

STU Curriculum (Science and ICT & Computing)

Science Curriculum

AF	LO	Phase 1 (Year 1 and 2)	Phase 2 (Year 3 and 4)	Phase 3 (Year 5 and 6)
	To work scientifically (WS)	<ol style="list-style-type: none"> 1. Ask simple questions. 2. Observe closely, using simple equipment. 3. Perform simple tests. 4. Identify and classify. 5. Use observations and ideas to suggest answers to questions. 6. Gather and record data to help in answering questions. 7. To present data using a simple diagram, such as a pictogram. 	<ol style="list-style-type: none"> 1. Ask relevant questions. 2. Set up simple practical enquiries and comparative and fair tests. 3. Make accurate measurements using standard units, using a range of equipment, e.g. thermometers and data loggers. 4. Gather, record, classify and present data in a variety of ways to help in answering questions. 5. Record findings using simple scientific language, drawings, labelled diagrams, bar charts and tables. 6. Report on findings from enquiries, including oral and written explanations. 7. Report on findings from enquiries, including displays or presentations of results and conclusions. 8. Use results to draw simple conclusions and suggest improvements, new questions and predictions for setting up further tests. 9. Identify differences, similarities or changes related to simple, scientific ideas and processes. 10. Use straightforward, scientific evidence to answer questions or to support their findings. 11. To interpret data presented in a variety of tables, diagrams and bar charts and answer questions / pose questions for investigation relating to these. 	<ol style="list-style-type: none"> 1. Plan enquiries, including independently identifying and controlling variables where necessary. 2. Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work. 3. Take measurements, using a range of scientific equipment, with increasing accuracy and precision. 4. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models. 5. Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions. 6. Present findings in written form, displays and other presentations. 7. Use test results to make predictions to set up further comparative and fair tests. 8. Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments. 9. Demonstrate understanding of how much results can be trusted and identify the factors contributing to the reliability of results.
	Biology To understand plants	<ol style="list-style-type: none"> 8. Identify and name a variety of common plants, including garden plants, wild plants and trees and know which are deciduous and which are evergreen. WS4 9. Identify and describe the basic structure of a variety of common flowering plants, including roots, stem/trunk, leaves and flowers. WS5 10. Observe and describe how seeds and bulbs grow into mature plants. WS2/5 11. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. WS2/3/5 	<ol style="list-style-type: none"> 12. Identify and describe the functions of different parts of flowering plants: roots, stem, leaves and flowers. WS5/9 13. 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. WS2/6/7 14. Understand the way in which water is transported within plants. WS5/10 15. Explore the role of flowers in the life cycle of flowering plants, including pollination, seed formation and seed dispersal. WS10 	<ol style="list-style-type: none"> 10. Relate knowledge of plants to studies of all living things. WS5

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<p style="text-align: center;">To understand animals and humans</p>	<p>12. Identify and name a variety of common animals that are birds, fish, amphibians, reptiles, mammals and invertebrates. WS4</p> <p>13. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. WS4</p> <p>14. Describe and compare the structure of a variety of common animals (birds, fish, amphibians, reptiles, mammals and invertebrates, including pets). WS5</p> <p>15. Identify name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. WS4</p> <p>16. Notice that animals, including humans, have offspring which grow into adults. WS5</p> <p>17. Investigate and describe the basic needs of animals, including humans, for survival (water, food& air). WS2/3</p> <p>18. Describe the importance for humans of exercise, eating the right amounts of different types of food and hygiene. WS1/5</p>	<p>16. Identify that animals, including humans, need the right type of nutrition which they get from eating, as they cannot make their own food. WS10</p> <p>17. Identify that humans and some animals have skeletons and muscles for support, protection and movement. WS5</p> <p>18. Describe the simple functions of the basic parts of the digestive system in humans. WS5/6/7</p> <p>19. Identify the different types of teeth in humans and their simple functions. WS5</p> <p>20. Construct and interpret a variety of food chains, identifying producers, predators and prey. WS4</p> <p>21. Recognise the impact of diet, exercise, drugs and lifestyle on the way human bodies function. WS1/6/7</p>	<p>11. Identify and name the main parts of the human circulatory system, and explain the functions of the heart, blood vessels and blood (including the pulse and clotting). WS8</p> <p>12. Describe the ways in which nutrients and water are transported within animals, including humans. WS4</p> <p>13. Recognise the impact of diet, exercise, drugs and lifestyle on the way human bodies function. WS6</p> <p>14. Recognise the impact of poor diet and smoking on the heart and circulatory system. WS6</p>
<p style="text-align: center;">To investigate living things</p>	<p>19. Explore and compare the differences between things that are living, that are dead and that have never been alive. WS1/5</p> <p>20. Identify and name the habitat of a variety of plants and animals. WS4</p> <p>21. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants and how they depend on each other. WS4/5</p> <p>22. Understand basic food chains and name different sources of food. WS6</p>	<p>22. Identify and name a variety of living things (plants and animals) in the local and wider environment, using classification keys to assign them to groups, giving reasons. WS4</p> <p>23. Recognise that environments are constantly changing and that this can sometimes pose dangers to specific habitats. WS1/6/7</p>	<p>15. Describe the life cycles common to a variety of animals, including humans (birth, growth, development, reproduction, death), and to a variety of plants (growth, reproduction and death). WS4 HRE link.</p> <p>16. Explain the classification of living things into broad groups according to common, observable characteristics and based on similarities and differences, including plants, animals and micro- organisms. WS6</p> <p>17. Describe the life process of reproduction in some plants and animals. WS8</p> <p>18. Describe the changes as humans develop from birth to old age. WS6 HRE Link.</p> <p>19. Recognise the human impact on environments and how this can sometimes pose dangers to specific habitats and living things. WS6</p>
<p style="text-align: center;">To understand evolution and inheritance</p>	<p>23. Identify how humans have features that are similar to their parents'. WS2</p>	<p>24. Identify how animals and plants are suited to and adapt to their environment in different ways. WS6/7</p>	<p>20. Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents. WS5</p> <p>21. Describe how adaptation leads to evolution. WS5</p> <p>22. Recognise how and why the human skeleton has changed over time, since we separated from other primates. WS5</p> <p>23. Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. WS6</p>

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Chemistry	To understand materials	<p>24. Distinguish between an object and the material from which it is made. WS4</p> <p>25. Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water and rock. WS4</p> <p>26. Describe the simple physical properties of a variety of everyday materials. WS2</p> <p>27. Compare and group together a variety of everyday materials on the basis of their simple physical properties. WS4</p> <p>28. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. WS6/7</p> <p>29. Identify and compare the uses of a variety of everyday materials, including wood, metal, plastic, glass, brick/rock, and paper/cardboard. WS4</p>	<p>25. Compare and group together different kinds of rocks on the basis of their simple, physical properties. WS9</p> <p>26. Understand in basic terms the difference between igneous and sedimentary rocks and identify examples of each. WS9</p> <p>27. Know that soils are made from rocks and organic matter. WS5</p> <p>28. Use simple terms to describe how fossils are formed when things that have lived are trapped within sedimentary rock. WS5</p> <p>29. Compare and group materials together, according to whether they are solids, liquids or gases. WS4</p> <p>30. Observe that some materials change state when they are heated or cooled, and measure the temperature at which this happens in degrees Celsius (°C), building on their teaching in mathematics. WS2/3/8</p> <p>31. Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. WS5</p>	<p>24. Compare and group together everyday materials based on evidence from comparative and fair tests, including their hardness, solubility, conductivity (electrical and thermal), and response to magnets. WS1/7</p> <p>25. Understand how some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution. WS5</p> <p>26. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. WS8</p> <p>27. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. WS6</p> <p>28. Demonstrate that dissolving, mixing and changes of state are reversible changes. WS1</p> <p>29. 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, oxidation and the action of acid on bicarbonate of soda. WS5</p>	
	Physics	To understand movement, forces and magnets	<p>30. Notice and describe how things move, using simple comparisons such as faster and slower. WS5/6</p> <p>31. Recognise the difference between a push and a pull and recognise when each force is being used. WS2/5</p>	<p>32. Know that magnetic forces can act at a distance. WS2</p> <p>33. Observe how magnets attract or repel each other and attract some materials and not others. WS2</p> <p>34. 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. WS1/2/6/7</p> <p>35. Describe magnets as having two poles. WS10</p> <p>36. Predict whether two magnets will attract or repel each other, depending on which poles are facing. WS8</p>	<p>30. Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. WS5</p> <p>31. Identify the effect of drag forces, such as air resistance, water resistance and friction that act between moving surfaces. WS3</p> <p>32. Describe, in terms of drag forces, why moving objects that are not driven tend to slow down. WS4</p> <p>33. Understand that force and motion can be transferred through mechanical devices such as gears, pulleys, levers and springs. WS4</p>
		To understand light and seeing	<p>32. Observe and name a variety of sources of light, including electric lights, flames and the Sun, explaining that we see things because light travels from them to our eyes. WS4</p>	<p>37. Notice that light is reflected from surfaces. WS1</p> <p>38. Observe the apparent movement of the Sun during the day. WS2/4</p> <p>39. Associate shadows with a light source being blocked by something; find patterns that determine the size of shadows. WS1/2/4/5</p> <p>40. Understand that darkness is the absence of light. WS6/7</p> <p>41. Recognise that light from the sun can be harmful and understand ways to protect their eyes. WS6/7</p>	<p>34. Understand that light appears to travel in straight lines. WS4</p> <p>35. Use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eyes. WS4/5</p> <p>36. 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. WS4/5</p> <p>37. Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them, and to predict the size of shadows when the position of the light source changes. WS1/7</p>
To understand sound and hearing		<p>33. Observe and name a variety of sources of sound, noticing that we hear with our ears. WS2</p> <p>34. I understand that sounds get fainter as the distance from the sound's source increases. WS2/3</p>	<p>42. Identify how sounds are made, associating some of them with something vibrating. WS10</p> <p>43. Find patterns between the pitch of a sound and features of the object that produced it. WS1/2/10</p> <p>44. Find patterns between the volume of a sound and the strength of the vibrations that produced it. WS1/2/10</p>		



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To understand electrical circuits	35. Identify common appliances that run on electricity. WS4/6/7	45. Identify whether or not a lamp will light in a simple series circuit based on whether or not the lamp is part of a connected (closed) circuit with a battery. WS2/4/5/6/7 46. Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit. WS2/4/5/6/7 47. Recognise some common conductors and insulators and associate metals with being good conductors. WS2/4/5/6/7 48. Be able to draw a simple series circuit using the correct electrical symbols. WS5	38. Identify and name the basic parts of a simple electrical circuit, including cells, wires, bulbs, switches and buzzers. WS3 39. Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit. WS1/5 40. 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. WS5/9
	36. Construct a simple series electrical circuit. WS3		
To understand the Earth's movement in space	37. Understand the difference between day and night. WS1/5 38. Observe changes across the four seasons. WS1/5 39. Observe and describe weather associated with the seasons and how day length varies. WS6/7		41. Describe the movement of the Earth relative to the Sun in the solar system. WS4 42. Describe the movement of the Moon relative to the Earth. WS4 43. Describe the Sun, Earth and Moon as approximately spherical bodies. WS4 44. Use the idea of the Earth's rotation to explain day and night. WS5/6

Science Opportunities: * Items marked * are not statutory.

Title	Key Stage 1	Key Stage 2
Working Scientifically	Across all year groups scientific knowledge and skills should be learned by working scientifically. (This is documented in the Essentials for progress section.)	
Biology	<p><u>Plants</u></p> <ul style="list-style-type: none"> Identify, classify and describe their basic structure. Observe and describe growth and conditions for growth. <p><u>Habitats</u></p> <ul style="list-style-type: none"> Look at the suitability of environments and at food chains. <p><u>Animals and humans</u></p> <ul style="list-style-type: none"> Identify, classify and observe. Look at growth, basic needs, exercise, food and hygiene. <p><u>All living things*</u></p> <ul style="list-style-type: none"> Investigate differences. 	<p><u>Plants</u></p> <ul style="list-style-type: none"> Look at the function of parts of flowering plants, requirements of growth, water transportation in plants, life cycles and seed dispersal. <p><u>Evolution and inheritance</u></p> <ul style="list-style-type: none"> Look at resemblance in offspring. Look at changes in animals over time. Look at adaptation to environments. Look at differences in offspring. Look at adaptation and evolution. Look at changes the human skeleton over time <p><u>Animals and humans</u></p> <ul style="list-style-type: none"> Look at nutrition, transportation of water and nutrients in the body, and the muscle and skeleton system of humans and animals. Look at the digestive system in humans. Look at teeth. Look at the the human circulatory system. <p><u>All living things</u></p> <ul style="list-style-type: none"> Identify and name plants and animals Look at classification keys. Look at the life cycle of animals and plants. Look at classification of plants, animals and micro-organisms. Look at reproduction in plants and animals, and human growth and changes. Look at the effect of diet, exercise and drugs.
Chemistry	<p><u>Materials</u></p> <ul style="list-style-type: none"> Identify, name, describe, classify, compare properties and changes. Look at the practical uses of everyday materials. 	<p><u>Rocks and fossils</u></p> <ul style="list-style-type: none"> Compare and group rocks and describe the formation of fossils. <p><u>States of matter</u></p> <ul style="list-style-type: none"> Look at solids, liquids and gases, changes of state, evaporation, condensation and the water cycle.



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		<p><u>Materials</u></p> <ul style="list-style-type: none">• Examine the properties of materials using various tests.• Look at solubility and recovering dissolved substances.• Separate mixtures.• Examine changes to materials that create new materials that are usually not reversible.
Physics	<p><u>Light*</u></p> <ul style="list-style-type: none">• Look at sources and reflections. <p><u>Sound*</u></p> <ul style="list-style-type: none">• Look at sources. <p><u>Electricity*</u></p> <ul style="list-style-type: none">• Look at appliances and circuits. <p><u>Forces</u></p> <ul style="list-style-type: none">• Describe basic movements. <p><u>Earth and space</u></p> <ul style="list-style-type: none">• Observe seasonal changes.	<p><u>Light</u></p> <ul style="list-style-type: none">• Look at sources, seeing, reflections and shadows.• Explain how light appears to travel in straight lines and how this affects seeing and shadows. <p><u>Sound</u></p> <ul style="list-style-type: none">• Look at sources, vibration, volume and pitch. Electricity• Look at appliances, circuits, lamps, switches, insulators and conductors.• Look at circuits, the effect of the voltage in cells and the resistance and conductivity of materials. <p><u>Forces and magnets</u></p> <ul style="list-style-type: none">• Look at contact and distant forces, attraction and repulsion, comparing and grouping materials.• Look at poles, attraction and repulsion.• Look at the effect of gravity and drag forces.• Look at transference of forces in gears, pulleys, levers and springs. <p><u>Earth and space</u></p> <ul style="list-style-type: none">• Look at the movement of the Earth and the Moon <p>Explain day and night</p>



Science National Curriculum Guidance Notes

STU (Science) Curriculum Guidance Notes – non-statutory

Phase 1

Use this document, alongside the school Curriculum documents for guidance on pitch and progression within the National Curriculum.

Each set of non-statutory guidance notes gives examples of how children might investigate, or **'work scientifically'** within each area of science.

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Working Scientifically

Pupils in years 1 and 2 should explore the world around them and raise their own questions. They should experience different types of scientific enquiries, including practical activities, and begin to recognise ways in which they might answer scientific questions. They should use simple features to compare objects, materials and living things and, with help, decide how to sort and group them, observe changes over time, and, with guidance, they should begin to notice patterns and relationships. They should ask people questions and use simple secondary sources to find answers. They should use simple measurements and equipment (for example, hand lenses, egg timers) to gather data, carry out simple tests, record simple data, and talk about what they have found out and how they found it out. With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language.

These opportunities for working scientifically should be provided across years 1 and 2 so that the expectations in the programme of study can be met by the end of year 2. Pupils are not expected to cover each aspect for every area of study.

Year 1

Plants

Pupils should use the local environment throughout the year to explore and answer questions about plants growing in their habitat. Where possible, they should observe the growth of flowers and vegetables that they have planted. They should become familiar with common names of flowers, examples of deciduous and evergreen trees, and plant structures (including leaves, flowers (blossom), petals, fruit, roots, bulb, seed, trunk, branches, stem).

Pupils might work scientifically by: observing closely, perhaps using magnifying glasses, and comparing and contrasting familiar plants; describing how they were able to identify and group them, and drawing diagrams showing the parts of different plants including trees. Pupils might keep records of how plants have changed over time, for example the leaves falling off trees and buds opening; and compare and contrast what they have found out about different plants.

Animals, including humans

Pupils should use the local environment throughout the year to explore and answer questions about animals in their habitat. They should understand how to take care of animals taken from their local environment and the need to return them safely after study. Pupils should become familiar with the common names of some fish, amphibians, reptiles, birds and mammals, including those that are kept as pets.

Pupils should have plenty of opportunities to learn the names of the main body parts (including head, neck, arms, elbows, legs, knees, face, ears, eyes, hair, mouth, teeth) through games, actions, songs and rhymes.

Pupils might work scientifically by: using their observations to compare and contrast animals at first hand or through videos and photographs, describing how they identify and group them; grouping animals according to what they eat; and using their senses to compare different textures, sounds and smells.

Everyday materials

Pupils should explore, name, discuss and raise and answer questions about everyday materials so that they become familiar with the names of materials and properties such as: hard/soft; stretchy/stiff; shiny/dull; rough/smooth; bendy/not bendy; waterproof/not waterproof; absorbent/not absorbent; opaque/transparent. Pupils should explore and experiment with a wide variety of materials, not only those listed in the programme of study, but including for example: brick, paper, fabrics, elastic, foil.

Pupils might work scientifically by: performing simple tests to explore questions, for example: 'What is the best material for an umbrella? ...for lining a dog basket? ...for curtains? ...for a bookshelf? ...for a gymnast's leotard?'

Seasonal changes

Pupils should observe and talk about changes in the weather and the seasons.

Living Things and their habitats

Pupils should be introduced to the idea that all living things have certain characteristics that are essential for keeping them alive and healthy. They should raise and answer questions that help them to become familiar with the life processes that are common to all living things. Pupils should be introduced to the terms 'habitat' (a natural environment or home of a variety of plants and animals) and 'micro-habitat' (a very small habitat, for example for woodlice under stones, logs or leaf litter). They should raise and answer questions about the local environment that help them to identify and study a variety of plants and animals within their habitat and observe how living things depend on each other, for example, plants serving as a source of food and shelter for animals. Pupils should compare animals in familiar habitats with animals found in less familiar habitats, for example, on the seashore, in woodland, in the ocean, in the rainforest.

Pupils might work scientifically by: sorting and classifying things according to whether they are living, dead or were never alive, and recording their findings using charts. They should describe how they decided where to place things, exploring questions for example: 'Is a flame alive? Is a deciduous tree dead in winter?' and talk about ways of answering their questions. They could construct a simple food chain that includes humans (e.g. grass, cow, human). They could describe the conditions in different habitats and micro-habitats (under log, on stony path, under bushes) and find out how the conditions affect the number and type(s) of plants and animals that live there.

Plants

Pupils should use the local environment throughout the year to observe how different plants grow. Pupils should be introduced to the requirements of plants for germination, growth and survival, as well as to the processes of reproduction and growth in plants.

Note: Seeds and bulbs need water to grow but most do not need light; seeds and bulbs have a store of food inside them.

Pupils might work scientifically by: observing and recording, with some accuracy, the growth of a variety of plants as they change over time from a seed or bulb, or observing similar plants at different stages of growth; setting up a comparative test to show that plants need light and water to stay healthy.

Animals, including humans

Pupils should be introduced to the basic needs of animals for survival, as well as the importance of exercise and nutrition for humans. They should also be introduced to the processes of reproduction and growth in animals. The focus at this stage should be on questions that help pupils to recognise growth; they should not be expected to understand how reproduction occurs.

The following examples might be used: egg, chick, chicken; egg, caterpillar, pupa, butterfly; spawn, tadpole, frog; lamb, sheep. Growing into adults can include reference to baby, toddler, child, teenager, adult.

Pupils might work scientifically by: observing, through video or first-hand observation and measurement, how different animals, including humans, grow; asking questions about what things animals need for survival and what humans need to stay healthy; and suggesting ways to find answers to their questions.

Uses of everyday materials

Pupils should identify and discuss the uses of different everyday materials so that they become familiar with how some materials are used for more than one thing (metal can be used for coins, cans, cars and table legs; wood can be used for matches, floors, and telegraph poles) or different materials are used for the same thing (spoons can be made from plastic, wood, metal, but not normally from glass). They should think about the properties of materials that make them suitable or unsuitable for particular purposes and they should be encouraged to think about unusual and creative uses for everyday materials. Pupils might find out about people who have developed useful new materials, for example John Dunlop, Charles Macintosh or John McAdam.

Pupils might work scientifically by: comparing the uses of everyday materials in and around the school with materials found in other places (at home, the journey to school, on visits, and in stories, rhymes and songs); observing closely, identifying and classifying the uses of different materials, and recording their observations.

Working Scientifically

Pupils in years 3 and 4 should be given a range of scientific experiences to enable them to raise their own questions about the world around them. They should start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions; recognise when a simple fair test is necessary and help to decide how to set it up; talk about criteria for grouping, sorting and classifying; and use simple keys. They should begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them. They should help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used.

They should learn how to use new equipment, such as data loggers, appropriately. They should collect data from their own observations and measurements, using notes, simple tables and standard units, and help to make decisions about how to record and analyse this data. With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions. With support, they should identify new questions arising from the data, making predictions for new values within or beyond the data they have collected and finding ways of improving what they have already done. They should also recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations. Pupils should use relevant scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences.

These opportunities for working scientifically should be provided across years 3 and 4 so that the expectations in the programme of study can be met by the end of year 4. Pupils are not expected to cover each aspect for every area of study.

Year 3Plants

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.

Note: Pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens.

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. 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.

Animals, including humans

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.

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.

Rocks

Linked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment.

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.

Light

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 how light behaves. 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. **Note:** Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. 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.



Forces and Magnets

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). 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.

Year 4

Living Things and their habitats

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 habitat. They should identify how the habitat changes throughout the year. Pupils should explore possible ways of grouping a wide selection of living things that include animals and flowering plants and non-flowering plants. Pupils could begin to put vertebrate animals into groups such as fish, amphibians, reptiles, birds, and mammals; and invertebrates into snails and slugs, worms, spiders, and insects. **Note:** Plants can be grouped into categories such as flowering plants (including grasses) and non-flowering plants, such as ferns and mosses. 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. 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.

Animals, including humans

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. 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.

States of matter

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. **Note:** Teachers should avoid using materials where heating is associated with chemical change, for example, through baking or burning. Pupils might work scientifically by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, 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.

Sound

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. 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.

Electricity

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; these will be introduced in year 6. **Note:** Pupils might use the terms current and voltage, but these should not be introduced or defined formally at this stage. Pupils should be taught about precautions for working safely with electricity. 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.

Phase 3

Working Scientifically

Pupils in years 5 and 6 should use their science experiences to: explore ideas and raise different kinds of questions; select and plan the most appropriate type of scientific enquiry to use to answer scientific questions; recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why. They should use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment. They should make their own decisions about what observations to make, what measurements to use and how long to make them for, and whether to repeat them; choose the most appropriate equipment to make measurements and explain how to use it accurately. They should decide how to record data from a choice of familiar approaches; look for different causal relationships in their data and identify evidence that refutes or supports their ideas. They should use their results to identify when further tests and observations might be needed; recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact. They should use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas and should talk about how scientific ideas have developed over time. These opportunities for working scientifically should be provided across years 5 and 6 so that the expectations in the programme of study can be met by the end of year 6. Pupils are not expected to cover each aspect for every area of study.

Year 5

Living things and their habitats

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 the 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.

Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.

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 the rainforest, in the oceans, in 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, 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.

Animals, including humans

Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.

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.

Properties and changes of materials

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.

Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them. Safety guidelines should be followed when burning materials.



Year 6

Living things and their habitats

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.

Pupils might find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification. 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.

Animals including humans

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.

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.

Pupils might work scientifically by: exploring the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.

Evolution and inheritance

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 got 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. **Note:** At this stage, pupils are not expected to understand how genes and chromosomes work.

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, brightly coloured and scented flowers.

Light

Pupils should build on the work on light in year 3, exploring the way that light behaves, including light sources, reflection and shadows. They should talk about what happens and make predictions.

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 a range of phenomena including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters (they do not need to explain why these phenomena occur).

Electricity

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.

Note: Pupils are expected to learn only about series circuits, not parallel circuits. Pupils should be taught to take the necessary precautions for working safely with electricity. 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.

Science Glossary

accelerate = Move faster.

air = A mixture of gases including oxygen.

air resistance = Force which pushes on objects in air.

amphibians = Animals that live on land and in water. They have wet skins.

artery = Blood is carried away from the heart to the body in arteries. Arteries carry lots of oxygen.

atom = Tiny particles in solids, liquids and gases. Atoms carry sound to your ear.

attract = Two magnets will pull each other together if you put the north pole of one magnet to the south pole of the other.

axis = Where the Earth turns itself around (spins). The Earth spins on its axis, which gives us night and day.

battery = Where the electricity comes from in a circuit

birds = Animals that have feathers, two legs and a beak.

boil = Heat a liquid so that it changes to a gas.

boiling point or boiling temperature = The temperature at which liquid boils and changes into a gas. For water this is 100°C.

canine = Tooth that is sharp and pointed for ripping and tearing meat.

carnivore = Animal that eats another animal. (Secondary consumer in the food chain.)

carpel = The female part of a flower.

cell 1 = Another term for a battery

cell 2 = Tiny parts which make up a living thing.

change of state = A change from solid to liquid, or liquid to gas (or other way around).

circuit diagram = A drawing which shows all the components in a circuit and how they are connected.

circulation = When blood travels from the heart to every part of the body and back to the heart.

classify = Put things into groups. Animals are classified by five groups; mammals, fish, birds, reptiles and amphibians.

competition = How living things have to get what they need before other living things get them.

complete circuit = From one end of the battery through all the components without any gaps.

compress = When something is squashed. (Think of press.)

conclusion = What you have found out.

condensation = When a warm gas meets a cold solid, it changes to a liquid. (e.g. breathing warm air on a cold window.)

conditions = How things are, e.g. cold, light, warm etc.

conductor = Lets heat or electricity pass through.

consumer = An organism that consumes food but does not produce it i.e an animal.

degrees Celsius (°C) = unit in which temperature is measured.

describe = Write HOW something happened.

digestion = How food is broken down into tiny pieces so that it can be carried in the blood.

dispersal = Spreading seeds far from the parent plant.

dissolve = When you add a solid to a liquid, the solid 'seems to disappear'.

ear drum = Part of the ear that vibrates for us to hear the sound.

echo = Some solids are too thick for all the sound waves to travel through, so some sound is reflected back and you hear the same sound again, but quieter.

energy = Effort needed.

environment = The surroundings for a living thing.

evaporation = When a liquid is heated and it changes to a gas. (e.g. the sun heating puddles in the playground.)

evolve = How living things change so that they don't become extinct.

excrete = When a living thing gets rid of waste so that it won't be poisoned.

extend = When something stretches.

experiment = When you test an idea to prove it.

explain = Write about WHY something happened.

extinct = When animals die out and there are none left to breed.

filtering = A way to separate solids from a liquid, using paper and perhaps a funnel.

fish = Animals that have gills, fins and scales.

food chain /web = How energy is passed from one living thing to another.

force = A push, pull or twist that affects an object making it 1) start to move, 2) move faster, 3) stop moving, 4) change shape or 5) change direction.

force meter = Equipment used to measure how much force is needed to move an object.

fossil = Found in rocks, it is proof that something lived long ago.

freeze = Change a liquid into a solid by cooling (lowering the temperature).

friction = The force that tries to stop objects moving.

function = What something is used for.

gas = A material with atoms that are far apart and that spread to fill any space.

habitat = Where an organism lives.

herbivore = Animal that eats plants. The primary consumer in the food chain.

igneous = Rocks made by heat in volcanoes.

impermeable = A substance that does not let water pass through it

incisor = Tooth for cutting and slicing. (Think of scissors!)

insect = Animal with six legs and three body parts. Don't confuse with spiders, woodlice and centipedes; they are not insects, they have more than six legs.

insoluble = A solid that will not dissolve in a liquid.

insulator = A material that won't let heat or electricity pass through.

investigation = A search for proof through a test or experiment.

irreversible change = A change that cannot be undone, such as burning a piece of wood..

keys = Short information that helps you to classify things.

leaf = Part of the plant that makes the food using sunlight.

living = Use MRS NERG to work out if something is living --- Move, Respire, Sensitive, Nutrition, Excrete, Reproduce and Grow.

liquid = A material that has atoms close together and almost in a pattern. A liquid will spread to fill the shape of the container it is in.

magnetic = A material that is attracted to a magnet.

major organs = Very important body parts that must be kept healthy. Heart, lungs, kidneys, liver, brain, stomach and intestines.

mammal = An animal that has fur, gives birth to live young and gives milk.

melt = Change a solid to a liquid by heating.

metal = A material that is a good heat conductor and good electrical conductor.

metamorphic = A rock that has changed because of a lot of heat or pressure.

micro-organism = A living thing (germ) that needs warmth, damp and food to survive. Some micro-organisms are dangerous they give us disease; but some are useful, they help us to make cheese and break down sewage.

molar = Tooth for grinding food. (Ours are at the back of the mouth).

muscles = Help us to move. They are fixed to the bones. Muscles work in pairs, one has to contract (shorten) and the other extend (stretch).

Newton = Force is measured in Newtons. 1N will lift 100g.

nutrition = How living things get energy. Plants make their own food in the leaves using energy from the sun.

observe = Watch and look carefully.

omnivore = Animal that eats plants and animals.

opaque = An object that light can't pass through, so you can't see through it.

orbit = The path a planet makes around the Sun or that the moon makes around the Earth.
(The moon takes 28 days to orbit Earth).

organism = A living thing, any plant or animal.

ovary = Female part of the plant that keeps the eggs cells safe.

pitch = How high or low a sound is. High pitch is caused by short, tight and thin objects vibrating fast.

plaque = Dissolved food (mainly sugar) and bacteria that attacks the tooth. Get rid of it by brushing your teeth after meals.

poles = There are two poles on a magnet, the north pole and south pole.

pollen = Tiny grains that carry the genes from the male part of the plant.

pollinate = When the pollen from the male part of the plant lands on the female stigma.

pollution = Waste materials that damage living things.

predator = An animal that hunts others to kill and eat them.

predict = What you think will happen.

pressure = The force over an area. E.g. a drawing pin head is a large area you push your force on to drive the thin part into a wall.)

prey = An animal hunted by others.

primary consumer = An animal that eats plants (herbivore).

producer = A green plant that begins the food chain.

protein = Food that builds muscle.

pulse = Measures the heart rate; how fast or slow the heart is beating.

reflection = When light rays (which travel in straight lines) bounce off objects. Shiny surfaces will send a reflection of us into our eyes.

repel = When a north of one magnet is put next to a north of another magnet the two magnets push apart. (South and south will repel too).

reproduce = When male and female genes join together to make a new life.

reptiles = Animals that have scales and a dry skin.

respire = using oxygen to turn food into energy.

reversible = A material can be changed and then changed back to how it used to be.
E.g. melting an ice-cube is reversible because it can be frozen back into an ice-cube.

roots = Part of the plant that take in nutrients and water. They keep the plant stable.

saliva = A liquid in our mouth which kills germs on food and makes food easy to swallow.

saturate = When a liquid can't dissolve any more solids and you can see the solids in the liquid.

sedimentary = Rock made by layers settling on top of each other.

sieving = A way to separate solids of different sizes.

sensitive = Living things are sensitive to their environment. If their environment is changed or damaged their life is affected.

sepal = Part of the plant that protects the young flower (bud) until it is ready to reproduce.

shadow = When light can't pass through an object (an opaque material), the area behind the object is dark and this is a shadow.

skeleton = Our frame to hold us up, protect some organs and help us to move. It grows with us and can mend when broken.

soil = Tiny pieces of rock and decomposed material from things that once lived.

solar system = A group of planets that orbit the Sun. The Sun is a star. The planets in our solar system are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Pluto is no longer considered a planet

solid = A material that has atoms very close together and in a neat pattern. A solid will keep its own shape.

soluble = A solid that will dissolve in water. (Lots of headache tablets are soluble, watch out for the adverts on T.V. when they drop the tablets into water and they fizz.)

sound = You will only get sound when something vibrates. The vibration makes the atoms in solids, liquids and gases compress and extend, so they carry the sound to your ear.

sphere = A 3D rounded object. The Sun, moon and Earth are nearly spheres.

stamen = Name for the male sex organs of a plant, (the anther and filament).

state = Solid liquid or gas. A material can be in any of these three states.

stem = Part of the plant that takes the nutrients and water to all the other parts.

stigma = Female part of the plant that is sticky so that pollen will stick to it.

style = Female part of the plant that takes the pollen down to the egg in the ovary.

switch = In some circuits, the switch can be used to stop electricity making a circuit and in others the switch is used to complete the circuit.

temperature = How we measure how hot or cold something is.

translucent = An object that lets some light through, but you can't see clearly. E.g. a bathroom window; you know that someone is in there, but you can't see who!

transparent = An object that is see through.

upthrust = The force that pushes up in water.

vacuum = A place where there is no solid, liquid or gas and so there is silence, as there are no atoms to carry the sound.

vein = Blood vessel that carries blood back to the lungs to excrete the carbon dioxide.

vertebrate = An animal with a backbone.

vibration = The movement of an object when a force has been used. No vibration = silence.

volume = How loud or quiet a sound is.

water cycle = Water recycled through evaporation or condensation.

weight = The force pulling down on a mass due to gravity.

Support Materials

Science	Computing
<ul style="list-style-type: none"> Chris Quigley greater depth 	<ul style="list-style-type: none"> CLC computing milestones



Expectations for STEAM week

This year, we want to link STEAM week to saving our planet, incorporating elements of research with practical STEAM activities. The research focus will be on **environmental** engineers and inventions (famous people and different roles) as well as the ideas of overcoming obstacles and STEAM being for everyone. This will allow for lots of links to BLP, through perseverance, collaboration and capitalising.

Key outcomes:

- A piece of research into an engineer/inventor (either written, or in digital form e.g. pic collage, powerpoint, word) that can be shared in celebration assembly. For example a fact file, non-fiction text or a biography (could be an individual, group or whole class).
- A design and prototype of a world saving invention (group or whole class).
- A series of lessons that result in a design and prototype of a world saving invention (either small group or whole class) that has been created representing the person chosen and this should be able to be displayed or presented.
- A page in topic books about STEAM week (could be a piccollage)

[Any evidence on Twitter please use #lhsteam2020 as well as any curriculum areas it links to.](#)

Useful websites:

- Great activities for EYFS and KS1; <https://fun-a-day.com/marble-course/>
- Lots of great engineering ideas which can be steered to environmental engineering. <https://www.instructables.com/id/Project-Based-Engineering-for-Kids/>
- <https://www.stem.org.uk/>

Suggestions for inventors of environmental saving products:

Name	M/F	Area of STEM	Famous for...	Class
Albert Betz	M	Engineering	Pioneer of wind turbine technology	
Raul Oaida	M	Engineering	Lego car that works using air	
Adidas	NA	Engineering	Trainers made of recycled plastic	
Kevin Kumala	M	Engineering	Biodegradable bags and plant-based plastic	
Boyan Slat	M	Engineering	Oceanic clean up	
Duro-Aina Adebola, Akindele Abiola, Faleke Oluwatyoin and Bello Eniola	F	Engineering	Urine-powered Generator	
Anirudh Sharma	M	Engineering	Air:Ink - Cartridge which turns car pollution into ink.	
Andrew Turton & Pete Ceglinski	M	Engineering	Sea Bin Inventors - Bin which filters out plastic from the sea.	
Maria Telkes	F	Engineering	Thermoelectric Power Generator	
Jane Goodall	F	Biology	Primatologist and champion of animal rights	
Rachel Carson	F	Environmental Science	Discovered the dangers of pesticides and chemicals to humans, plants, and animals, and was a landmark in the nation's environmental history	
Wangari Maathai	F	Biology & Environmentalist	Founding The Green Belt Movement	

Example weekly outline

Monday	Tuesday	Wednesday	Thursday	Friday
- Dragons den style assessment of previously created environmental inventions	- Research what the world needs / invention ideas - Children can look at ideas provided	- Plan invention → look at what resources they will need	- Continue planning /start making prototype using 'junk'.	- SLT dragons den → Winning design gets to order actual resources they need to make invention

