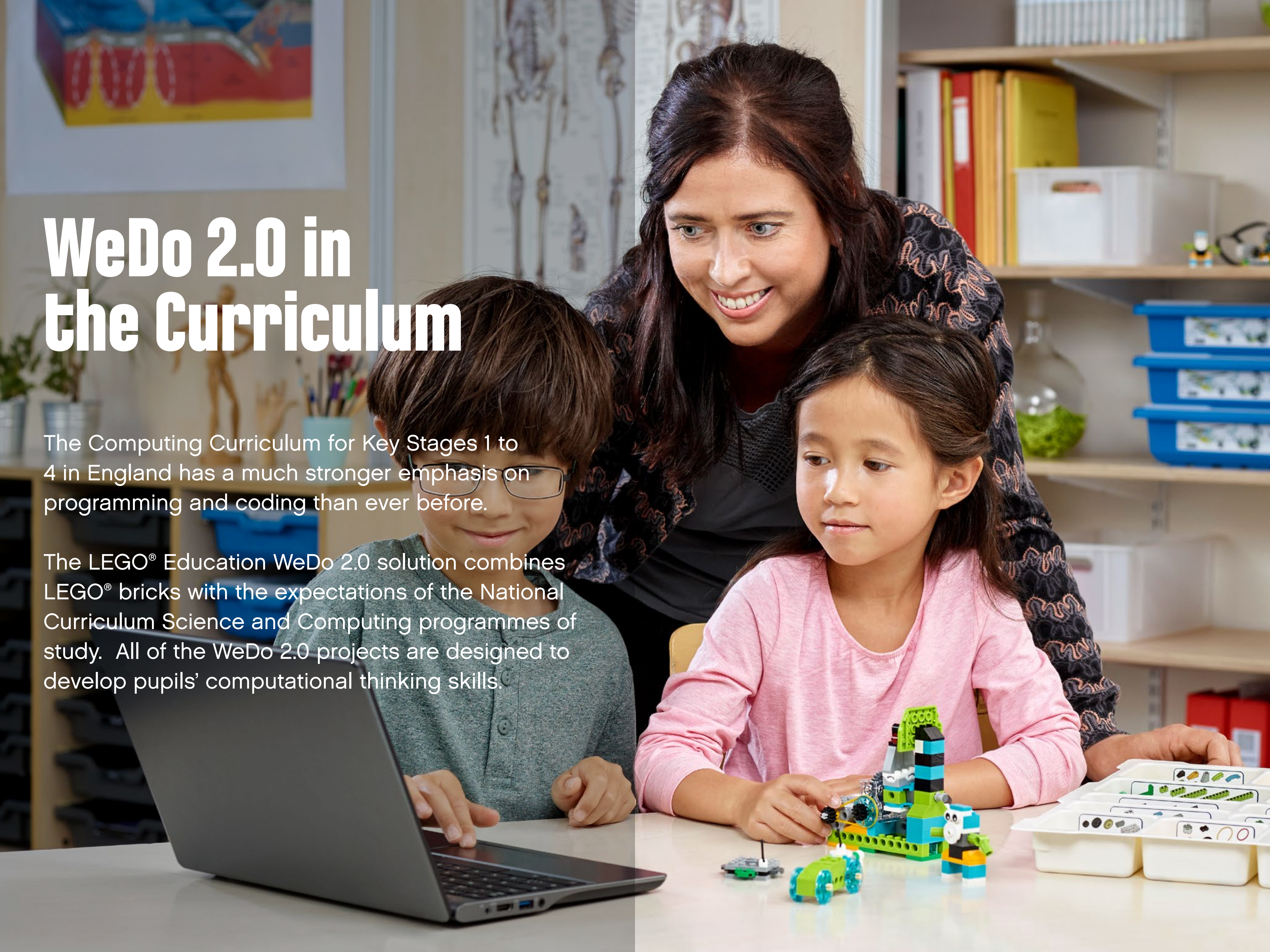


# WeDo 2.0 in the Curriculum

The Computing Curriculum for Key Stages 1 to 4 in England has a much stronger emphasis on programming and coding than ever before.

The LEGO® Education WeDo 2.0 solution combines LEGO® bricks with the expectations of the National Curriculum Science and Computing programmes of study. All of the WeDo 2.0 projects are designed to develop pupils' computational thinking skills.







## Computational Thinking in the Curriculum

This material is aimed Key Stage 2 but can be adapted for any primary school year group.

The National Curriculum in England Computing Programme of Study aims to ensure that all pupils:

- can understand and apply the fundamental principles and concepts of computer science, including abstraction, logic, algorithms and data representation.
- can analyse problems in computational terms and have repeated practical experience of writing computer programs in order to solve such problems.
- can evaluate and apply information technology, including new or unfamiliar technologies, analytically to solve problems.
- are responsible, competent, confident, and creative users of information and communication technology.

To reach those goals, LEGO Education have developed further Projects with direct links to the requirements of the Computing Curriculum at Key Stage 2.

Using these materials, pupils will develop their skills and an understanding of these requirements.

Pupils should be taught to:

- design, write, and debug programs that accomplish specific goals, including controlling or simulating physical systems; solve problems by decomposing them into smaller parts.
- use sequence, selection and repetition in programs; work with variables and various forms of input and output.
- use logical reasoning to explain how some simple algorithms work and to detect and correct errors in algorithms and problems.
- use search technologies effectively, appreciate how results are selected and ranked and be discerning in evaluating digital content.

- select, use, and combine a variety of software (including Internet services) on a range of digital devices to design and create a range of programs, systems and content that accomplish given goals, including collecting, analysing, evaluating and presenting data and information.
- use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.
- understand computer networks including the Internet; how they can provide multiple services, such as the World Wide Web; and the opportunities they offer for communication and collaboration.



# Visual Overview of the Guided Projects

## 1. Moon Base

This project is about designing a solution in which a robot would be able to assemble a base on the moon.

## 2. Grabbing Objects

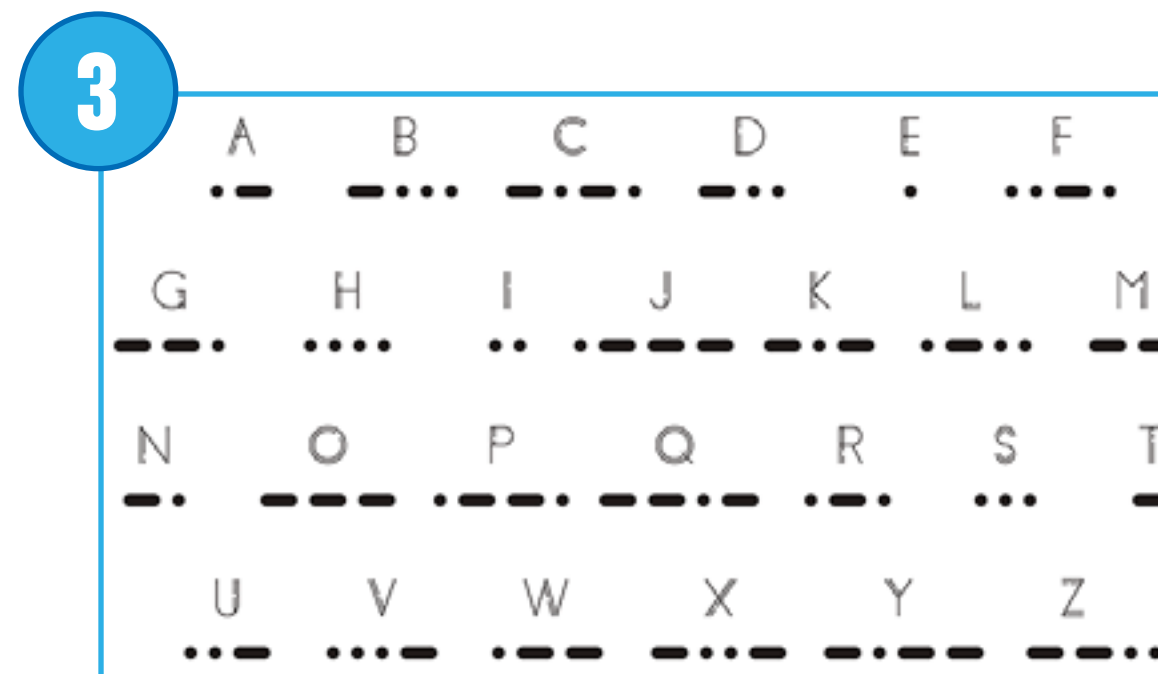
This project is about designing a solution for a prosthetic arm that is able to move small objects around.

## 3. Send Messages

This project is about designing a solution for exchanging information using a system of signals that are organised in patterns.

## 4. Volcano Alert

This project is about designing a device for improving the monitoring of volcanic activity in order to guide scientific exploration.







## Visual Overview of the Open Projects

### 5. Inspection

This project is about designing a solution in which a robot is able to inspect narrow spaces, guiding its motion with sensors.

### 6. Emotional Design

This project is about designing a solution in which a robot can display positive emotions when it is interacting with people.

### 7. City Safety

This project is about designing a solution to improve safety in a city.

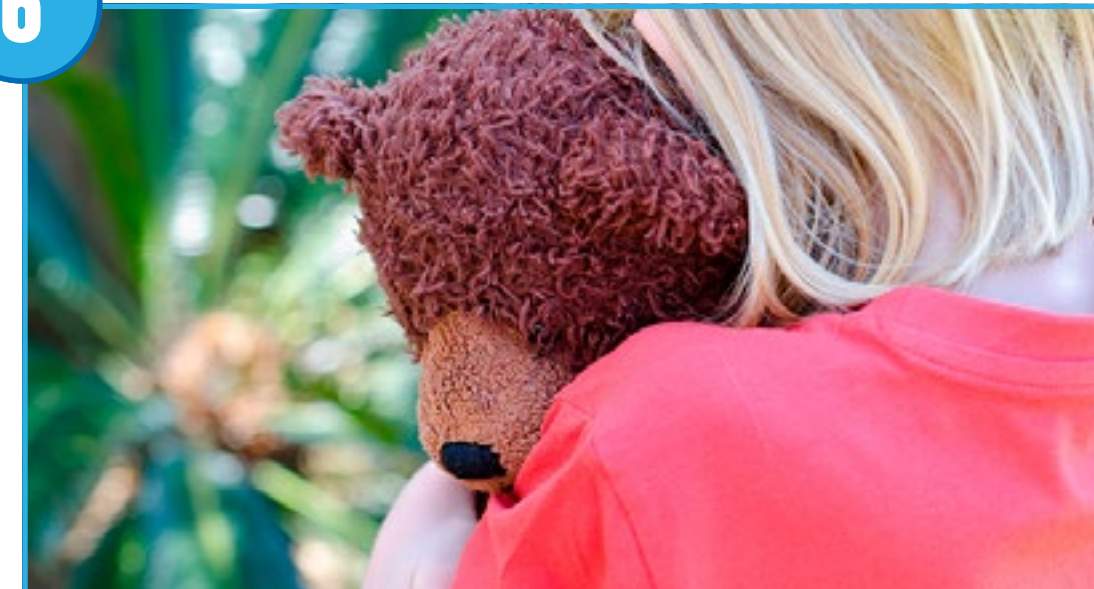
### 8. Animal Senses

This project is about modelling how animals use their senses to interact with their environment.

5



6



7



8







## Potential Flow to Develop Computational Thinking Skills

You can organise the projects as you wish. Each project highlights opportunities for developing computational thinking skills and it is up to you to focus on the ones that are most relevant to you and your pupils. Here is one suggested sequence, which is based on an increasing level of complexity in the programming concepts covered:

### Getting Started

Use two lessons of 45 minutes each to introduce your pupils to WeDo 2.0.

Lesson 1, Milo, the Science Rover

Lesson 2, combine Milo's Motion Sensor, Milo's Tilt Sensor and Collaborating

### Guided Projects

Use two lessons of 45 minutes each, during which your pupils will program a sequence of actions.

Lesson 3, Moon Base (Explore and Create phases)

Lesson 4, Moon Base (Test and Share phases)

Use two lessons of 45 minutes each, during which your pupils will use sensors (inputs).

Lesson 5, Grabbing Objects (Explore and Create phases)

Lesson 6, Grabbing Objects (Test and Share phases)

Use two lessons of 45 minutes each, during which your pupils will use sensors (inputs), loops and parallel programming.

Lesson 7, Send Messages (Explore and Create phase)

Lesson 8, Send Messages (Test and Share phase)

Use two lessons of 45 minutes each to introduce your pupils to conditions and how to integrate all of the other programming principles.

Lesson 9, Volcano Alert (Explore and Create phases)

Lesson 10, Volcano Alert (Test and Share phases)

### Open Projects

Use two or three lessons of 45 minutes each to make your own project that is based on one of the suggested Open Projects. This project should integrate all of the programming principles, as well as the computational thinking skills that were developed during the Guided Projects.



# Potential Flow to Develop Computational Thinking Skills

## Getting Started

Introduce your pupils to WeDo 2.0.



45 minutes

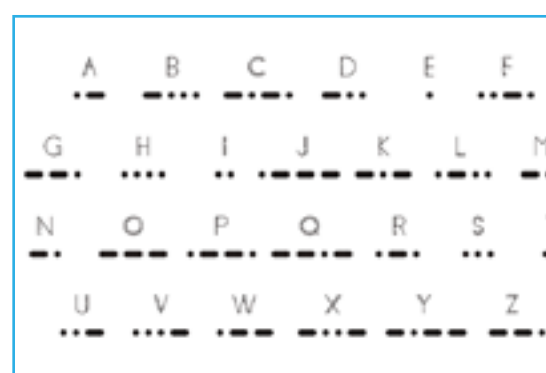


45 minutes



## Guided Project - Send Messages

Pupils will use sensors (inputs), loops and parallel programming.



Using a condensed lesson flow  
2 x 45 minutes



## Guided Project - Moon Base

Pupils will program sequences of actions.



Using a condensed lesson flow  
2 x 45 minutes



## Guided Project - Volcano Alert

Pupils will be introduced to conditions and to other programming principles.



Using a condensed lesson flow  
2 x 45 minutes



## Guided Project - Grabbing Objects

Pupils will use sensors (inputs).



Using a condensed lesson flow  
2 x 45 minutes



## Open Projects







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

	Lower KS 2 - Working Scientifically	Year 3	Year 4	Upper KS 2 - Working Scientifically	Year 5	Year 6
<b>17. Moon Base</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s6			UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5 UKS2.WS.s6	5.ES.s1 5.ES.s2 5.ES.s3 5F.s3	
<b>18. Grabbing Objects</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s5 LKS2.WS.s6	3.FM.s2		UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5	5.F.s3	
<b>19. Send Messages</b>	LKS2.WS.s1 LKS2.WS.s2			UKS2.WS.s1 UKS2.WS.s4		
<b>20. Volcano Alert</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4		K-2-ETS1-3. 3-5-ETS1-1. 3-5-ETS1-2. 3-5-ETS1-3.	UKS2.WS.s1 UKS2.WS.s5		

\*NB: Design & Technology and other relevant curriculum requirements are referenced in the Teacher’s Notes for each project.



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

	Lower KS 2 - Working Scientifically	Year 3	Year 4	Upper KS 2 - Working Scientifically	Year 5	Year 6
<b>21. Inspection</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4 LKS2.WS.s6 LKS2.WS.s7			UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5		
<b>22. Emotional Design</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4 LKS2.WS.s6 LKS2.WS.s7			UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5		
<b>23. City Safety</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4 LKS2.WS.s6 LKS2.WS.s7			UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5		
<b>24. Animal Senses</b>	LKS2.WS.s1 LKS2.WS.s2 LKS2.WS.s4 LKS2.WS.s6 LKS2.WS.s7		4.LTH.s3	UKS2.WS.s1 UKS2.WS.s4 UKS2.WS.s5		6.EI.S3

\*NB: Design & Technology and other relevant curriculum requirements are referenced in the Teacher’s Notes for each project.





# 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	
	LKS2.WS.s1	Asking relevant questions and use different types of scientific enquiries to answer them
	LKS2.WS.s2	Setting up simple practical enquiries, and comparative and fair tests
	LKS2.WS.s3	Making systematic and careful observations and where appropriate, take accurate measurements using standard units and 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 that are related to simple scientific ideas and processes
	LKS2.WS.s9	Using straightforward scientific evidence to answer questions or to support their findings





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

Year 3 Plants (3.P)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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 <i>Pupils should be taught to:</i>
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 that are associated with the skeleton and muscles, finding out how the 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.





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

Year 3 Rocks (3.R)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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 <i>Pupils should be taught to:</i>
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.





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

## Year 3 Forces and Magnets (3.FM)

	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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.





# 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 <i>Pupils should be taught to:</i>
<b>S</b>	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
<b>NS</b>	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 <i>Pupils should be taught to:</i>
<b>S</b>	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
<b>NS</b>	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.





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

Year 4 States of Matter (4.SM)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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.





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

Year 4 Sound (4.S)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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 <i>Pupils should be taught to:</i>
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.





# 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





# 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 <i>Pupils should be taught to:</i>
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 <i>Pupils should be taught to:</i>
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.





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

## Year 5 Properties and Changes of Materials (5.PCM)

Year 5 Properties and Changes of Materials (5.PCM)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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	Demonstrate 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.nsl	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.nsl2	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.





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

## Year 5 Earth and Space (5.ES)

Year 5 Earth and Space (5.ES)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
<b>S</b>	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
<b>NS</b>	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.





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

Year 5 Forces (5.F)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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.





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

## Year 6 Living Things and Their Habitats (6.LTH)

	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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 <i>Pupils should be taught to:</i>
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.





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

## Year 6 Evolution and Inheritance (6.EI)

		<b>Year 6 Evolution and Inheritance (6.EI)</b>
	<b>Code</b>	<b>National Curriculum Statement</b> <i>Pupils should be taught to:</i>
<b>S</b>	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
<b>NS</b>	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.



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

Year 6 Light (6.L)		
	Code	National Curriculum Statement <i>Pupils should be taught to:</i>
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 <i>Pupils should be taught to:</i>
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.





# Computing Curriculum Requirements

Learning Outcome / Curriculum Link	17. Moon Base	18. Grabbing Objects	19. Send Messages	20. Volcano Alert	21. Inspection	22. Emotional Design	23. City Safety	24. Animal Senses
Design programs that accomplish specific goals	●	●	●	●	●	●	●	●
Write programs that accomplish specific goals	●	●	●	●	●	●	●	●
Use sequences in programs		●		●	●	●	●	●
Work with various forms of input		●	●	●	●	●	●	●
Work with various forms of output	●	●	●	●	●	●	●	●
Debug programs that accomplish specific goals		●	●	●	●	●	●	●
Use repetition in programs		●	●		●	●	●	●
Control or simulate physical systems	●	●	●	●	●	●	●	●
Solve problems by decomposing them into smaller parts	●	●		●	●	●	●	●
Use selection in programs	●	●	●	●	●	●	●	●
Work with variables			●	●	●	●	●	●
Use logical reasoning to explain how simple algorithms work		●	●	●	●	●	●	●
Use logical reasoning to detect and correct errors in algorithms	●	●			●	●	●	●
Create a range of programs, systems and content that can accomplish specific goals, including collecting, analysing, evaluating, and presenting data and information	●	●	●	●	●	●	●	●
Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content	●	●	●	●	●	●	●	●
Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact	●	●	●	●	●	●	●	●