is about how pupils learn and follow directions for an investigation to formulate probable solution ideas.

4. Analyse and interpret data.
The focus of this practice is to learn how to gather information from experiences, document discoveries, and share ideas from the learning process.

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Science practices and the engineering habits of mind

5. Use mathematics and computational thinking.
The purpose of this practice is to realise the role of numbers in data-gathering processes. Pupils read and gather data about investigations, make charts, and draw diagrams resulting from the numerical data. They add simple data sets to come up with conclusions. They understand or create simple algorithms.

6. Construct explanations and design solutions.
This practice is about ways they might go about constructing an explanation or designing a solution for a problem.

7. Engage in argument from evidence.
Constructively sharing ideas based on evidence is an important feature of science and engineering. This practice is about how pupils begin to share their ideas and demonstrate proof to others in a group.

8. Obtain, evaluate, and communicate information.
Teaching children about what real scientists do is key to this practice. The way in which they set up and complete investigations to gather information, how they evaluate their findings, and how they document, are all important elements. It is important that teachers explore a plethora of ways to have pupils gather, record, evaluate, and communicate their findings. Ideas include digital presentations, portfolios, drawings, discussion, video, and interactive notebooks.

Important

The WeDo 2.0 projects will engage your pupils in all science and engineering practices. Refer to the practices grid of this chapter to get an overview.

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Use the LEGO® bricks in a scientific context

LEGO® bricks have been used in three different ways in the WeDo 2.0 projects:
1. To model reality
2. To investigate
3. To design

These three ways will give you the opportunity to develop a different set of practices, as the outcome of the project is different in each case.

1. Use models
Pupils represent and describe their ideas using the bricks.

Pupils can build a model to gather evidence or provide a simulation. Although only representations of reality, models enhance understanding and explain natural phenomena.

When implementing a modelling project, encourage pupils to focus their creativity on representing the reality as accurately as possible. By doing that, they will need to identify and explain the limitations of their models.

Examples of modelling Guided Projects are:
- Frog's Metamorphosis
- Plants and Pollinators

2. Investigate
Planning and carrying out investigations is an ideal framework for a science project. Pupils' learning is enhanced by active engagement with the problem. Pupils are encouraged to make predictions, carry out tests, collect data, and draw conclusions.

When implementing an investigation project, you should encourage pupils to pay special attention to ensure fair testing. Ask them to search for cause and effect in their tests, ensuring they change only one variable at a time.

Examples of investigating Guided Projects are:
- Pulling
- Speed
- Robust Structures

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Use the LEGO® bricks in an engineering context

3. Design
Pupils design solutions for a problem for which there is no single answer. The problem may require pupils to design a combination of plans, models, simulations, programs, and presentations. Going through the design process will require pupils to constantly adjust and modify their solutions to meet criteria.

While designing a solution, it will be important to recognise that the idea of "failure" in engineering is a sign of growth in the cognitive process. Therefore, pupils may not reach a viable solution on their first attempt or within the provided time constraints. In that case, encourage them to reflect on their process and to identify what they have learned.

When you implement a design project, encourage pupils to focus their creativity on designing multiple solutions. Ask them to select the prototype they think is the best according to the criteria you have set.

Examples of designing Guided Projects are:
- Prevent Flooding
- Drop and Rescue
- Sort to Recycle

Important

Documents produced by pupils following the completion of these three types of projects may contain different types of information.

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Use LEGO® bricks in a computational thinking context

Computational thinking is a set of problem-solving skills that are applied to working with computers and other digital devices. In WeDo 2.0, computational thinking is handled in a developmentally appropriate manner through the use of icons and programming blocks.

Computational thinking characteristics include:

- Logical reasoning
- Looking for patterns
- Organising and analysing data
- Modelling and simulations
- Using computers to assist in testing models and ideas
- Using algorithms to sequence actions

Its application in science and engineering projects enables pupils to use powerful digital tools to carry out investigations and build and program models, which might otherwise be tricky to do. Pupils use programs to activate motors, lights, sounds, or displays, or to react to sounds, tilt, or movement to implement functionalities to their models or prototypes.

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Visual overview of Guided Projects

1. Pulling
Investigate the effects of balanced and unbalanced forces on the movement of an object.

2. Speed
Investigate the factors that make a car accelerate to help predict future motion.

3. Robust Structures
Investigate the characteristics that make a building earthquake resistant, using an earthquake simulator constructed from LEGO® bricks.

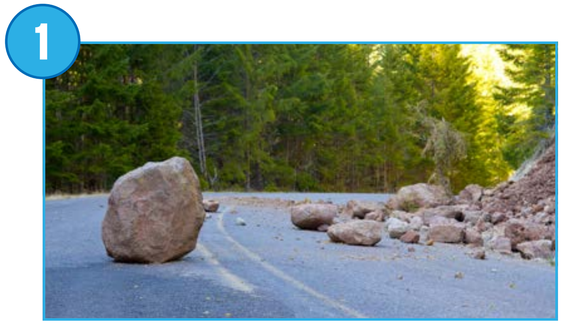
4. Frog's Metamorphosis
Model a frog's metamorphosis using a LEGO representation, and identify the characteristics of the organism at each stage.

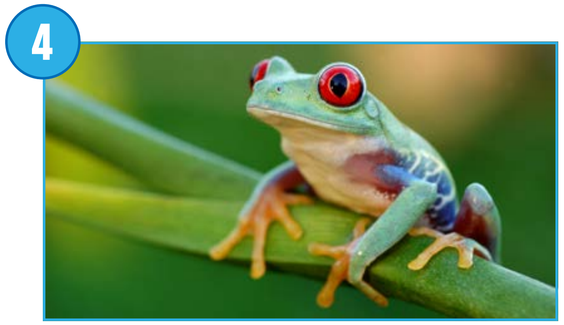
5. Plants and Pollinators
Model a LEGO representation of the relationship between a pollinator and flower during the reproduction phase.

6. Prevent Flooding
Design an automatic LEGO floodgate to control water according to various precipitation patterns.

7. Drop and Rescue
Design a device to reduce the impacts on humans, animals, and the environment after an area has been damaged by extreme weather.

8. Sort to Recycle
Design a device that uses the physical properties of objects, including their shape and size, to sort them.





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Visual overview of Open Projects

9. Predator and Prey
Model a LEGO® representation of the behaviours of different predators and their prey.

10. Animal Expression
Model a LEGO representation of different communication methods used in the animal kingdom.

11. Extreme Habitats
Model a LEGO representation of how habitat influences the survival of certain species.

12. Space Exploration
Design a LEGO prototype of a rover that would be ideal for exploring distant planets.

13. Hazard Alarm
Design a LEGO prototype of a weather alarm device to reduce the impact of severe storms.

14. Cleaning the Ocean
Design a LEGO prototype to help people remove plastic waste from the ocean.

15. Wildlife Crossing
Design a LEGO prototype to allow an endangered species to safely cross a road or other hazardous area.

16. Moving Materials
Design a LEGO prototype of a device that can move specific objects in a safe and efficient way.

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National Curriculum for Science at Key Stage 2 Numbering

The National Curriculum for Science does not have a numbered system.
We created our own for WeDo 2.0 for ease of use when referencing the curriculum grid and assessment tools.

The system works as follows:

LKS2	Lower Key Stage 2
UKS2	Upper Key Stage 2
WS	Working Scientifically
P	Plants
A	Animals, Including Humans
R	Rocks
L	Light
FM	Forces & Magnets
LTH	Living Things & Their Habitats
SM	States of Matter
S	Sound
E	Electricity
PCM	Properties and Changes of Materials
ES	Earth & Space
F	Forces
EI	Evolution & Inheritance
s	Statutory Requirement
ns	Non-Statutory requirements

Examples of how these codes are used are:

- 3.FM.s1 = Year 3. Forces & Magnets. Statutory Requirement 1.
- 6.LTH.ns1 = Year 6. Living Things & Their Habitats. Non-statutory Requirement 1.

Our advice to teachers would be to write the codes next to the statements in your copy of the National Curriculum to enable easy reference.

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Curriculum Overview (Science) of Guided Projects, Organised by Year Group

NB: Addressed Computing, Geography and Design & Technology Curriculum requirements are referenced in the teacher's notes for each project.

	Lower KS 2 Working Scientifically	Year 3	Year 4	Upper KS 2 Working Scientifically	Year 5	Year 6
1. Pulling	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4 LKS2.WS.s5 LKS2.WS.s6 LKS2.WS.s7 LKS2.WS.s8 LKS2.WS.s9	3.FM.s1 3.FM.ns2		UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5 UKS2.WS.s6	5.F.s2 5.F.s3 5.F.ns1	
2. Speed					5.F.s3	
3. Robust Structures					5.F.s3	
4. Frog's Metamorphosis		3.A.s1 3.A.ns1	4.LTH.s3 4.LTH.ns1 4.LTHns2 4.A.s3		5.LTH.s1 5.LTH.s2 5.LTH.ns1 5.LTH.ns3 5.F.s3	6.LTH.s1 6.LTH.s2 6.LTH.ns1 6.EI.s2 6.EI.s3
5. Plants and Pollinators		3.P.s1	4.LTH.ns1		5.LTHs1 5.LTH.s2 5.LTH.ns2 5.F.s3	
6. Prevent Flooding			4.SM.s3		5.F.s2 5.F.s3	
7. Drop and Rescue					5.F.s3 5.F.ns1	
8. Sort to Recycle			4.LTH.ns2		5.F.s3	

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Curriculum Overview of Open Projects, Organised by Year Group

NB: Addressed Computing, Geography and Design & Technology Curriculum requirements are referenced in the teacher's notes for each project.

	Lower KS 2 Working Scientifically	Year 3	Year 4	Upper KS 2 Working Scientifically	Year 5	Year 6
9. Predator and Prey	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4 LKS2.WS.s5 LKS2.WS.s6 LKS2.WS.s7 LKS2.WS.s8 LKS2.WS.s9	3.A.s2		UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5 UKS2.WS.s6	5.F.s3	6.EI.s3
10. Animal Expression					5.LTH.s1 5.LTH.s2 5.F.s3	6.LTH.s1 6.EI.s2
11. Extreme Habitats			4.LTH.s3 4.LTH.ns2		5.F.s3	6.EI.s3
12. Space Exploration					5.ES.s1 5.ES.s2 5.ES.s3 5.F.s3	
13. Hazard Alarm					5.F.s3	
14. Cleaning the Ocean			4.LTH.s3 4.LTH.ns2		5.F.s3	
15. Wildlife Crossing					5.F.s3	6.EI.s3
16. Moving Materials					5.F.s3	

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Working Scientifically Lower Key Stage 2 (LKS2.WS)		
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:		
Statutory Requirements (S)	**Code**	*Pupils should be taught to:*
	LKS2.WS.s1	asking relevant questions and using different types of scientific enquiries to answer them.
	LKS2.WS.s2	setting up simple practical enquiries, comparative and fair tests.
	LKS2.WS.s3	making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers.
	LKS2.WS.s4	gathering, recording, classifying and presenting data in a variety of ways to help in answering questions.
	LKS2.WS.s5	recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables.
	LKS2.WS.s6	reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions.
	LKS2.WS.s7	using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions.
	LKS2.WS.s8	identifying differences, similarities or changes related to simple scientific ideas and processes.
	LKS2.WS.s9	using straightforward scientific evidence to answer questions or to support their findings.

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Year 3 Plants (3.P)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	3.P.s1	Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves, and flowers.
	3.P.s2	Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.
	3.P.s3	Investigate the way in which water is transported within plants.
	3.P.s4	Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation, and seed dispersal.
NS	3.P.ns1	Pupils should be introduced to the relationship between structure and function: the idea that every part has a job to do. They should explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction.
	3.P.ns2	Pupils might work scientifically by: comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser; discovering how seeds are formed by observing the different stages of plant life cycles over a period of time; looking for patterns in the structure of fruits that relate to how the seeds are dispersed.
	3.P.ns3	They might observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers.

Year 3 Animals, Including Humans (3.A)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	3.A.s1	Identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat.
		Identify that humans and some other animals have skeletons and muscles for support, protection, and movement.
NS	3.A.ns1	Pupils should continue to learn about the importance of nutrition and should be introduced to the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions.
	3.A.ns2	Pupils might work scientifically by: identifying and grouping animals with and without skeletons and observing and comparing their movement; exploring ideas about what would happen if humans did not have skeletons. They might compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. They might research different food groups and how they keep us healthy, and design meals based on what they find out.

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Year 3 Rocks (3.R)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	3.R.s1	Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties.
	3.R.s2	Describe in simple terms how fossils are formed when things that have lived are trapped within rock.
	3.R.s3	Recognise that soils are made from rocks and organic matter.
NS	3.R.ns1	Linked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment.
	3.R.ns2	Pupils might work scientifically by: observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time; using a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Pupils might research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. Pupils could explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They can raise and answer questions about the way soils are formed.

Year 3 Light (3.L)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	3.L.s1	Recognise that they need light in order to see things, and that dark is the absence of light.
	3.L.s2	Notice that light is reflected from surfaces.
	3.L.s3	Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
	3.L.s4	Recognise that shadows are formed when the light from a light source is blocked by an opaque object.
	3.L.s5	Find patterns in the way that shadows change in size.
NS	3.L.ns1	Pupils should explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about the behaviour of light. They should think about why it is important to protect their eyes from bright lights. They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change.
	3.L.ns2	Pupils might work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Year 3 Forces and Magnets (3.FM)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	3.FM.s1	Compare how things move on different surfaces.
	3.FM.s2	Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
	3.FM.s3	Observe how magnets attract or repel each other and attract some materials and not others.
	3.FM.s4	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.
	3.FM.s5	Describe magnets as having two poles.
	3.FM.s6	Predict whether two magnets will attract or repel each other, depending on which poles are facing.
NS	3.FM.ns1	Pupils should observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). They should explore the behaviour and everyday uses of different magnets (for example, bar, ring, button, and horseshoe).
	3.FM.ns2	Pupils might work scientifically by: comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces and gathering and recording data to find answers their questions; exploring the strengths of different magnets and finding a fair way to compare them; sorting materials into those that are magnetic and those that are not; looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets.

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Year 4 Living Things and their Habitats (4.LTH)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	4.LTH.s1	Recognise that living things can be grouped in a variety of ways.
	4.LTH.s2	Explore and use classification keys to help group, identify, and name a variety of living things in their local and wider environment.
	4.LTH.s3	Recognise that environments can change and that this can sometimes pose dangers to living things.
NS	4.LTH.ns1	Pupils should use the local environment throughout the year to raise and answer questions that help them to identify and study plants and animals in their habitats. They should identify how habitats change throughout the year. Pupils should explore possible ways of grouping a wide selection of living things that include animals, flowering plants, and non-flowering plants. Pupils could begin to put vertebrate animals such as fish, amphibians, reptiles, birds, and mammals; and invertebrates such as snails, slugs, worms, spiders, and insects into groups.
	4.LTH.ns2	Pupils should explore examples of human impact (both positive and negative) on environments, for example, the positive effects of nature reserves, ecologically planned parks, or garden ponds, and the negative effects of population and development, litter, or deforestation.
	4.LTH.ns3	Pupils might work scientifically by: using and making simple guides or keys to explore and identify local plants and animals; making a guide to local living things; raising and answering questions based on their observations of animals and what they have found out about other animals that they have researched.

Year 4 Animals, Including Humans (4.A)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	4.A.s1	Describe the simple functions of the basic parts of the digestive system in humans.
	4.A.s2	Identify the different types of teeth in humans and their simple functions.
	4.A.s3	Construct and interpret a variety of food chains, identifying producers, predators and prey.
NS	4.A.ns1	Pupils should be introduced to the main body parts associated with the digestive system, for example, mouth, tongue, teeth, oesophagus, stomach, and small and large intestine, and explore questions that help them to understand their special functions.
	4.A.ns2	Pupils might work scientifically by: comparing the teeth of carnivores and herbivores, and suggesting reasons for differences; finding out what damages teeth and how to look after them. They might draw and discuss their ideas about the digestive system and compare them with models or images.

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Year 4 States of Matter (4.SM)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	4.SM.s1	Compare and group materials together, according to whether they are solids, liquids, or gases.
	4.SM.s2	Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C).
	4.SM.s3	Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.
NS	4.SM.ns1	Pupils should explore a variety of everyday materials and develop simple descriptions of the states of matter (solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container). Pupils should observe water as a solid, a liquid, and a gas, and should note the changes to water when it is heated or cooled.
	4.SM.ns2	Pupils might work scientifically by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, and cream (for example, to make food such as chocolate crispy cakes and ice-cream for a party). They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid. They might observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting.

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National Curriculum for Science Requirements – Lower Key Stage 2 Programme of Study

Year 4 Sound (4.S)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	4.S.s1	Identify how sounds are made, associating some of them with something vibrating.
	4.S.s2	Recognise that vibrations from sounds travel through a medium to the ear.
	4.S.s3	Find patterns between the pitch of a sound and the features of the object that produced it.
	4.S.s4	Find patterns between the volume of a sound and the strength of the vibrations that produced it.
	4.S.s5	Recognise that sounds get fainter as the distance from the sound source increases.
NS	4.S.ns1	Pupils should explore and identify the way sound is made through vibration in a range of different musical instruments from around the world; and find out how the pitch and volume of sounds can be changed in a variety of ways.
	4.S.ns2	Pupils might work scientifically by: finding patterns in the sounds that are made by different objects such as saucepan lids of different sizes or elastic bands of different thicknesses. They might make earmuffs from a variety of different materials to investigate which provides the best insulation against sound. They could make and play their own instruments by using what they have found out about pitch and volume.

Year 4 Electricity (4.E)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	4.E.s1	Identify common appliances that run on electricity.
	4.E.s2	Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches, and buzzers.
	4.E.s3	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.
	4.E.s4	Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.
	4.E.s5	Recognise some common conductors and insulators, and associate metals with being good conductors.
NS	4.E.ns1	Pupils should construct simple series circuits, trying different components, for example, bulbs, buzzers, and motors, and including switches, and use their circuits to create simple devices. Pupils should draw the circuit as a pictorial representation, not necessarily using conventional circuit symbols at this stage.
	4.E.ns2	Pupils might work scientifically by: observing patterns, for example, that bulbs get brighter if more cells are added, that metals tend to be conductors of electricity, and that some materials can and some cannot be used to connect across a gap in a circuit.

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National Curriculum for Science Requirements – Upper Key Stage 2 Programme of Study

Working Scientifically Upper Key Stage 2 (UKS2.WS)		
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:		
Statutory Requirements	**Code**	**National Curriculum Statement**
	UKS2.WS.s1	Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
	UKS2.WS.s2	Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.
	UKS2.WS.s3	Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, and bar and line graphs.
	UKS2.WS.s4	Using test results to make predictions to set up further comparative and fair tests.
	UKS2.WS.s5	Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations.
	UKS2.WS.s6	Identifying scientific evidence that has been used to support or refute ideas or arguments.

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National Curriculum for Science Requirements – Upper Key Stage 2 Programme of Study

Year 5 Living Things and their Habitats (5.LTH)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	5.LTH.s1	Describe the differences in the life cycles of a mammal, an amphibian, an insect, and a bird.
	5.LTH.s2	Describe the life process of reproduction in some plants and animals.
NS	5.LTH.ns1	Pupils should study and raise questions about their local environment throughout the year. They should observe life-cycle changes in a variety of living things, for example, plants in a vegetable garden or flower border, and animals in the local environment. They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall.
	5.LTH.ns2	Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.
	5.LTH.ns3	Pupils might work scientifically by: observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in rainforests, oceans, desert areas, and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences. They might try to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers or bulbs. They might observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow.

Year 5 Animals, Including Humans (4.A)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	5.A.s1	Describe the changes as humans develop to old age.
NS	5.A.ns1	Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.
	5.A.ns2	Pupils could work scientifically by researching the gestation periods of other animals and comparing them with humans; by finding out and recording the length and mass of a baby as it grows.

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Year 5 Properties and Changes of Materials (5.PCM)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	5.PCM.s1	Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.
	5.PCM.s2	Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.
	5.PCM.s3	Use knowledge of solids, liquids, and gases to decide how mixtures might be separated, including through filtering, sieving, and evaporating.
	5.PCM.s4	Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood, and plastic.
	5.PCM.s5	Demonstate that dissolving, mixing and changes of state are reversible changes.
	5.PCM.s6	Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.
NS	5.PCM.ns1	Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials, including relating these to what they learnt about magnetism in Year 3 and about electricity in Year 4. They should explore reversible changes, including, evaporating, filtering, sieving, melting, and dissolving, recognising that melting and dissolving are different processes. Pupils should explore changes that are difficult to reverse, for example, burning, rusting, and other reactions, for example, vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example, Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.
	5.PCM.ns2	Pupils might work scientifically by: carrying out tests to answer questions, for example, 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?' They might compare materials in order to make a switch in a circuit. They could observe and compare the changes that take place, for example, when burning different materials or baking bread or cakes. They might research and discuss how chemical changes have an impact on our lives, for example, cooking, and discuss the creative use of new materials such as polymers, super-sticky and super-thin materials.

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Year 5 Earth and Space (5.ES)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	5.ES.s1	Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.
	5.ES.s2	Describe the movement of the Moon relative to the Earth.
	5.ES.s3	Describe the Sun, Earth, and Moon as approximately spherical bodies.
	5.ES.s4	Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
NS	5.ES.ns1	Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).
	5.ES.ns2	Pupils should learn how ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen, and Copernicus.
	5.ES.ns3	Pupils might work scientifically by: comparing the time of day at different places on the Earth through Internet links and direct communication; creating simple models of the solar system; constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day; finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks.

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Year 5 Forces (5.F)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	5.F.s1	Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
	5.F.s2	Identify the effects of air resistance, water resistance, and friction, that act between moving surfaces.
	5.F.s3	Recognise that some mechanisms, including levers, pulleys, and gears, allow a smaller force to have a greater effect.
NS	5.F.ns1	Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, accelerate, or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Pupils should explore the effects of levers, pulleys, and simple machines on movement. Pupils might find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.
	5.F.ns2	Pupils might work scientifically by: exploring falling paper cones or cupcake cases, designing and making a variety of parachutes, and carrying out fair tests to determine which designs are the most effective. They might explore resistance in water by making and testing boats of different shapes. They might design and make products that use levers, pulleys, gears, and/or springs, and explore their effects.

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Year 6 Living Things and their Habitats (6.LTH)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	6.LTH.s1	Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves, and flowers.
	6.LTH.s2	Explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant.
NS	6.LTH.ns1	Pupils should build on their learning about grouping living things in Year 4, by looking at the classification system in more detail. They should be introduced to the idea that broad groupings, such as micro-organisms, plants, and animals can be subdivided. Through direct observations where possible, they should classify animals into commonly found invertebrates (such as insects, spiders, snails, worms) and vertebrates (fish, amphibians, reptiles, birds and mammals). They should discuss reasons why living things are placed in one group and not another.
	6.LTH.ns2	Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification.
	6.LTH.ns3	Pupils might work scientifically by: using classification systems and keys to identify some animals and plants in the immediate environment. They could research unfamiliar animals and plants from a broad range of other habitats and decide where they belong in the classification system.

Year 6 Animals, Including Humans (6.A)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	6.A.s1	Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels, and blood.
	6.A.s2	Recognise the impact of diet, exercise, drugs, and lifestyle on the way their bodies function.
	6.A.s3	Describe the ways in which nutrients and water are transported within animals, including humans.
NS	6.A.ns1	Pupils should build on their learning from Years 3 and 4, about the main body parts and internal organs (skeletal, muscular, and digestive system) to explore and answer questions that help them to understand how the circulatory system enables the body to function.
	6.A.ns2	Pupils should learn how to keep their bodies healthy and how their bodies might be damaged – including how some drugs and other substances can be harmful to the human body.
	6.A.ns3	Pupils might work scientifically by: exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle, and health.

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Year 6 Evolution and Inheritance (6.EI)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	6.EI.s1	Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.
	6.EI.s2	Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.
	6.EI.s3	Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.
NS	6.EI.ns1	Building on what they learned about fossils in the topic on rocks in Year 3, pupils should find out more about how living things on earth have changed over time. They should be introduced to the idea that characteristics are passed from parents to their offspring, for instance by considering different breeds of dogs, and what happens when, for example, labradors are crossed with poodles. They should also appreciate that variation in offspring over time can make animals more or less able to survive in particular environments, for example, by exploring how giraffes' necks became longer, or the development of insulating fur on the arctic fox. Pupils might find out about the work of palaeontologists such as Mary Anning and about how Charles Darwin and Alfred Wallace developed their ideas on evolution.
	6.EI.ns2	Pupils might work scientifically by: observing and raising questions about local animals and how they are adapted to their environment; comparing how some living things are adapted to survive in extreme conditions, for example, cactuses, penguins, and camels. They might analyse the advantages and disadvantages of specific adaptations, such as being on two feet rather than four, having a long or a short beak, having gills or lungs, tendrils on climbing plants, or brightly coloured and scented flowers.

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Year 6 Light (6.L)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	6.L.s1	Recognise that light appears to travel in straight lines.
	6.L.s2	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.
	6.L.s3	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.
NS	6.L.ns1	Pupils should build on the work on light from Year 3, exploring the way that light behaves, including light sources, reflection, and shadows. They should talk about what happens and make predictions.
	6.L.ns2	Pupils might work scientifically by: deciding where to place rear-view mirrors on cars; designing and making a periscope, and using the idea that light appears to travel in straight lines to explain how it works. They might investigate the relationship between light sources, objects, and shadows by using shadow puppets. They could extend their experience of light by looking at a range of phenomena including rainbows, colours on soap bubbles, objects appearing to bend when viewed through water, and coloured filters (they do not need to explain why these phenomena occur).

Year 6 Electricity (6.E)		
	Code	**National Curriculum Statement** *Pupils should be taught to:*
S	6.E.s1	Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit.
	6.E.s2	Compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers, and the on/off position of switches.
	6.E.s3	Use recognised symbols when representing a simple circuit in a diagram.
NS	6.E.ns1	Building on their work in Year 4, pupils should construct simple series circuits, to help them to answer questions about what happens when they try different components, for example, switches, bulbs, buzzers, and motors. They should learn how to represent a simple circuit in a diagram using recognised symbols.
	6.E.ns2	Pupils might work scientifically by: systematically identifying the effect of changing one component at a time in a circuit; designing and making a set of traffic lights, a burglar alarm, or some other useful circuit.

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