



## Year 5 - Working Scientifically

### Topic: Forces

### Science Enquiries

- Research
- Fair Testing

### Prior Knowledge

#### Year 3 - Forces & Magnets

- Compare how things move on different surfaces.
- Notice that some forces need contact between two objects, but magnetic forces can act at a distance.
- Observe how magnets attract or repel each other and attract some materials and not others.
- 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.
- Describe magnets as having two poles.
- Predict whether two magnets will attract or repel each other, depending on, which poles are facing.

### Key Learning for Y5

1. Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
2. Identify the effects of air resistance, water resistance and friction that act between moving surfaces.
3. Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
4. Explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall.
5. Explore the effects of friction on movement and find out how it slows or stops moving objects.
6. Find out how scientists, for example, Galileo Galilei and Isaac Newton helped to develop the theory of gravitation

## **Common Misconceptions**

Some children may think that:

- the heavier the object the faster it falls, because it has more gravity acting on it
- forces always act in pairs which are equal and opposite
- smooth surfaces have no friction
- objects always travel better on smooth surfaces
- a moving object has a force which is pushing it forwards and it stops when the pushing force wears out
- a non-moving object has no forces acting on it
- heavy objects sink and light objects float.

## **Evidence/Activities for key learning:**

- Demonstrate the effect of gravity acting on an unsupported object
- Give examples of friction, water resistance and air resistance
- Give examples of when it is beneficial to have high or low friction, water resistance and air resistance
- Demonstrate how pulleys, levers and gears work, clearly showing their effects and explaining how they work.

## **Evidence/Activities for science skills and science enquiries**

- Investigate the effect of friction in a range of contexts *e.g. trainers, bathmats, mats for a helter-skelter.*
- Investigate the effects of water resistance in a range of contexts *e.g. dropping shapes through water and pulling shapes, such as boats, along the surface of water.* Explain the results of their investigations in terms of the force, showing a good understanding that as the object tries to move through the water or air or across the surface the particles in the water, air or on the surface slow it down
- Investigate the effects of air resistance in a range of contexts *e.g. parachutes, spinners, sails on boats.*
- *Make a product that involves a lever, pulley or gear (cross-curricular links: DT).*
- Research how the work of scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

## **Progression/Future Learning**

Forces is taught again KS3 so does not link to any further learning in KS2.

## **Topic: Earth & Space**

### **Science Enquiries:**

- Research

### **Prior Learning**

#### **Year 1 - Seasonal Change**

- Observe changes across the four seasons.
- Observe and describe weather associated with the seasons and how day length varies.

### **Key Learning for Y5**

1. Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.
2. Describe the movement of the Moon relative to the Earth.
3. Describe the Sun, Earth and Moon as approximately spherical bodies.
4. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
5. U  
se the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.
6. L  
earn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006).
7. U  
nderstand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).

### **Common Misconceptions**

Some children may think that:

- the Earth is flat
- the Sun is a planet
- the Sun rotates around the Earth
- the Sun moves across the sky during the day
- the Sun rises in the morning and sets in the evening
- the Moon appears only at night
- night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.

### **Evidence/Activities for key learning**

- *Create a voice over for a video clip or animation (cross-curricular link: ICT).*
- Show, using diagrams, the movement of the Earth & Moon and explain the movement of the Earth & Moon.
- Use diagrams to show the rotation of the Earth and how this causes day and night.
- Explain what causes day and night and why we have time zones.
- *Create and explain how a sundial works (cross-curricular link: DT).*

### **Evidence/Activities for science skills + science enquiries**

- Use secondary sources to help research and create:
  - a model e.g. *role play or using balls* to show the movement of the Earth around the Sun and the Moon around the Earth.
  - a model to show why day and night occur.
- Make first-hand observations of how shadows caused by the Sun change through the day.
- Research time zones.
- Describe the views and arguments of past scientists (including the evidence they used) to deduce shapes and movements of the Earth, Moon and planets before space travel.
- Explain how the discoveries of past scientists have influenced our current understanding of space and predict where future discoveries could take us.

### **Progression/Future Learning**

Earth & Space is taught again KS3 so does not link to any further learning in KS2.

## **Topic: Properties and Changes of Materials**

### **Science Enquiries:**

- Classifying
- Fair Testing
- Observing

### **Previous learning:**

#### **Year 2 - Use of everyday materials**

- Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.
- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

#### **Year 4 - States of Matter**

- Compare and group materials together, according to whether they are solids, liquids or gases.
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C).
- Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

### **Key Learning in Y5:**

1. 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.
2. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.
3. Know that some materials will dissolve in liquid to form a solution and describe how to recover a substance from a solution.
4. Demonstrate that dissolving, mixing and changes of state are reversible changes.
5. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.
6. 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.
7. Explore reversible changes, including, evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.

8. Explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example, vinegar with bicarbonate of soda.

### **Common Misconceptions**

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change.

There is confusion between physical/chemical changes and reversible and irreversible changes. **They do not** correlate simply. **Chemical changes** result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials *e.g. cutting a loaf of bread*. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

Some children may also think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

### **Evidence/Activities for key learning:**

- Use understanding of properties to explain everyday uses of materials, for example, how bricks, wood, glass and metals are used in buildings
- Explain what dissolving means, giving examples
- Name equipment used for filtering and sieving
- Use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving
- Describe some simple reversible and non-reversible changes to materials, giving examples
- Create a chart or table grouping/comparing everyday materials by different properties

### **Evidence/Activities for science enquiries and science skills:**

- Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties *e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat.*
- Explore adding a range of solids to water and other liquids *e.g. cooking oil, as appropriate.*
- Investigate rates of dissolving by carrying out comparative and fair test. Explain
- Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture and giving reason for their choices.
- Explore a range of non-reversible changes *e.g. rusting, adding fizzy tablets to water, burning.*
- Carry out comparative and fair tests involving non-reversible changes *e.g. What affects the rate of rusting? What affects the amount of gas produced?*
- Research new materials produced by chemists *e.g. Spencer Silver (glue of sticky notes) and Ruth Benerito (wrinkle free cotton).*

### **Progression/Future Learning**

Properties and changes of materials is taught again KS3 so does not link to any further learning in KS2.

## **Topic: Animals, including humans**

### **Science enquiries:**

- Research

### **Previous Learning**

#### **Year 2:**

- Notice that animals, including humans, have offspring, which grow into adults.

### **Key Learning for Y5:**

1. Describe the changes as humans develop into old age
2. Draw a timeline to indicate the stages in growth and development of humans
3. Learn about changes experience in puberty

### **Common Misconceptions**

Some children may think that:

- a baby grows in a mother's tummy
- a baby is "made".

### **Evidence/Activities for key learning**

- Explain the changes that takes place in boys and girls during puberty
- Explain how a baby changes physically as it grows, and also what it is able to do

### **Evidence/Activities for science skills and science enquiries**

- *Present information about the changes occurring during puberty as an information leaflet for other Y5 children or answers to 'problem page questions (cross-curricular links: English)*

**[Cross-curricular link for this topic: PSHCE](#)**

### **Progression/Future Learning**

This topic is taught again KS3 so does not link to any further learning in KS2.

## **Topic: Living things and their habitats**

### **Science Enquiries**

- Observing
- Classifying
- Pattern Seeking

### **Previous Learning**

#### **Year 2 - Animals, including humans**

- Notice that animals, including humans, have offspring which grow into adults.

#### **Year 3 – Plants**

- Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

### **Key Learning for Y5**

1. Describe the differences in life cycle between mammal, amphibian, bird and insect.
2. Describe life process and reproduction in some plants and animals.
3. Raise questions about their local environment throughout the year.
4. Find out about the work of naturalists and animal behaviourists, for example,
5. David Attenborough and Jane Goodall.
6. Find out about different types of reproduction, including sexual and asexual reproduction in plants, and sexual reproduction in animals.

### **Common Misconceptions**

Some children make think that:

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

### **Evidence/Activities for key learning:**

- Draw the life cycle of a range of animals identifying patterns between different life cycles.
- Compare two or more life cycles, identifying the similarities and differences.
- *Present their understanding of the life cycle of a range of animals in different ways e.g. drama, pictorially, chronological reports, creating a game (cross-curricular link: English, DT).*
- Explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways

### **Evidence/Activities for science enquiries and science skills:**

- Use secondary sources and, where possible, first-hand observations to find out about the life cycle of a range of animals.
- Compare the gestation times for mammals and look for patterns *e.g. in relation to size of animal or length of dependency after birth.*
- Look for patterns between the size of an animal and its expected life span.
- Grow and observe plants that reproduce asexually *e.g. strawberries, spider plants, potatoes.*
- Take cuttings from a range of plants *e.g. African violet, mint.*
- Plant bulbs and then harvest to see how they multiply.
- Use secondary sources to find out about pollination.

### **Progression/Future Learning**

This topic is taught again KS3 so does not link to any further learning in KS2.