



Title	<b>Examples of Upper Key Stage 2 Science Specific Learning Challenges</b>
Originator	CD
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# Introduction

- This scheme of work has been developed to ensure that you will have full coverage of the new National Curriculum. It follows the programmes of study for each year very carefully and provides the right balance between working scientifically and learning scientific facts.
- Each set of Learning Challenges then links directly to the science knowledge, skills and understanding to ensure that learning is progressive and continuous.
- There has been an attempt to link either creative or expressive arts into each scientific learning challenge so that there is breadth and balance in the coverage as a whole.
- The art, DT, music and dance knowledge, skills and understanding have been taken from the 'Weaving KSU into the new National Curriculum' book which ensures that you will have progression and continuity in these subject areas also.
- The initial or main questions outlined in the examples that follow are obviously the starting points for you to consider. The ethos that underpins the Learning Challenge approach requires teachers to check on what children already know and then invite them to think of their own questions. This approach is still highly desirable but teachers need to ensure that they are meeting the National Curriculum requirements. **Very importantly ensure that all content absolutely meets your context.**
- Each Learning Challenge has a suggested 'wow' and its own suggested reflection. By using these you will get a more complete level of challenge for the pupils.
- You will also note that every opportunity has been taken to help children apply literacy and numeracy skills where it is possible to do so.
- Finally, every attempt has been made to bring science to life by taking starting points from the children's context. In this way it is hoped that science will be viewed as exciting and interesting as well as fun.

# Learning Challenges – The Principles

## *What are the main principles?*

- The Learning Challenge concept is built around the principle of greater learner involvement in their work. It requires deep thinking and encourages learners to work using a question as the starting point.
- In designing the curriculum teachers and learners are using a prime learning challenge, expressed as a question, as the starting point. Using the information gained from pre- learning tasks and the school's context a series of subsidiary challenges are then planned. Each subsidiary learning challenge is also expressed as a question. See how this works in the scheme of work provided.
- The subsidiary learning challenge is normally expected to last for one week but this does not need to be the case. However, initially it may be useful for the learners and indeed the staff to get used to the weekly learning challenge. The important point is that the learning challenges need to make sense to the learners and be something that is within their immediate understanding.

# Learning Challenges – The Principles

## *How do the Pre- Learning Tasks Work?*

- Pre-Learning Tasks ensure that learners are directly involved in the planning process. Well planned pre-learning tasks should help to bring out what learners already know; what misconceptions they may have and what really interests them.
- Teachers should take account of the outcomes from pre-learning tasks to plan the subsidiary learning challenges for each major area of study. It should help teachers recognise what transferable skills learners have already developed that could be used to initiate new learning with a level of confidence.
- Pre-Learning tasks could take many different forms and can last for as long or as short as required. Some may be written tasks others oral. Mind mapping is one method that has been used successfully by many schools. Using pre-learning tasks as part of a school's programme of home learning will help to get parents and carers directly involved in their children's learning.

# Learning Challenges – The Principles

## ***How do we ensure that pupils are improving their knowledge and understanding and developing appropriate skills?***

- Continuity and Progression in the curriculum will be built around a set of matrices known as essential ‘knowledge, skills and understanding’ within subject disciplines. These are broken into Year group expectations and have additional challenges for able learners. The Knowledge, Skills and Understanding’ matrices within the Learning Challenge Curriculum (Weaving Knowledge, Skills and Understanding into the new National Curriculum) will allow school to guarantee that the learners’ essential skills are being developed, alongside National Curriculum requirements (where appropriate), whilst allowing individual schools to have a great deal of autonomy with their methodology.
- In addition, there is an expectation that teachers apply English, mathematics and ICT skills where it is appropriate to do so.

# Learning Challenges – The Principles

## How are learners presented with opportunities to reflect on their learning?

- Time for learners to reflect or review their learning is central to the whole process. This is in keeping with the 'Learning to Learn' principles where reflection is seen as a very important part of individuals' learning programme.
- Within the Learning Challenge Curriculum it is suggested that the final subsidiary learning challenge is handed over for learners to reflect on their learning. The idea is that learners present their learning back to the rest of the class or another appropriate audience - making the most of their oracy and ICT skills to do so. Initially, learners may require a great deal of direction so the reflection time may need to be presented in the form of a question which helps them to review their work.
- Although reflection is seen as a concluding part of the prime learning challenge it is hoped that there will be continual opportunities for learners to reflect frequently, especially as each subsidiary learning challenge comes to an end. Ideally, there should be a good deal of learner autonomy evident during reflection time.

# Science

# Upper Key Stage 2

Upper Key Stage 2

# Science Programme of Study: Upper Key Stage 2

- The principal focus of science teaching in **upper key stage 2** is to enable pupils to develop a deeper understanding of a wide range of scientific ideas. They should do this through exploring and talking about their ideas; asking their own questions about scientific phenomena; and analysing functions, relationships and interactions more systematically. At upper key stage 2, they should encounter more abstract ideas and begin to recognise how these ideas help them to understand and predict how the world operates. They should also begin to recognise that scientific ideas change and develop over time. They should select the most appropriate ways to answer science questions using different types of scientific enquiry, including observing changes over different periods of time, noticing patterns, grouping and classifying things, carrying out comparative and fair tests and finding things out using a wide range of secondary sources of information. Pupils should draw conclusions based on their data and observations, use evidence to justify their ideas, and use their scientific knowledge and understanding to explain their findings.
- 'Working and thinking scientifically' is described separately at the beginning of the programme of study, but must **always** be taught through and clearly related to substantive science content in the programme of study. Throughout the notes and guidance, examples show how scientific methods and skills might be linked to specific elements of the content.
- Pupils should read, spell and pronounce scientific vocabulary correctly.

# Science Learning Challenges

Year 5

# Year 5 Statutory Requirements

Working Scientifically (Y5 & Y6)	Living Things and their habitats	Animals, including humans
<ul style="list-style-type: none"><li>• planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li><li>• taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li><li>• recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li><li>• using test results to make predictions to set up further comparative and fair tests</li><li>• 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</li><li>• identifying scientific evidence that has been used to support or refute ideas or arguments.</li></ul>	<ul style="list-style-type: none"><li>• describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird</li><li>• describe the life process of reproduction in some plants and animals.</li></ul>	<ul style="list-style-type: none"><li>• describe the changes as humans develop to old age.</li></ul>

# Year 5 Statutory Requirements (continued)

Properties and changes of materials	Earth and Space	Forces
<ul style="list-style-type: none"> <li>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</li> <li>know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution</li> <li>use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating</li> <li>give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic</li> <li>demonstrate that dissolving, mixing and changes of state are reversible changes</li> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>describe the movement of the Earth, and other planets, relative to the Sun in the solar system</li> <li>describe the movement of the Moon relative to the Earth</li> <li>describe the Sun, Earth and Moon as approximately spherical bodies</li> <li>use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.</li> </ul>	<ul style="list-style-type: none"> <li>explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object</li> <li>identify the effects of air resistance, water resistance and friction, that act between moving surfaces</li> <li>recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.</li> </ul>

# Science: Year 5 Overview

	Living things and their habitats	Animals, including humans	Properties & changes of materials	Earth and space	Forces
<b>YEAR 5</b>	<ul style="list-style-type: none"> <li>• Life cycles of plants and animals</li> <li>• Birth, growth, development and reproduction</li> </ul>	<ul style="list-style-type: none"> <li>• Changes as humans develop from birth to old age</li> </ul>	<ul style="list-style-type: none"> <li>• Dissolving</li> <li>• Evaporating</li> <li>• Filtering</li> <li>• Reversible and Irreversible changes</li> </ul>	<ul style="list-style-type: none"> <li>• Earth relative to the Sun</li> <li>• Moon relative to the Earth</li> <li>• Relationship between Sun, Earth and Moon</li> <li>• Earth's rotation</li> <li>• Day and night</li> </ul>	<ul style="list-style-type: none"> <li>• Gravity</li> <li>• Air Resistance</li> <li>• Water Resistance</li> <li>• Friction</li> <li>• Gears, Pulleys, Leavers and Springs</li> </ul>
<b>Possible Learning Challenges</b>	<ul style="list-style-type: none"> <li>• Do all animals and plants start life as an egg?</li> </ul>	<ul style="list-style-type: none"> <li>• How different will you be when you are as old as your grandparents?</li> </ul>	<ul style="list-style-type: none"> <li>• Could you be the next CSI investigator?</li> </ul>	<ul style="list-style-type: none"> <li>• Will we ever send another human to the moon?</li> </ul>	<ul style="list-style-type: none"> <li>• Can you feel the force?</li> </ul>

# Scientific Knowledge, Skills and Understanding within the National Curriculum

Year 5 Science

# Knowledge, Skills and Understanding breakdown for Working Scientifically

## Year 5

Planning	Obtaining and presenting evidence	Considering evidence and evaluating
<ul style="list-style-type: none"> <li>• Can they plan and carry out a scientific enquiry to answer questions, including recognising and controlling variables where necessary?</li> <li>• Can they make a prediction with reasons?</li> <li>• Can they use test results to make predictions to set up comparative and fair tests?</li> <li>• Can they present a report of their findings through writing, display and presentation?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they take measurements using a range of scientific equipment with increasing accuracy and precision?</li> <li>• Can they take repeat readings when appropriate?</li> <li>• Can they record more complex data and results using scientific diagrams, labels, classification keys, tables, scatter graphs, bar and line graphs?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they report and present findings from enquiries through written explanations and conclusions?</li> <li>• Can they use a graph to answer scientific questions?</li> </ul>

## Year 5 (Challenging)

<ul style="list-style-type: none"> <li>• Can they explore different ways to test an idea, choose the best way and give reasons?</li> <li>• Can they vary one factor whilst keeping the others the same in an experiment?</li> <li>• Can they use information to help make a prediction?</li> <li>• Can they explain, in simple terms, a scientific idea and what evidence supports it?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they decide which units of measurement they need to use?</li> <li>• Can they explain why a measurement needs to be repeated?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they find a pattern from their data and explain what it shows?</li> <li>• Can they link what they have found out to other science?</li> <li>• Can they suggest how to improve their work and say why they think this?</li> </ul>
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# Knowledge, Skills and Understanding breakdown for Living Things, their Habitats and Animals, including humans

## Year 5

### Animals, including humans

- Can they describe the changes as humans develop to old age?

### Living things and their habitats

- Can they describe the differences in the life cycles of a mammal, an amphibians, an insects and a bird?
- Can they describe the life cycles of common plants?
- Can they explore the work of well know naturalists and animal behaviourists? (David Attenborough and Jane Goodall)

## Year 5 (Challenging)

- Can they create a timeline to indicate stages of growth in certain animals, such as frogs and butterflies?
- Can they describe the changes experienced in puberty?
- Can they draw a timeline to indicate stages in the growth and development of humans?

- Can they observe their local environment and draw conclusions about life-cycles, e.g. plants in the vegetable garden or flower border?
- Can they compare the life cycles of plants and animals in their local environment with the life cycles of those around the world, e.g. rainforests?

# Knowledge, Skills and Understanding breakdown for Properties and Changes to Materials

## Year 5

### Properties and changes to materials

- Can they compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets?
- Can they explain how some materials dissolve in liquid to form a solution?
- Can they describe how to recover a substance from a solution?
- Can they use their knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving, evaporating?
- Can they give reasons, based on evidence for comparative and fair tests for the particular uses of everyday materials, including metals wood and plastic?
- Can they describe changes using scientific words? (evaporation, condensation)
- Can they demonstrate that dissolving, mixing and changes of state are reversible changes?
- Can they 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?
- Can they use the terms 'reversible' and 'irreversible'?

### Year 5 (challenging)

- Can they describe methods for separating mixtures? (filtration, distillation)
- Can they work out which materials are most effective for keeping us warm or for keeping something cold?
- Can they use their knowledge of materials to suggest ways to classify? (solids, liquids, gases)
- Can they explore changes that are difficult to reverse, e.g. burning, rusting and reactions such as vinegar with bicarbonate of soda?
- Can they explore the work of chemists who created new materials, e.g. Spencer Silver (glue on sticky notes) or Ruth Benerito (wrinkle free cotton)?

# Knowledge, Skills and Understanding breakdown for Earth, Space and Forces

## Year 5

### Earth and Space

- Can they identify and explain the movement of the Earth and other planets relative to the sun in the solar system?
- Can they explain how seasons and the associated weather is created?
- Can they describe and explain the movement of the Moon relative to the Earth?
- Can they describe the sun, earth and moon as approximately spherical bodies?
- Can they use the idea of the earth's rotation to explain day and night and the apparent movement of the sun across the sky?

### Forces

- Can they explain that unsupported objects fall towards the earth because of the force of gravity acting between the earth and the falling object?
- Can they identify the effects of air resistance, water resistance and friction that act between moving surfaces?
- Can they recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect?

## Year 5 (Challenging)

- Can they compare the time of day at different places on the earth?
- Can they create shadow clocks?
- Can they begin to understand how older civilizations used the sun to create astronomical clocks, e.g. Stonehenge?
- Can they explore the work of some scientists? (Ptolemy, Alhazen, Copernicus)

- Can they describe and explain how motion is affected by forces? (including gravitational attractions, magnetic attraction and friction)
- Can they design very effective parachutes?
- Can they work out how water can cause resistance to floating objects?
- Can they explore how scientists, such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation?

# Year 5: Do all animals and plants start life as an egg?

## Science Y5: Living Things and their Habitats

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

**WOW:** Show clips of film of animals hunting each other and talk about life cycles.

LC1 Can you work out which animals depend on each other for survival?

LC2 What would you ask David Attenborough or Jane Goodall if you met them?

LC3 How can you create a presentation to show the life cycle of a butterfly or a frog?

LC4 Do all animals start life as an egg?

LC5 How do humans change as they grow?

LC6 Can you recreate the life cycle of a butterfly in using music and dance?

LC7 How can you create art from the environment?

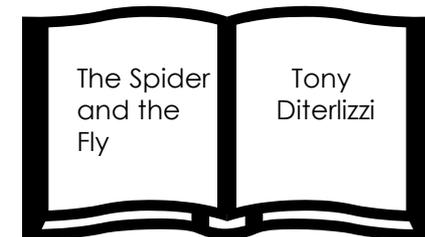
LC8 Reflection: Children to create a poster of a chosen animal or plant showing its life cycle.

**Working Scientifically:** observe and compare 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), ask pertinent questions and suggest reasons for similarities and differences.

**Literacy Link:** There are many opportunities to link Literacy within this LC. In LC1 explanation texts (use the Spider and the Fly book); LC2 devising questions, etc.

**Expressive Arts Link:** In LC6 children will be provided with opportunities to write their own music and create their own dance taking the life cycle of a butterfly as their stimuli.

**Creative Art Link:** Children will look at the work of Andy Goldsworthy or Simon Watts and use items they find in the environment to create a 3D piece of art.



## Year 5: Do all animals and plants start life as an egg?

### Year 5: Science, Art, Music and Dance Knowledge, Skills and Understanding

#### Year 5 Science: Living Things and their habitats

- Can they describe and compare the life cycles of a range of animals, including humans, amphibians, insects and birds?
- Can they describe the life cycles of common plants?
- Can they talk with knowledge about birth, reproduction and death of familiar animals or plants?
- Can they explore the work of well know naturalists? (David Attenborough and Jane Goodall)
- Can they report findings from investigations through written explanations and conclusions?
- Can they use a graph to answer scientific questions?

#### Art & Design

- Do they experiment with and combine materials and processes to design and make 3D form?
- Do they learn about the work of others by looking at their work in books, the Internet, visits to galleries and other sources of information?
- Do they keep notes in their sketch books as to how they might develop their work further?
- Do they use their sketch books to compare and discuss ideas with others?
- Can they combine visual and tactile qualities?

#### Year 5 Challenging

- Can they observe their local environment and draw conclusions about life-cycles? (for example, the vegetable garden or flower border)
- Can they compare the life cycles of plants and animals in their local environment with the life cycles of those around the world, eg rainforests?
- Can they explain (in simple terms) a scientific idea and what evidence supports it?

#### Music and Dance

- Can they change sounds or organise them differently to change the effect?
- Can they compose music which meets specific criteria?
- Can they choose the most appropriate tempo for a piece of music?
- Do they plan and perform dances confidently?
- Can they compose motifs and plan dances creatively and collaboratively in groups?
- Can they adapt and refine the way they use weight, space and rhythm in their dances to express themselves in the style of dance they use?
- Can they perform different styles of dance clearly and fluently?
- Do they organise their own warm-up and cool-down exercises?

# Year 5: How different will you be when you are as old as your grandparents?

## Science Y5: Animals (including Humans)

- describe the changes as humans develop to old age.

**WOW:** Use the photographic app that shows what they will look like in 20 years time and talk about what their feelings are, etc.

LC1	Choose a baby, themselves, a teenager, a young adult, their parents and their grandparents and create a chart to find out about what they can and cannot do?
LC2	What can you now do that you couldn't do when you were a baby?
LC3	Do we all have the same X Factor?
LC4	What are the important things we should do to keep fit and healthy?
LC5	What do we understand by the term 'puberty'? (non statutory)
LC6	Through drawing and painting, can you accurately sketch yourself and your grandparent?
LC7	What is the life expectancy of different animals?
LC8	Reflection: How would you wish to be remembered as you make your journey through life?

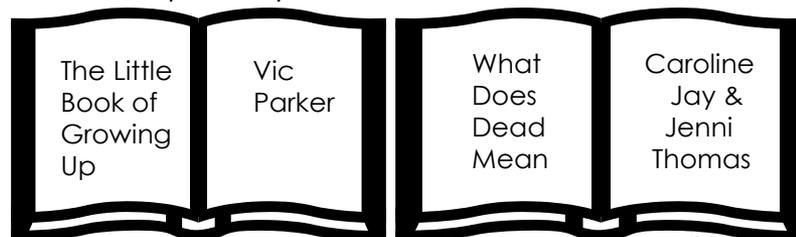
**Working Scientifically:** compare data about the gestation periods of humans and other animals or find out and record the length and mass of a baby as it grows.

**Literacy Link:** Many opportunities here for reflective writing (LC2); explanation texts (LC4) and (LC5).

**Numeracy Links:** Many opportunities in this LC for children to carry out measurements and create graphs and charts.

**Creative Art Link:** Opportunities in LC6 for children to create a self-portrait having looked at a range of artists' work. They will then create another drawing or painting of an older person's face and try to capture the differences.

**LC7** This LC provides opportunities for you to deal with the issues associated with death in as much depth as you would wish to.



# Year 5: How different will you be when you are as old as your grandparents?

## Year 5: Science and Art Knowledge, Skills and Understanding

### Year 5 Science: Animals (including Humans)

- Can they create a timeline to indicate stages of growth in humans?
- Can they explain what puberty is? (non statutory)
- Do they appreciate that all animals will eventually die?
- Can they explain why different animals have a different life expectancy?
  
- Can they make a prediction with reasons?
- Can they use test results to make further predictions and set up further comparative tests?
- Can they present a report of their findings through writing, display and presentation?
- Can they take measurements using a range of scientific equipment with increasing accuracy and precision?
- Can they record more complex data and results using scientific diagrams, classification keys, tables, bar charts, line graphs and models?

### Art & Design

- Do they successfully use shading to create mood and feeling?
- Can they organise line, tone, shape and colour to represent figures and forms in movement?
- Can they explain why they have chosen specific materials to draw with?
- Can they create all the colours they need?
- Can they create mood in their paintings?
- Can they express their emotions accurately through their painting and sketches?
- Do they keep notes in their sketch books as to how they might develop their work further?
- Do they use their sketch books to compare and discuss ideas with others?
- Do they learn about the work of others by looking at their work in books, the Internet, visits to galleries and other sources of information?

### Year 5 Challenging

- Can they create a timeline to indicate stages of growth in certain animals, such as frogs and butterflies?
  
- Can they explain (in simple terms) a scientific idea and what evidence supports it?
- Can they decide which units of measurement they need to use?
- Can they explain why a measurement needs to be repeated?
- Can they find a pattern from their data and explain what it shows?
- Can they link what they have found out to other science?
- Can they suggest how to improve their work and say why they think this?

# Year 5: Could you be the next CSI investigator?

## Science Y5: Properties and Changes of Materials

- 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
- know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution
- use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating
- give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic
- demonstrate that dissolving, mixing and changes of state are reversible changes
- 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

**WOW:** Burn a number of different materials, examine the remains and see whether the original item can be identified.

LC1	Can you think of five materials that can be changed and reversed and five that cannot?
LC2	How have scientists made use of changes to create materials that make our lives easier, e.g. cling film?
LC3	Which materials dissolve and evaporate and why can this sometimes be an important quality in those materials?
LC4	How are reversible and irreversible changes important to forensic scientists?
LC5	How could you solve a crime by using forensic evidence?
LC6	What is bicarbonate of soda and what impact does it have on different materials?
LC7	Using finger prints as well as hand and foot prints, can you create an interesting piece of art work that has interesting design features?
LC8	Reflection: Create your own version of 'Brainiac' and present it to Key Stage 1 children.

**Working Scientifically:** carry out tests to answer questions such as '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.

**Literacy Link:** There are many opportunities to make use of a range of literacy skills in this LC. For example there are opportunities in LC2 to find out about a particular scientist's work, e.g. Ruth Benerito or Spencer Silver.

**Creative Art Link:** LC7 provides opportunities for children to consider the work of Salvador Dali and then create their own work using footprints, handprints and fingerprints.



# Year 5: Could you be the next CSI investigator?

## Year 5: Science and Art Knowledge, Skills and Understanding

### Year 5 Science: Materials

- Can they explore different ways to test an idea and choose the best way, and give reasons?
- Can they vary one factor whilst keeping the others the same in an experiment? Can they explain why they do this?
- Can they plan and carry out an investigation by controlling variables fairly and accurately?
- Can they make a prediction with reasons?
- Can they use information to help make a prediction?
- Can they use test results to make further predictions and set up further comparative tests?
- Can they explain (in simple terms) a scientific idea and what evidence supports it?
- Can they present a report of their findings through writing, display and presentation?
  
- Can they explain how changes can result in the formation of new materials?
- Can they explain what an irreversible change is and give examples?
- Can they explore the work of famous chemists? (Lavoisier, Priestley, Spencer Silver or Ruth Benerito)
- Can they distinguish metals from other solid materials by describing metallic properties?
- Can they explain why some metals rust?
- Can they explain what happens when vinegar or bicarbonate of soda is added to materials?

### Year 5 Challenging

- Can they make a prediction which links with other scientific knowledge?
- Can they identify the key factors when planning a fair test?
- Can they explain how a scientist has used their scientific understanding plus good ideas to have a breakthrough?
  
- Can they identify where changes in state take place and explain these?
- Can they give a clear description of what happens when a material is burnt or heated as in cooking?
- Can they give examples of how chemical changes can impact on our lives?
- Can they suggest ways to separate mixtures based on what they know about certain materials?

### Art & Design

- Do their sketch books contain detailed notes, and quotes explaining about items?
- Do they compare their methods to those of others and keep notes in their sketch books?
- Do they combine graphics and text based research of commercial design, for example magazines etc., to influence the layout of their sketch books.
- Do they adapt and refine their work to reflect its meaning and purpose, keeping notes and annotations in their sketch books?
- Can they create work which is open to interpretation by the audience?
- Can they include both visual and tactile elements in their work?
- Can they combine pattern, tone and shape?
- Can they overprint using different colours?
- Do they look very carefully at the methods they use and make decisions about the effectiveness of their printing methods?

# Year 5: Will we ever send another human to the moon?

## Science Y5: Earth and Space

- describe the movement of the Earth, and other planets, relative to the Sun in the solar system
- describe the movement of the Moon relative to the Earth
- describe the Sun, Earth and Moon as approximately spherical bodies
- use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

WOW: Visit from a mobile Planetarium or set up a telescope.

LC1	Could we describe the Earth and the Sun as space cousins?
LC2	If the Earth and Sun are cousins, is the Moon a young nephew?
LC3	Can you explain why we have day and night?
LC4	How can we appreciate the distances between and the sizes of the Sun, Earth and Moon?
LC5	What can we learn about the solar system and the other planets in it?
LC6	Who was Neil Armstrong and what would you ask him if you met him?
LC7	How could you create a moon surface and create a moon buggy?
LC8	Reflection: Could you create a simulated moon landing and film it?

**Working Scientifically:** compare the time of day at different places on the Earth through internet links and direct communication; create simple models of the solar system; construct simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day; find out why some people think that structures such as Stonehenge might have been used as astronomical clocks.

**Literacy Link:** LC5 provides opportunities for children to complete a fact file on a chosen planet. They could also complete a set of questions they would ask Neil Armstrong (LC6).

**Numeracy Link:** LC4 provides a great deal of opportunity for children to measure and use scale and create diagrams.

**Creative Art Link:** Children to design and make a model to represent the moon surface and then to create a buggy. They will film this later as part of their reflection.



## Year 5: Will we ever send another human to the moon?

### Year 5: Science and DT Knowledge, Skills and Understanding

#### Year 5 Science: Earth and Space

- Can they identify and explain the movement of the Earth relative to the Sun?
- Can they explain how seasons and the associated weather are created?
- Can they identify and explain the movement of the Moon relative to the Earth?
- Can they explain the size, shape and position of the Earth, Sun and Moon?
- Can they explain how night and day are created and use diagrams to show this?
- Can they explain how planets are linked to stars?

#### Year 5 Challenging

- Can they compare the time of day at different places on the Earth?
- Can they create shadow clocks?
- Can they begin to understand how older civilizations used the Sun to create astronomical clocks?
- Can they explore the work of some scientists? (Ptolemy, Alhazen, Copernicus)

#### Design & Technology

- Can they come up with a range of ideas after they have collected information?
- Do they take a user's view into account when designing?
- Can they produce a detailed step-by-step plan?
- Can they suggest some alternative plans and say what the good points and drawbacks are about each?
- Can they explain why their finished product is going to be of good quality?
- Can they explain how their product will appeal to the audience?
- Can they use a range of tools and equipment expertly?
- Do they keep checking that their design is the best it can be?
- Do they check whether anything could be improved?
- Can they evaluate appearance and function against the original criteria?
- **Using materials:** Are their measurements accurate enough to ensure that everything is precise?
- How have they ensured that their product is strong and fit for purpose?
- Are they motivated enough to refine and improve their product?
- Do they persevere through different stages of the making process?

# Year 5: Can you feel the force?

## Science Y5: Forces

- explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object
- identify the effects of air resistance, water resistance and friction, that act between moving surfaces
- recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

**WOW:** Find a hill to run up and down and consider the question, 'Why does it take longer to run up rather than down a hill?'

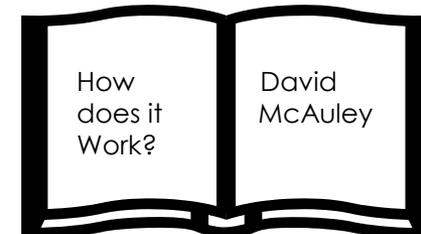
LC1	What is friction and how does it affect moving objects?
LC2	Why will a car always move faster than a boat?
LC3	What is gravity and why is Isaac Newton linked to it?
LC4	Can you design and make a parachute to help you understand more about air resistance?
LC5	How do builders get heavy items onto the top of skyscrapers?
LC6	Can you design, make and evaluate a structure that will propel a marble as far as possible?
LC7	What helps you to climb hills on your bicycle?
LC8	Reflection: Put together a presentation to show the advantages and disadvantages of friction in your life.

**Working Scientifically:** explore falling paper cones or cup-cake cases, and design and make 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 artefacts that use simple levers, pulleys, gears and/or springs and explore their effects.

**Literacy Link:** Many possibilities exist for children to write in a range of genres, especially in LC1 and LC3.

**Numeracy Link:** In LC1 and LC4 there are huge expectations that children's measuring skills are required to be accurate.

**Creative Art Link:** In LC6 children should design and make a structure from any chosen material that will propel a marble as far as possible. This will be competition to find the person being most successful.



# Year 5: Can you feel the force?

## Year 5: Science and DT Knowledge, Skills and Understanding

### Year 5 Science: Forces

- Can they explore different ways to test an idea, choose the best way, and give reasons?
- Can they vary one factor whilst keeping the others the same in an experiment? Can they explain why they do this?
- Can they plan and carry out an investigation by controlling variables fairly and accurately?
- Can they make a prediction with reasons?
- Can they use information to help make a prediction?
- Can they use test results to make further predictions and set up further comparative tests?
- Can they explain (in simple terms) a scientific idea and what evidence supports it?
- Can they present a report of their findings through writing, display and presentation?
  
- Can they explain what gravity is and its impact on our lives?
- Can they explain why a wheeled object that is initially pushed will slow down and stop?
- Can they explain the impact of friction on a moving object?
- Can they explain the effect of drag force on moving objects?
- Can they explain how force and motion can be transferred through gears, pulleys, levers and springs?

### Year 5 Challenging

- Can they make a prediction which links with other scientific knowledge?
- Can they identify the key factors when planning a fair test?
- Can they explain how a scientist has used their scientific understanding plus good ideas to have a breakthrough?
  
- Can they describe and explain how motion is affected by forces? (including gravitational attractions, magnetic attraction and friction)
- Can they design very effective parachutes?
- Can they work out how water can cause resistance to floating objects?

### Design & Technology

- Can they use a range of information to inform their design?
- Can they use market research to inform plans?
- Can they work within constraints?
- Can they follow and refine their plan if necessary?
- Can they justify their plan to someone else?
- Do they consider culture and society in their designs?
- Can they use tools and materials precisely?
- Do they change the way they are working if needed?
- How well do they test and evaluate their final product?
- Is it fit for purpose?
- What would improve it?
- Would different resources have improved their product?
- Would they need more or different information to make it even better?
- Can they justify why they selected specific materials?
- Can they work within a budget?
- How have they ensured that their work is precise and accurate?
- Can they hide joints so as to improve the look of their product?

# Science Learning Challenges

Year 6 Science

# Year 6 Statutory Requirements

Working Scientifically (Y5 & Y6)	Living things and their habitats	Animals, including humans
<ul style="list-style-type: none"> <li>planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary</li> <li>taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate</li> <li>recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs</li> <li>using test results to make predictions to set up further comparative and fair tests</li> <li>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</li> <li>identifying scientific evidence that has been used to support or refute ideas or arguments.</li> </ul>	<ul style="list-style-type: none"> <li>describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals</li> <li>give reasons for classifying plants and animals based on specific characteristics.</li> </ul>	<ul style="list-style-type: none"> <li>identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood</li> <li>recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</li> <li>describe the ways in which nutrients and water are transported within animals, including humans.</li> </ul>

# Year 6 Statutory Requirements (continued)

Evolution and inheritance	Light	Electricity
<ul style="list-style-type: none"><li>• recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago</li><li>• recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents</li><li>• identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</li></ul>	<ul style="list-style-type: none"><li>• recognise that light appears to travel in straight lines</li><li>• 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</li><li>• 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</li><li>• use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.</li></ul>	<ul style="list-style-type: none"><li>• associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit</li><li>• 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</li><li>• use recognised symbols when representing a simple circuit in a diagram.</li></ul>

# Science: Year 6 Overview

	LIVING THINGS and their Habitats	ANIMALS, including Humans	EVOLUTION and INHERITANCE	LIGHT	ELECTRICITY
<b>YEAR 6</b>	<ul style="list-style-type: none"> <li>• Classification of living things</li> <li>• Vertebrates and invertebrates</li> <li>• Classifying reptiles, amphibians, mammals, insects, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Circulatory system</li> <li>• Heart, blood vessels</li> <li>• Diet, exercise and drugs</li> <li>• Transport of nutrients through the body</li> </ul>	<ul style="list-style-type: none"> <li>• Fossils tell us about the past</li> <li>• Off spring</li> <li>• Changes to the human skeleton over time</li> <li>• Darwin</li> </ul>	<ul style="list-style-type: none"> <li>• How light travels</li> <li>• The eye</li> <li>• Shadows</li> </ul>	<ul style="list-style-type: none"> <li>• Electrical circuits (series)</li> <li>• Designing traffic lights</li> </ul>
<b>Possible Learning Challenge</b>	<ul style="list-style-type: none"> <li>• <b>Could Spiderman really exist?</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>What would a journey through your body be like?</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Have we always looked like this?</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>How can you light up your life?</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Could you be the next Nintendo apprentice?</b></li> </ul>

# Scientific Knowledge, Skills and Understanding within the National Curriculum

Year 6 Science

# Knowledge, Skills and Understanding breakdown for Working Scientifically

## Year 6

Planning	Obtaining and presenting evidence	Considering evidence and evaluating
<ul style="list-style-type: none"> <li>• Can they explore different ways to test an idea, choose the best way, and give reasons?</li> <li>• Can they vary one factor whilst keeping the others the same in an experiment? Can they explain why they do this?</li> <li>• Can they plan and carry out an investigation by controlling variables fairly and accurately?</li> <li>• Can they make a prediction with reasons?</li> <li>• Can they use information to help make a prediction?</li> <li>• Can they use test results to make further predictions and set up further comparative tests?</li> <li>• Can they explain, in simple terms, a scientific idea and what evidence supports it?</li> <li>• Can they present a report of their findings through writing, display and presentation?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they explain why they have chosen specific equipment? (incl ICT based equipment)</li> <li>• Can they decide which units of measurement they need to use?</li> <li>• Can they explain why a measurement needs to be repeated?</li> <li>• Can they record their measurements in different ways? (incl bar charts, tables and line graphs)</li> <li>• Can they take measurements using a range of scientific equipment with increasing accuracy and precision?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they find a pattern from their data and explain what it shows?</li> <li>• Can they use a graph to answer scientific questions?</li> <li>• Can they link what they have found out to other science?</li> <li>• Can they suggest how to improve their work and say why they think this?</li> <li>• Can they record more complex data and results using scientific diagrams, classification keys, tables, bar charts, line graphs and models?</li> <li>• Can they report findings from investigations through written explanations and conclusions?</li> <li>• Can they identify scientific evidence that has been used to support to refute ideas or arguments?</li> <li>• Can they report and present 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?</li> </ul>

## Year 6 (Challenging)

<ul style="list-style-type: none"> <li>• Can they choose the best way to answer a question?</li> <li>• Can they use information from different sources to answer a question and plan an investigation?</li> <li>• Can they make a prediction which links with other scientific knowledge?</li> <li>• Can they identify the key factors when planning a fair test?</li> <li>• Can they explain how a scientist has used their scientific understanding plus good ideas to have a breakthrough?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they plan in advance which equipment they will need and use it well?</li> <li>• Can they make precise measurements?</li> <li>• Can they collect information in different ways?</li> <li>• Can they record their measurements and observations systematically?</li> <li>• Can they explain qualitative and quantitative data?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they draw conclusions from their work?</li> <li>• Can they link their conclusions to other scientific knowledge?</li> <li>• Can they explain how they could improve their way of working?</li> </ul>
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# Knowledge, Skills and Understanding breakdown for Living Things, their Habitats and Animals, including humans

## Year 6

Evolution and Inheritance	Living Things & their habitats	Animals, including humans
<ul style="list-style-type: none"> <li>• Can they recognise that living things have changed over time and that fossils provide information about living things that inhabited the earth millions of years ago?</li> <li>• Can they recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents?</li> <li>• Can they give reasons why offspring are not identical to each other or to their parents?</li> <li>• Can they explain the process of evolution and describe the evidence for this?</li> <li>• Can they identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences including microorganisms, plants and animals?</li> <li>• Can they give reasons for classifying plants and animals based on specific characteristics?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood?</li> <li>• Can they recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function?</li> <li>• Can they describe the ways in which nutrients and water are transported within animals, including humans?</li> </ul>

## Year 6 (Challenging)

<ul style="list-style-type: none"> <li>• Can they talk about the work of Charles Darwin, Mary Anning and Alfred Wallace?</li> <li>• Can they explain how some living things adapt to survive in extreme conditions?</li> <li>• Can they analyse the advantages and disadvantages of specific adaptations, such as being on two rather than four feet?</li> <li>• Can they begin to understand what is meant by DNA?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they explain why classification is important?</li> <li>• Can they readily group animals into reptiles, fish, amphibians, birds and mammals?</li> <li>• Can they sub divide their original groupings and explain their divisions?</li> <li>• Can they group animals into vertebrates and invertebrates?</li> <li>• Can they find out about the significance of the work of scientists such as Carl Linnaeus, a pioneer of classification?</li> </ul>	<ul style="list-style-type: none"> <li>• Can they explore the work of medical pioneers, for example, William Harvey and Galen and recognise how much we have learnt about our bodies?</li> <li>• Can they compare the organ systems of humans to other animals?</li> <li>• Can they make a diagram of the human body and explain how different parts work and depend on one another?</li> <li>• Can they name the major organs in the human body?</li> <li>• Can they locate the major human organs?</li> <li>• Can they make a diagram that outlines the main parts of a body?</li> </ul>
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# Knowledge, Skills and Understanding breakdown for Light and Electricity

## Year 6

### Electricity

- Can they identify and name the basic parts of a simple electric series circuit? (cells, wires, bulbs, switches, buzzers)
- Can they compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers, the on/off position of switches?
- Can they use recognised symbols when representing a simple circuit in a diagram?

### Light

- Can they recognise that light appears to travel in straight lines?
- Can they 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?
- Can they 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?
- Can they use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them?

## Year 6 (Challenging)

- Can they make their own traffic light system or something similar?
- Can they explain the danger of short circuits?
- Can they explain what a fuse is?
- Can they explain how to make changes in a circuit?
- Can they explain the impact of changes in a circuit?
- Can they explain the effect of changing the voltage of a battery?

- Can they explain how different colours of light can be created?
- Can they use and explain how simple optical instruments work? (periscope, telescope, binoculars, mirror, magnifying glass, Newton's first reflecting telescope)
- Can they explore a range of phenomena, including rainbows, colours on soap bubbles, objects looking bent in water and coloured filters.

# Year 6: Could Spiderman really exist?

## Science Y6: Living Things and their Habitats

- describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals
- give reasons for classifying plants and animals based on specific characteristics.

*WOW: Consider the attributes that Spiderman has and give realistic thought to whether these could exist in any creature we know.*

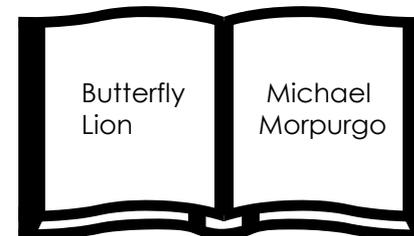
LC1	Can you create your own classification system that will take account of all plants and animals within your school grounds?
LC2	Can you now classify a group of animals and plants you have selected from a chosen environment?
LC3	Can you discover the special attributes that some animals and plants have to help them survive?
LC4	Why might some animals and plants be endangered and can you focus on one that you would like to carry out further research on?
LC5	What are micro-organisms and how would you classify them?
LC6	By observing artists' work can you capture images of a chosen animal?
LC7	Reflection: Take a plant or animal that you know and one that you don't know and create an IT presentation to show which group/s they belong to, etc.

**Working Scientifically:** devise classification systems and keys to identify some animals and plants in the immediate environment. They could research animals and plants in other habitats and decide where they belong in the classification system.

**Literacy Link:** LC6 provides opportunities for children to carry out individual research based on micro-organisms. They should start by coming up with a range of questions and then set their research out in sections answering their own questions.

**Numeracy Link:** Create different tables to show how to classify living things. Use a variety of formats to do so and consider which is the most appropriate.

**Creative Art Link:** LC6 provides opportunities for children to research the work of artists who have specialised in animals and plants before sketching or drawing their own.



# Year 6: Could Spiderman really exist?

## Year 6: Science and DT Knowledge, Skills and Understanding

### Year 6 Science: Living Things and their Habitats

- Can they describe and compare the life cycles of a range of animals, including humans, amphibians, insects and birds?
- Can they talk with knowledge about birth, reproduction and death of familiar animals or plants?
- Can they take measurements using a range of scientific equipment with increasing accuracy and precision?
- Can they record more complex data and results using scientific diagrams, classification keys, labels, scattergraphs, tables, bar and line graphs?

### Year 6 Challenging

- Can they observe their local environment and draw conclusions about life-cycles? (for example, the vegetable garden or flower border)
- Can they classify plants and animals in their local environment with those around the world, e.g. rainforests?
- Can they find a pattern from their data and explain what it shows?
- Can they link what they have found out to other science?
- Can they suggest how to improve their work and say why they think this?

### Art & Design

- Do their sketches communicate emotions and a sense of self with accuracy and imagination?
- Can they explain why they have combined different tools to create their drawings?
- Can they explain why they have chosen specific drawing techniques?
- Can they explain what their own style is?
- Can they use a wide range of techniques in their work?
- Can they explain why they have chosen specific painting techniques?
- Do their sketch books contain detailed notes, and quotes explaining about items?
- Do they compare their methods to those of others and keep notes in their sketch books?
- Do they combine graphics and text based research of commercial design, for example magazines etc., to influence the layout of their sketch books.
- Do they adapt and refine their work to reflect its meaning and purpose, keeping notes and annotations in their sketch books?

# Year 6: What would a journey through your body look like?

## • Science Y6: Animals, including humans

- identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
- describe the ways in which nutrients and water are transported within animals, including humans.

**WOW:** *Everyone will start by running around the school field and then observe what happens to their bodies*

LC1     What is pulse and why do we have one?

LC2     Why can the heart be described as the most important pump we have?

LC3     What happens to the oxygen we breathe?

LC4     Why could we describe blood as the body's river system?

LC5     What have we learnt from pioneers like William Harvey?

LC6     Can you create a picture of your face using collage?

LC7     Can you carry out a survey to show the impact of exercise on the body?

LC8     Reflection: Working as a team, in small groups, can you put together a presentation which shows the relationship between the heart, blood and breathing.

**Working Scientifically:** explore the work of scientists and scientific research about the relationship between diet, exercise, drugs, lifestyle and health.

**Literacy Link:** LC5 provides opportunities for children to write a biography.

**Numeracy Link:** Opportunities for children to create graphs related to pulse and exercise.

**Creative Art Link:** Children to look at creating a self-portrait but using small pieces of coloured paper to capture accurate colour and proportion.

# Year 6: What would a journey through your body look like?

## Year 6: Science and Art Knowledge, Skills and Understanding

### Year 6 Science: Animals, including humans

- Can they plan and carry out an investigation by controlling variables fairly and accurately?
- Can they make a prediction with reasons?
- Can they use test results to make further predictions and set up further comparative tests?
- Can they present a report of their findings through writing, display and presentation?
- Can they take measurements using a range of scientific equipment with increasing accuracy and precision?
- Can they record more complex data and results using scientific diagrams, labels, classification keys, tables, scatter graphs, bar and line graphs?
- Can they report findings from investigations through written explanations and conclusions?
- Can they use a graph to answer scientific questions?
  
- Can they identify and explain the function of the organs of the human circulatory system? (heart, blood vessels, blood)
- Can they name the major organs in the human body?
- Can they locate the major human organs?
- Can they make a diagram that outlines the main parts of a body?

### Year 6 Challenging

- Can they explore the work of medical pioneers, for example, William Harvey and Galen and recognise how much we have learnt about our bodies?
- Can they compare the organ systems of humans to other animals?
- Can they make a diagram of the human body and explain how different parts work and depend on one another?

### Art & Design

- Can they use paper mosaic to produce a piece of art?
- Can they combine visual and tactile qualities?
- Do they successfully use shading to create mood and feeling?
- Can they organise line, tone, shape and colour to represent figures and forms in movement?
- Can they explain why they have chosen specific materials to draw with?
- Do they keep notes in their sketch books as to how they might develop their work further?
- Do they use their sketch books to compare and discuss ideas with others?

# Year 6: Have we always looked like this?

## Science Y6: Evolution and Inheritance

- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

*WOW: Watch an extract of Planet of the Apes and consider how realistic it could be*

LC1	Could we possibly have evolved from apes, monkeys or other primates?
LC2	What do fossils tell us about 'how things have changed'?
LC3	Who was Charles Darwin and why is he still a controversial figure?
LC4	Why do you not usually look exactly like your mum or dad?
LC5	Can you find out how animals who: live in the cold; around the equator; under the ground: and, in trees: are specifically adapted to live and survive there?
LC6	How is the human skeleton suited to our life style?
LC7	Can you create a group dance that requires you to use different balances, giving consideration to your skeletal position?
LC8	Reflection: Carry out individual research about the way humans have adapted over years that requires you to start with a range of questions.

**Working Scientifically:** observe and raise questions about local animals and how they are adapted to their environment; compare 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.

**Literacy Link:** Many opportunities to write in different ways and to use their reading skills to research a range of information. This is prominent in LC1; LC2, LC3, LC4. LC5 and LC6.

**Creative Arts Link:** LC4 provides opportunities for children to sketch themselves and use photographs to sketch an older member of their family. This will require detailed observation and accurate sketching.

**Expressive Art Link:** Plan and design a group dance that shows how the human shape and body is successfully designed to balance and move.

## Year 6: Have we always looked like this?

### Year 6: Science, Art and Dance Knowledge, Skills and Understanding

#### Year 6 Science: Evolution and Inheritance

- Can they give reasons for why living things produce offspring of the same kind?
- Can they give reasons for why offspring are not identical with each other or with their parents?
- Can they explain the process of evolution and describe the evidence for this?
- Can they begin to appreciate that variation in offspring over time can make animals more or less able to survive in particular environments?
- Can they talk about the life of Charles Darwin?

#### Dance

- Can they work creatively and imaginatively on their own, with a partner to compose motifs and structure simple dances?
- Can they perform to an accompaniment expressively and sensitively?
- Can they perform dances fluently and with control?
- Can they warm-up and cool-down independently?
- Do they understand how dance helps to keep them healthy?
- Do they use appropriate criteria to evaluate and refine their own and others' work?
- Do they talk about dance with understanding, using appropriate language and terminology?

#### Year 6 Challenging

- Can they explain how some living things adapt to survive in extreme conditions?
- Can they analyse the advantages and disadvantages of specific adaptations, such as being on two rather than four feet?
- Can they begin to understand what is meant by DNA?

#### Art & Design

- Do their sketches communicate emotions and a sense of self with accuracy and imagination?
- Can they explain why they have combined different tools to create their drawings?
- Can they explain why they have chosen specific drawing techniques?
- Do their sketch books contain detailed notes, and quotes explaining about items?
- Do they compare their methods to those of others and keep notes in their sketch books?
- Do they combine graphics and text based research of commercial design, for example magazines etc., to influence the layout of their sketch books.
- Do they adapt and refine their work to reflect its meaning and purpose, keeping notes and annotations in their sketch books?

# Year 6: How can you light up your life?

## Science Y6: Light

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

*WOW: Spend time in a blacked out room and consider how the eyes adapt and why it is difficult to see anything.*

LC1	How do we know that light travels faster than sound?
LC2	How can you set up an experiment to show that light travels in straight lines?
LC3	How do your eyes work?
LC4	How can you use mirrors to see around blind corners?
LC5	Spend a small period of time being blind folded and see how successful you are at doing everyday things you take for granted?
LC6	Can you use water colour painting to create a landscape or still life painting which shows light and shadow?
LC7	Can you create a shadow puppet story and present it to others?
LC8	Reflection: Can you prepare a documentary entitled 'Let's Light it up' which shows what you have learnt in this LC.

**Working Scientifically:** decide where to place rear-view mirrors on cars; design and make 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.

**Literacy Link:** LC1 through to LC3 provide huge opportunities to link with literacy activities. LC7 provides opportunities to link with play-scripts based on shadows created with a range of objects which are photographed and then set to a story.

**Numeracy Link:** There are opportunities to use very large numbers when considering the distance the Sun is away from the Earth and the speed at which light travels to Earth.

**Possible Creative Art Link:** LC3 provides additional opportunities for children to do close observational sketches of the eyes giving attention to proportion .

**Creative Art Link:** LC6 provides opportunities to look at the work of several famous painters, including Constable and Cezanne giving particular attention to light, tone and shadow before attempting their own work.

# Year 6: How can you light up your life?

## Year 6: Science and Art Knowledge, Skills and Understanding

### Year 6 Science: Light

- Can they explore different ways to test an idea and choose the best way, and give reasons?
- Can they vary one factor whilst keeping the others the same in an experiment? Can they explain why they do this?
- Can they plan and carry out an investigation by controlling variables fairly and accurately?
- Can they make a prediction with reasons?
- Can they use information to help make a prediction?
- Can they use test results to make further predictions and set up further comparative tests?
- Can they explain (in simple terms) a scientific idea and what evidence supports it?
- Can they present a report of their findings through writing, display and presentation?
  
- Can they explain how light travels?
- Can they explain how the human eye sees objects?
- Can they explain how different colours of light can be created?
- Can they use and explain how simple optical instruments work? (periscope, telescope, binoculars, mirror, magnifying glass, Newton's first reflecting telescope)
- Can they explain changes linked to light (and sound)?

### Year 6 Challenging

- Can they make a prediction which links with other scientific knowledge?
- Can they identify the key factors when planning a fair test?
- Can they explain how a scientist has used their scientific understanding plus good ideas to have a breakthrough?
  
- Can they use the ray model to explain the size of shadows?

### Art & Design

- Do their sketches communicate emotions and a sense of self with accuracy and imagination?
- Can they explain why they have combined different tools to create their drawings?
- Can they explain why they have chosen specific drawing techniques?
- Can they explain what their own style is?
- Can they use a wide range of techniques in their work?
- Can they explain why they have chosen specific painting techniques?
- Do their sketch books contain detailed notes, and quotes explaining about items?
- Do they compare their methods to those of others and keep notes in their sketch books?
- Do they combine graphics and text based research of commercial design, for example magazines etc., to influence the layout of their sketch books.
- Do they adapt and refine their work to reflect its meaning and purpose, keeping notes and annotations in their sketch books?
- Can they make a record about the styles and qualities in their work?
- Can they say what their work is influenced by?

# Year 6: Could you be the next Nintendo apprentice?

## Science Y6: Electricity

- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- 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
- use recognised symbols when representing a simple circuit in a diagram.

*WOW: Look at a range of board games that require batteries and evaluate them*

LC1 Can you create a circuit that has at least one of these features: switch; buzzer; motor?

LC2 How do traffic lights work and can you create an electrical product that needs to be sequenced?

LC3 What do you understand about: cells and volts and how it impacts on how electrical products work?

LC4 Can you set up your own company and give it an appropriate name, discuss allocation of jobs

LC5 Can you design a board game that makes use of an electric circuit and at least one of the features looked at in LC1?

LC6 How would you go about selling your product?

LC7 Reflection: Ensure your product is ready to be part of a science fair.

**Working Scientifically:** 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.

**Literacy Link:** The main literacy link is associated with marketing their product. This includes the use of persuasive language and also involves careful planning.

**Enterprise Link:** This LC provides groups of children with an opportunity to organise themselves into business groups, including seeking a business loan ,etc.

**Creative Art Link:** The children will need to use their expertise for designing and making to create this product.

## Year 6: Could you be the next Nintendo apprentice?

### Year 6: Science and DT Knowledge, Skills and Understanding

#### Year 6 Science: Electricity

- Can they identify and name the basic parts of a simple electric series circuit? (cells, wires, bulbs, switches, buzzers, motors)
- Can they compare and give reasons for variation in how components function, including bulb brightness, buzzer volume and on/off position of switches?
- Can they explain how to make changes in a circuit?
- Can they explain the impact of changes in a circuit?
- Can they explain the effect of changing the voltage of a battery?

#### Year 6 Challenging

- Can they make their own traffic light system or something similar?
- Can they explain the danger of short circuits?
- Can they explain what a fuse is?

#### Design Technology

- Can they use a range of information to inform their design?
- Can they use market research to inform plans?
- Can they work within constraints?
- Can they follow and refine their plan if necessary?
- Can they justify their plan to someone else?
- Do they consider culture and society in their designs?
- Can they use tools and materials precisely?
- Do they change the way they are working if needed?
- How well do they test and evaluate their final product?
- Is it fit for purpose?
- What would improve it?
- Would different resources have improved their product?
- Would they need more or different information to make it even better?