Year 3 - Animals, including humans - LIFE

National Curriculum objectives

- identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat
- identify that humans and some other animals have skeletons and muscles for support, protection and movement

Notes and guidance

- 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

Sticky knowledge

- Different animals are adapted to eat different foods.
- Many animals have skeletons to support their bodies and protect vital organs.
- Muscles are connected to bones and move them when they contract.
- Movable joints connect bones

Animals, unlike plants which can make their own food, need to eat in order to get the nutrients they need.
Food contains a range of different nutrients - carbohydrates (including sugars), protein, vitamins, minerals, fats, sugars, water - and fibre that are needed by the body to stay healthy.
A piece of food will often provide a range of nutrients.
Humans, and some other animals, have skeletons and muscles which help them move and provide protection and support.

Vocabulary

Nutrients, nutrition, carbohydrates, sugars, protein, fats, vitamins, minerals, water, fibre, skeleton, bones, joints, endoskeleton, exoskeleton, hydrostatic skeleton, vertebrates, invertebrates, muscles, contract, relax, support, protect, move, skull, ribs, spine

Key scientists

Adelle Davis
(20th Century Nutritionist)

Marie Curie
(Radiation / X-Rays)

Linked texts

The Story of Frog Belly Rat Bone (Timothy Basil Ering)
Funnybones (Janet and Allan Ahlberg)
I Will Never Not Ever Eat a Tomato (Lauren Child)
Goldilocks and the Three Bears (Samantha Berger)

Prior Learning

- Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals. (Y1 - Animals, including humans)
- Identify and name a variety of common animals that are carnivores, herbivores and omnivores. (Y1 - Animals, including humans)
- Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). (Y1 - Animals, including humans)
- Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). (Y2 - Animals, including humans)
- Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. (Y2 - Animals, including humans)

Future learning

- Describe the simple functions of the basic parts of the digestive system in humans. (Y4 - Animals, including humans)
- Identify the different types of teeth in humans and their simple functions. (Y4 - Animals, including humans)
- Construct and interpret a variety of food chains, identifying producers, predators and prey. (Y4 - Animals, including humans)
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function. (Y6 - Animals, including humans)

Possible misconceptions

Some children may think:

- certain whole food groups like fats are 'bad' for you
- certain specific foods, like cheese are also 'bad' for you
- diet and fruit drinks are 'good' for you
- snakes are similar to worms, so they must also be invertebrates
- Invertebrates have no form of skeleton.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
How does the skull circumference of a girl compare with that of a boy? How does the angle that your elbow/knee is bent affect the circumference of your upper arm/thigh?	How do the skeletons of different animals compare? How can we group the food that we eat?	How does our skeleton change over time? (from birth to death)	Do male humans have larger skulls that female humans? Are you more likely to have bad eye sight and to wear glasses if you are older?	Why do different types of vitamins keep us healthy and which foods can we find them in?	How did chemist, Marie Maynard Daly, use science to help us improve our diets? How did James Lind explain the cause of scurvy and what was his evidence?	Why do we need a skeleton? • What types of skeleton are there? • Are all skeletons the same? • Can something survive without a skeleton? • What happens if we break a bone? • How do we move? • Are bones that are bigger, stronger? • Why do we need joints? • Why do muscles get tired? • Can we 'break' muscles?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.	them in identifying a range of living things.					

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
Investigating the human skeleton • Can children ask questions about the diversity of human skeletons? • Can children turn questions into a form that can be investigated? • Can children use their findings to make further predictions?	• Identify that animals have skeletons and muscles. • Identify that humans have skeletons and muscles for support, protection and movement.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• identifying and grouping animals with and without skeletons and observing and comparing their movement • compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. • exploring ideas about what would happen if humans did not have skeletons. • research different food groups and how they keep us healthy and design meals based on what they find out.

Activities	Possible evidence
• Chicken bone in vinegar https://sciencebob.com/bend-a-bone-with-vinegar/ • Classify food in a range of ways. • Use food labels to explore the nutritional content of a range of food items. • Use secondary sources to find out the types of food that contain the different nutrients. • Use food labels to answer enquiry questions e.g. How much fat do different types of pizza contain? How much sugar is in soft drinks? • Plan a daily diet to contain a good balance of nutrients. • Explore the nutrients contained in fast food. • Use secondary sources to research the parts and functions of the skeleton. • Investigate patterns asking questions such as: • Can people with longer legs run faster? • Can people with bigger hands catch a ball better? • Compare, contrast and classify skeletons of different animals.	• Can name the nutrients found in food • Can state that to be healthy we need to eat the right types of food to give us the correct amount of these nutrients • Can name some bones that make up their skeleton, giving examples that support, help them move or provide protection • Can describe how muscles and joints help them to move • Can classify food into those that are high or low in particular nutrients • Can answer their questions about nutrients in food, based on their gathered evidence. • Can talk about the nutrient content of their daily plan • Use their data to look for patterns (or lack of them) when answering their enquiry question • Can give similarities e.g. they all have joints to help the animal move, and differences between skeletons

Year 3 - Forces and magnets - ENERGY

National Curriculum objectives

- compare how things move on different surfaces
- notice that some forces need contact between 2 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 2 poles
- predict whether 2 magnets will attract or repel each other, depending on which poles are facing

Notes and guidance

- 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).

Sticky knowledge

- Magnets exert attractive and repulsive forces on each other.
- Magnets exert non-contact forces, which work through some materials.
- Magnets exert attractive forces on some materials.
- Magnet forces are affected by magnet strength, object mass, distance from object and object material.

A force is a push or a pull. When an object moves on a surface, the texture of the surface and the object affect how it moves. It may help the object to move better or it may hinder its movement e.g. ice skater compared to walking on ice in normal shoes.

A magnet attracts magnetic material. Iron and nickel and other materials containing these, e.g. stainless steel, are magnetic. The strongest parts of a magnet are the poles. Magnets have two poles - a north pole and a south pole. If two like poles, e.g. two north poles, are brought together they will push away from each other - repel. If two unlike poles, e.g. a north and south, are brought together they will pull together - attract. For some forces to act, there must be contact e.g. a hand opening a door, the wind pushing the trees. Some forces can act at a distance e.g. magnetism. The magnet does not need to touch the object that it attracts.

Vocabulary

Force, push, pull, friction, surface, magnet, magnetic, magnetic field, pole, north, south, attract, repel, compass, twist, contact force, non-contact force, magnetic force, strength, bar magnet, ring magnet, button magnet, horseshoe magnet, magnetic material, metal, iron, steel, poles.

Key scientists

William Gilbert
(Theories on Magnetism)

Andre Marie Ampere
(Founder of Electro-Magnetism)

Linked texts

The Iron Man
(Ted Hughes)
Mrs Armitage: Queen of the Road
(Quentin Blake)
Mr Archimedes' Bath
(Pamela Allen)

Prior Learning

- Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2 - Uses of everyday materials)

Future learning

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (Y5 - Forces)
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (Y5 - Forces)
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (Y5 - Forces)
- Magnetic fields by plotting with compass, representation by field lines. (KS3)
- Earth's magnetism, compass and navigation. (KS3)

Possible misconceptions

Some children may think:

- the bigger the magnet the stronger it is
- all metals are magnetic.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
Which magnet is strongest? Which surface is best to stop you slipping? How does the mass of an object affect how much force is needed to make it move? 	Which materials are magnetic? 	If we magnetise a pin, how long does it stay magnetised for? 	Does the size and shape of a magnet affect how strong it is? 	How have our ideas about forces changed over time? How does a compass work? 	How have our ideas about magnets changed over time?	What are magnetic materials? How can we find out? • Can I make a magnetic material non-magnetic? • How far away does a magnet have to be before it attracts a magnetic material? • How far away can the magnetic attraction between two magnets be experiences? • Is the repulsive force the same size? • How is the magnetic attraction of repulsion force affected by putting materials between the magnets? • Are bigger magnets stronger? • How could you use magnets to measure the number of pages in a book?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.	them in identifying a range of living things.					

Linked TAPS Assessment	Additional TAPS ideas	Working scientifically	
Balloon rockets • Can children use results to predict and explain what may happen on the next attempt? • Can children suggest improvements? **Forces - car ramps** • Can children make an accurate record of their measurements? • Can children use their results to explain how the car moves on different surfaces? **Shoe grip** • Can children plan and set up a fair test? **What is the strongest magnet?** • Can children decide on an approach to compare magnet strength? • Can children recognise and control variables where necessary?	Compare how things move on different surfaces. • Magnetic forces can act a distance.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• 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. *Eg building Stonehenge!*

Activities	Possible evidence
• Carry out investigations to explore how objects move on different surfaces e.g. spinning tops/coins, rolling balls/cars, clockwork toys, soles of shoes etc. • Explore what materials are attracted to a magnet. • Classify materials according to whether they are magnetic. • Explore the way that magnets behave in relation to each other. • Use a marked magnet to find the unmarked poles on other types of magnets. Explore how magnets work at a distance e.g. through the table, in water, jumping paper clips up off the table. • Devise an investigation to test the strength of magnets.	• Can give examples of forces in everyday life • Can give examples of objects moving differently on different surfaces • Can name a range of types of magnets and show how the poles attract and repel • Can draw diagrams using arrows to show the attraction and repulsion between the poles of magnets • Can use their results to describe how objects move on different surfaces • Can use their results to make predictions for further tests e.g. it will spin for longer on this surface than that, but not as long as it spun on that surface • Can use classification evidence to identify that some metals, but not all, are magnetic • Through their exploration, they can show how like poles repel and unlike poles attract, and name unmarked poles • Can use test data to rank magnets

Year 3 - LIGHT - ENERGY

National Curriculum objectives

- Recognise that they need light in order to see things, and that dark is the absence of light.
- Notice that light is reflected from surfaces.
- Recognise that light from the sun can be dangerous and that there are ways to protect their eyes.
- Recognise that shadows are formed when the light from a light source is blocked by an opaque object.
- Find patterns in the way that the size of shadows change.

Notes and guidance

- 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.
- think about why it is important to protect their eyes from bright lights. 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.*

Sticky knowledge

- There must be light for us to see. Without light it is dark.
- We need light to see things even shiny things.
- Transparent materials let light travel through them, and opaque materials don't let light through.
- Beams of light bounce off some materials (reflection).
- Shiny materials reflect light beams better than non-shiny materials.
- Light comes from a source

We see objects because our eyes can sense light. Dark is the absence of light. We cannot see anything in complete darkness.
Some objects, for example, the sun, light bulbs and candles are sources of light. Objects are easier to see if there is more light.
Some surfaces reflect light. Objects are easier to see when there is less light if they are reflective.
The light from the sun can damage our eyes and therefore we should not look directly at the sun and can protect our eyes by wearing sunglasses or sunhats in bright light.
Shadows are formed on a surface when an opaque or translucent object is between a light source and the surface and blocks some of the light. The size of the shadow depends on the position of the source, object and surface.

Vocabulary

Light, light source, dark, absence of light, reflect, ray, mirror, bounce, visible, beam, sun, glare, travel, straight, opaque, shadow, block, shiny, matt, surface, sunlight, dangerous, transparent, translucent.

Key scientists

James Clerk Maxwell
(Visible and Invisible Waves of Light)

Linked texts

The Owl Who Was Afraid of the Dark
(Jill Tomlinson)
The Dark
(Lemony Snicket)
The Firework-Maker's Daughter
(Philip Pullman)

Prior Learning

- Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense. (Y1 - Animals, including humans)
- Describe the simple physical properties of a variety of everyday materials. (Y1 - Materials)

Future learning

- Recognise that light appears to travel in straight lines. (Y6 - Light)
- 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. (Y6 - Light)
- 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. (Y6 - Light)
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them. (Y6 - Light)

Possible misconceptions

Some children may think:

- we can still see even where there is an absence of any light
- our eyes 'get used to' the dark
- the moon and reflective surfaces are light sources
- a transparent object is a light source
- shadows contain details of the object, such as facial features on their own shadow
- shadows result from objects giving off darkness.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
Which pair of sunglasses will be best at protecting our eyes? How does the distance between the shadow puppet and the screen affect the size of the shadow? How does the number of layers of transparent plastic affect how much light can pass through? 	How would you organise these light sources into natural and artificial sources? 	When is our classroom darkest? Is the Sun the same brightness all day? 	Are you more likely to have bad eyesight and to wear glasses if you are older? 	How does the Sun make light? 	How have our ideas about eclipses changed over time?	• A coin is lost, what would be the best way to find it? (Turn the lights out and see it shine? Use a torch to see it reflect?) • How does distance from a light source affect how bright it looks? • How does being in darkness affect your sense of hearing? • What colour would be the best to make a safety jacket from? • How does the colour of a material affect how reflective it is? • What would be the best material to make a blind for a baby's room? • How does thickness of a material affect how much light can pass through it? • How many pieces of tracing paper are as translucent as a single piece of white paper? • How does the shape of a mirror affect how the light reflects? • How can we change the darkness, size and shape of a shadow?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.	them in identifying a range of living things.					

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
Can everything make a shadow? • Can children make a series of careful observations? • Can children record their observations in a systematic way that relates to the question?	• Recognise that they need light in order to see things and notice that light is reflected from surfaces. • Find patterns in the way that the size of shadows change.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes.

Activities	Possible evidence
• Explore how different objects are more or less visible in different levels of lighting. • Explore how objects with different surfaces, e.g. shiny vs matt, are more or less visible. • Explore how shadows vary as the distance between a light source and an object or surface is changed. • Explore shadows which are connected to and disconnected from the object e.g. shadows of clouds and children in the playground. • Choose suitable materials to make shadow puppets. • Create artwork using shadows.	• Can describe how we see objects in light and can describe dark as the absence of light • Can state that it is dangerous to view the sun directly and state precautions used to view the sun, for example in eclipses • Can define transparent, translucent and opaque • Can describe how shadows are formed • Can describe patterns in visibility of different objects in different lighting conditions and predict which will be more or less visible as conditions change • Can clearly explain, giving examples, that objects are not visible in complete darkness • Can describe and demonstrate how shadows are formed by blocking light • Can describe, demonstrate and make predictions about patterns in how shadows vary

Year 3 - Plants - LIFE

National Curriculum objectives

- identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers
- 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
- investigate the way in which water is transported within plants
- explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal.

Sticky knowledge

- Plants are producers, they make their own food. • Their leaves absorb sunlight and carbon dioxide
- Plants have roots, which provide support and draw water from the soil
- Flowering plants have specific adaptations which help it to carry out pollination, fertilisation and seed production
- Seed dispersal improves a plants chances of successful reproduction
- Seeds/bulbs require the right conditions to germinate and grow.
- Seeds contain enough food for the plant's initial growth

Vocabulary

Air, light, water, nutrients, soil, support, anchor, reproduction, pollen, pollination, seed formation, dispersal (seed, animal, wind, water), transportation, flower, energy, growth, seedling, carbon dioxide, oxygen, sugar, material, photosynthesis, chlorophyll

Notes and guidance

- 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.

Many plants, but not all, have roots, stems/trunks, leaves and flowers/blossom. The roots absorb water and nutrients from the soil and anchor the plant in place. The stem transports water and nutrients/minerals around the plant and holds the leaves and flowers up in the air to enhance photosynthesis, pollination and seed dispersal. The leaves use sunlight and water to produce the plant's food. Some plants produce flowers which enable the plant to reproduce. Pollen, which is produced by the male part of the flower, is transferred to the female part of other flowers (pollination).
This forms seeds, sometimes contained in berries or fruits which are then dispersed in different ways. Different plants require different conditions for germination and growth.

Key scientists

Jan Ingenhousz (Photosynthesis)
Joseph Banks (Botanist)

Linked texts

The Hidden Forest (Jeannie Baker)
George and Flora's Secret Garden (Jo Elworthy)

Prior Learning

- Observe and describe how seeds and bulbs grow into mature plants. (Y2 - Plants)
- Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. (Y2 - Plants)

Future learning

- Describe the life process of reproduction in some plants and animals. (Y5 - Living things and their habitats)
- Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. (KS3)

Possible misconceptions

Some children may think:

- plants eat food
- food comes from the soil via the roots
- flowers are merely decorative rather than a vital part of the life cycle in reproduction
- plants only need sunlight to keep them warm
- roots suck in water which is then sucked up the stem.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
Which conditions can help seeds germinate faster? How does the length of the carnation stem affect how long it takes for the food colouring to dye the petals?	How many different ways can you sort our seed collection?	How do flowers in a vase change over time? What happens to celery when it is left in a glass of coloured water?	What colour flowers do pollinating insects prefer?	What are all the different ways that seeds disperse?		How do plants reproduce? Do all flowers look the same? How do insects know which flowers to pollinate? Why do flowers smell? What do seeds do? Can a plant live without its leaves? Do grass/trees make flowers? What conditions are perfect for a seed to grow? Where do weeds come from? How does the space between seeds affect how well they grow? Does seed size match plant size? Do plants take in water through their roots? How does water move through the plant? How do plants make their food? How does light affect plant growth? How does a plant get carbon dioxide?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent.	Regularly revisit KS1 skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support them in identifying a range of living things.	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Written conclusions to become increasingly sophisticated, with more focus on scientific explanations. Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.						

Linked TAPS Assessment	Other linked TAPS	Working scientifically	
How much water do plants need? • Can children use simple apparatus to measure water/height? • Can children record their measurements? **Function of a plant stem** • Can children make careful observations? • Can children use observations to suggest how water is transported?	Identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers. Explore seed dispersal.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• 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. • 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.

Activities	Possible evidence
• Observe what happens to plants over time when the leaves or roots are removed. • Observe the effect of putting cut white carnations or celery in coloured water. • Investigate what happens to plants when they are put in different conditions e.g. in darkness, in the cold, deprived of air, different types of soil, different fertilisers, varying amount of space. • Spot flowers, seeds, berries and fruits outside throughout the year. • Observe flowers carefully to identify the pollen. • Observe flowers being visited by pollinators e.g. bees and butterflies in the summer. • Observe seeds being blown from the trees e.g. sycamore seeds. • Research different types of seed dispersal. • Classify seeds in a range of ways, including by how they are dispersed. • Create a new species of flowering plant.	• Can explain the function of the parts of a flowering plant • Can describe the life cycle of flowering plants, including pollination, seed • formation, seed dispersal, and germination • Can give different methods of pollination and seed dispersal, including • examples • Can explain observations made during investigations • Can look at the features of seeds to decide on their method of dispersal • Can draw and label a diagram of their created flowering plant to show its parts, their role and the method of pollination and seed dispersal

Year 3 - Rocks (Materials) – MATTER

National Curriculum objectives

- compare and group together different kinds of rocks on the basis of their appearance and simple physical properties
- describe in simple terms how fossils are formed when things that have lived are trapped within rock
- recognise that soils are made from rocks and organic matter

Notes and guidance

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

Sticky knowledge

- There are different types of rock.
- There are different types of soil.
- Soils change over time.
- Different plants grow in different soils.
- Fossils tell us what has happened before.
- Fossils provide evidence.
- Palaeontologists use Fossils to find out about the past.
- Fossils provide evidence that living things have changed over time.

Rock is a naturally occurring material. There are different types of rock e.g. sandstone, limestone, slate etc. which have different properties. Rocks can be hard or soft. They have different sizes of grain or crystal. They may absorb water. Rocks can be different shapes and sizes (stones, pebbles, boulders). Soils are made up of pieces of ground down rock which may be mixed with plant and animal material (organic matter). The type of rock, size of rock pieces and the amount of organic matter affect the property of the soil. Some rocks contain fossils. Fossils were formed millions of years ago. When plants and animals died, they fell to the seabed. They became covered and squashed by other material. Over time the dissolving animal and plant matter is replaced by minerals from the water

Vocabulary

Rock, stone, pebble, boulder, grain, crystals, layers, hard, soft, texture, absorb water, soil, fossil, marble, chalk, granite, sandstone, slate, soil, peat, sandy/chalk/clay soil

Igneous, metamorphic, sedimentary, anthropic, permeable, impermeable, chemical fossil, body fossil, trace fossil, Mary Anning, cast fossil, mould fossil, replacement fossil, extinct, organic matter, topsoil, sub soil, base rock.

Key scientists

Mary Anning
(Discovery of Fossils)

Inge Lehmann
(Earth's Mantle)

Linked texts

The Pebble in My Pocket (Meredith Hooper)
Stone Girl, Bone Girl (Laurence Anholt)
The Street Beneath My Feet (Charlotte Guillain & Yuval Zommer)

Prior Learning

- Distinguish between an object and the material from which it is made. (Y1 - Everyday materials)
- Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. (Y1 - Everyday materials)
- Describe the simple physical properties of a variety of everyday materials. (Y1 - Everyday materials)
- Compare and group together a variety of everyday materials on the basis of their simple physical properties. (Y1 - 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. (Y2 - Uses of everyday materials)

Future learning

- Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago. (Y6 - Evolution and inheritance)
- The composition of the Earth. (KS3)
- The structure of the Earth. (KS3)
- The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. (KS3)

Possible misconceptions

Some children may think:

- rocks are all hard in nature
- rock-like, man-made substances such as concrete or brick are rocks
- materials which have been polished or shaped for use, such as a granite worktop, are not rocks as they are no longer 'natural'
- certain found artefacts, like old bits of pottery or coins, are fossils
- a fossil is an actual piece of the extinct animal or plant
- soil and compost are the same thing.

Enquiry						
Comparative and fair tests	Identify and classify	Observation over time	Pattern seeking	Research	Ideas over time	Key Questions
Which soil absorbs the most water? How does adding different amounts of sand to soil affect how quickly water drains through it?	Can you use the identification key to find out the name of each of the rocks in your collection?	How does tumbling change a rock over time? What happens when water keeps dripping on a sandcastle?	Is there a pattern in where we find volcanos on planet Earth?	Who was Mary Anning and what did she discover?	What were James Hutton's ideas about how rocks were made and what was his evidence? How did Mary Anning's work help us to understand prehistoric life?	• How are the soils different? • Which do you think has best drainage? • Which is more likely to lead to flooding? • How many soil types have we found? • Where might you find more? • How might the soil be different in different countries? • What rock is best for a kitchen chopping board? What might be the issues with various materials and what they must withstand? • What types of rocks are there? • How do rocks change? • What would grow best in your soil? • Why do you think worms are important to the creation of soil? • How can we use composting to make our own soil? • Does it currently look like real soil? • How long do you think this process will take and why? • How are fossils created? • Why do fossils help us find out about historical events? • If you could fossilise an object what would it be?
Use an increasingly wide range of equipment to make measurements. Learn what it means to measure accurately and check for reliability. Learn to independently plan how to record and analyse the data, using tables, pictograms, and bar charts to compare the measurements they make. Use the bar charts to draw conclusions about what they have found out to be the answer to their 'big question' Evaluate the procedure they used and the quality of their data, suggesting ways they could improve their test. Plan their own tests to collect data. Through fair testing learn to understand the different types of variables: • the dependent variable that they will change in their test, • the independent variable that they are going to measure so that they can find out how the dependent variable affects it, • the control variables which the children will need to keep the same so that they don't affect their results. Measure and record data that can then be displayed in a scatter graph or line graph. Use their data to draw conclusions that identify a causal relationship eg 'when you increase X, Y will always decrease'. Throughout KS2, become progressively more systematic in how they approach fair tests and increasingly independent. Written conclusions to become increasingly sophisticated, with more focus on scientific explanations.	Regularly revisit KSI skills: Focus on asking questions about the similarities and differences between things. Go outside to explore the world around them at all times of the year. Increased focus on measuring and using data to answer 'big questions'. Continue to build on their observational skills, becoming more independent in identifying, through the use of increasingly complex tools, as well as developing higher order skills in reasoning and justification when explaining how they have chosen to group things. Design simple tests to help them classify materials, as well as independently using a range of secondary sources to support	Measuring time in seconds, minutes, hours and days but also measuring a variety of variables that they observe to change such as temperature, light levels, and sound levels. Record their observations in the form of scientific drawings and labelling key features using scientific vocabulary. Look closely and record fine details using magnifying glasses and microscopes. Make predictions about how things might be, leading on to the planning of further comparative tests and fair tests to find out more.	Begin to think for themselves when deciding what they should measure and observe. Begin to make decisions about the most appropriate equipment to use to collect data. Use a data logger to collect the most accurate data they can. Using data analysis techniques to spot patterns, including using tabulated data and a variety of charts and graphs. Use data and graphs to support their explanations when describing relationships. Use pattern seeking as a preliminary test; use their findings to form and justify their own predictions, then propose further investigations to test these predictions.	Reading for information and note-taking. Learn to interpret the information they find and critically consider its relevance in answering their 'big questions'. Use a range of secondary sources, including books, websites, and video to find their information. Listen to presentations from experts and science professionals to get their information, or ask them questions in interviews and letters Find more data in their research and use this to help answer questions Start to collect their own data through questionnaires and interviews. Begin to evaluate the quality of the information they have found and how well it has enabled them to draw conclusions and answer their 'big question'.	Explore and talk about their own and other people's scientific ideas. Begin to recognise how scientific ideas change and develop over time. Use a range of secondary sources of information. Develop their use of scientific language. Explain ideas using their scientific knowledge and understanding. Evaluate the significance, strengths and weaknesses of different scientists' ideas.	

Focus on their skills in evaluating their scientific enquiries. Learn to critique not just their experimental methods but also their data by reflecting on reliability and accuracy.	them in identifying a range of living things.					

Linked TAPS Assessment	Additional TAPS ideas	Working scientifically	
Reporting on rocks • Can children group rocks based on properties? • Can children talk about / draw a diagram / write about their findings? • Can children draw conclusions about the least / most wearing rock?	• Describe in simple terms how fossils are formed when things that have lived are trapped within rock. • Compare and group together different kinds of rocks on the basis of their simple physical properties.	• asking relevant questions and using different types of scientific enquiries to answer them • setting up simple practical enquiries, comparative and fair tests • making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers • gathering, recording, classifying and presenting data in a variety of ways to help in answering questions • recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables • reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions • using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions • identifying differences, similarities or changes related to simple scientific ideas and processes • using straightforward scientific evidence to answer questions or to support their findings.	• 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. • research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. • 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. • raise and answer questions about the way soils are formed.

Activities	Possible evidence
• Observe rocks closely. • Classify rocks in a range of ways, based on their appearance. • Devise a test to investigate the hardness of a range of rocks. • Devise a test to investigate how much water different rocks absorb. • Observe how rocks change over time e.g. gravestones or old building. • Research using secondary sources how fossils are formed. • Observe soils closely. • Classify soils in a range of ways based on their appearance. • Devise a test to investigate the water retention of soils. • Observe how soil can be separated through sedimentation. • Research the work of Mary Anning.	• Can name some types of rock and give physical features of each • Can explain how a fossil is formed • Can explain that soils are made from rocks and also contain living/dead matter • Can classify rocks in a range of different ways, using appropriate vocabulary • Can devise tests to explore the properties of rocks and use data to rank the rocks • Can link rocks changing over time with their properties e.g. soft rocks get worn away more easily • Can present in different ways their understanding of how fossils are formed e.g. in role play, comic strip, chronological report, stop-go animation etc. • Can identify plant/animal matter and rocks in samples of soil • Can devise a test to explore the water retention of soils