St Laurence in Thanet CE Junior Academy

Curriculum overview

Science

Believe, Achieve, Aspire!

'Through God all things are possible' (Matthew 19:26)

Contents

Statement of Intent

Science at St Laurence provides a wide variety of scientific opportunities that inspire and engage all children to aid them in reaching and further developing their scientific capital.

To achieve this, the teaching of science at St Laurence is fluid and allows for opportunities for children to ask questions and be answered. We encourage children to celebrate mistakes in science and investigate ways to solve problems or come up with solutions to challenges. The learning links to real life situations and encourages a hands on approach which is meaningful and prepares them for later life. Through this we ensure our children are confident, life-long learners who will explore the world around them.

Intent, Implementation and Impact in Science

Intent

Implementation

Impact

The intent of our Science curriculum is a curriculum which is accessible to all and which will develop pupil's scientific knowledge and conceptual understanding as well as develop scientific enquiry skills. We intend to prepare our pupils with the knowledge and skills required for transition into secondary school and for their future lives. We intend to teach lessons which are creative and engaging and which develop children's curiosity, interest and love of Science. Our intent is that pupils are equipped with the scientific knowledge and key vocabulary required to understand the uses	Pupils are taught the processes and concepts, as well as the skills required in the new National Curriculum. Science is taught regularly for at least 10 hours per term by the class teachers, who plan collaboratively in year groups, following outlined plans provided by the subject leader. Science is taught with an emphasis on the pupils' engagement in practical enquiry to support and develop their understanding of scientific concepts and skills. Existing knowledge is reinforced and remembered through regular retrieval tasks built into all lessons. Teachers use a range of strategies when assessing the children within each unit: exploration, investigative enquiry and illustrative enquiry. Cross-curricular links are made with other subjects where relevant, especially Maths (though the collecting and analysis of data), Computing (through research and data logging) and PSHE (keeping safe, growing up and life cycles) Progress is monitored using ongoing Teacher Assessment as well as an end of topic assessment. Assessment spreadsheets are updated 3 times a year to indicate each child's progress.	The impact of our science curriculum is that children understand the science behind life, as well as real life problems and concepts. Our children develop a curiosity for science and life itself. They feel confident to ask and explore questions with adults and their peers. Science books show a wide range of learning covered in all aspects of Science as indicated in the National Curriculum. Books have been moderated by Science subject leaders at other Aquila schools. Books, plans and assessment are monitored by the subject leader regularly and feedback is proved to all staff in order to maintain high standards and/or develop the subject. Progress and understanding is evident through books, Teacher Assessment and assessment data.

and implications of Science, today and for the future, and that they understand and have an appreciation of the role of Science in history and its impact on their lives today. We want to develop pupils' understanding of the nature, processes and methods of Science through different types of scientific enquiry that help pupils to answer scientific questions about the world around them. We aim to enable pupils to effectively communicate scientific ideas by using scientific vocabulary that they can use and understand.	Children are provided with feedback (as per Feedback Policy), which enables them to, not only recognise what they have done well, but also address any misconceptions or highlight areas that may challenge them further. Thus, each child is supported at the appropriate level to enable them to make the best progress possible. Children are given opportunities to work independently or collaboratively in pairs or small groups. They are encouraged to develop their speaking and listening skills as well as collaborative working skills through talk partners and groups experiments. Pupils are encouraged to use appropriate scientific vocabulary which is shared with them on class displays or working walls and is modelled by the class teacher. As well as this, children can access key scientific vocabulary on their knowledge organisers with definitions, which is currently being implemented across each year group unit.	Children understand and use a range of scientific vocabulary which can be seen in books and is evident in pupil consultations. Our children are well-prepared for secondary school Science.

Spiritual, Moral, Social and Cultural Aspects of the Science Curriculum

Through science, children will be able to develop the following –

Spiritual:

- Children are able to reflect on their own beliefs, faiths, experiences, feelings and values.
- Enjoy learning about oneself, others and the surrounding worlds.
- Children are able to understand and reflect on their own identity.
- To think and reflect in awe about the developments in science and technology and the possibilities for the future.

Moral:

- The opportunity to learn what is right and wrong and respect the law.
- Children are able to understand consequences.
- Understand moral and ethical issues and offer reasoned views.

Social:

- Opportunities to engage and participate socially with each other within experiments and investigations.
- Opportunities to work independently across learning.
- Treating others with mutual respect linking to our school ethos 'Be Respectful'.
- Appreciate diverse points of view.

Cultural:

- Participate in cultural opportunities by being sympathetic within the community.
- Understand, respect, accept and celebrate diversity.
- Encourage children to reflect on how developments in science have led to changes in every-day life.
- Opportunities to look at and appreciate cultural influences outside of their environment.

Pedagogical Approach

Metacognition

Adapted from: EEF METACOGNITION AND SELF-REGULATED LEARNING—Guidance Report EEF_Metacognition_and_self-regulated_learning.pdf (d2tic4wvo1iusb.cloudfront.net)

Teaching Process

In terms of developing self-regulated learning and metacognition, this means we need to make sure that we don't give too much information at the same time (when delivering explicit instruction), and do not expect the learner to take on too much challenge when doing guided practice and independent work. The use of structured planning templates, teacher modelling, worked examples, and breaking down activities into steps can help achieve this.

Self-regulation and metacognition strategies work through learners monitoring and evaluating their own learning strategies.

- Explicit teaching
- Teachers modelling
- Opportunities for pupils to reflect on and monitor their strengths and areas of improvement, and plan how to overcome current difficulties.
- Providing enough challenge for learners to develop effective strategies, but not so difficult that they struggle to apply a strategy.

Self-regulated learning can be broken into three essential components that teachers need to know about to help their pupils to develop into successful learners:

Cognition is the mental process involved in knowing, understanding, and learning. By cognitive strategies, we mean skills like memorisation techniques or subject-specific strategies. This is the bread and butter of good teaching; cognitive strategies are fundamental to acquiring knowledge and completing learning tasks.

Metacognition is about the way's learners monitor and purposefully direct their learning. For example, having decided that a particular cognitive strategy for creating is likely to be successful, a pupil then monitors whether it has indeed been successful and then deliberately changes (or not) their method based on that evidence. By metacognitive strategies, we mean the strategies we use to monitor or control our cognition, such as checking that our technique was accurate or selecting the most appropriate cognitive strategy for the task we are undertaking.

Motivation is about our willingness to engage our metacognitive and cognitive skills and apply them to learning. Motivational strategies will include convincing oneself to undertake a tricky task now—affecting our current well-being—as a way of improving our future well-being in the task tomorrow. Cognition, metacognition, and motivation all interact in complex ways during the learning process. It is impossible to be metacognitive without having different cognitive strategies to hand and possessing the motivation and perseverance to tackle problems and apply these strategies.

Pedagogical Approach

Cognitive Load Theory

Adapted from: Cognitive Load Theory: Research that teachers really need to understand

Cognitive Load Theory — aim = to develop instructional techniques that fit within the characteristics of working memory in order to maximise learning.

Based on two principles:

1. There is a limit to how much **new** information the brain can hold. (**Working memory**—processing new information results in 'cognitive load' which can affect outcomes.)
2. There is no know limit to how much **stored** information that can be processed at one time. (**Long term memory**—stores information as schemas.

Explicit instruction involves teachers clearly showing children what to do, rather than have them construct or discover it for themselves. To lessen cognitive load on working memory. This can be used for new information and learning. Independent learning also needs to be incorporated but with cognitive load managed through guidance, prior information, scaffolds and assistance if needed.

Long term memory relies on the formation of schemas where information can be processed automatically with minimal conscious effort. Automaticity happens after extensive practice. Thus reducing working memory load. If working memory is overloaded, there is greater risk that the content will not be understood, be confused and not stored into the long-term memory. Ultimately, learning will be slowed down. Automation of schemas reduces the burden on working memory because when information can be accessed automatically, the working memory is freed up to process new information.

There are 3 types of Cognitive load—Intrinsic, Extraneous and Germane

I**ntrinsic** —difficulty of subject matter being learnt, it depends on the complexity of the material and the prior learning—i.e. different people will have different levels of cognitive load depending on their experiences and knowledge

Extraneous — how the subject matter is taught—we need to minimise extraneous cognitive load to free up working memory.

Germane—the load imposed on the working memory by the process of learning i.e. by transferring information into long-term memory through schema construction.

Science - Subject Leader Action Plan (23-24)

Improvement Required	How will this be achieved?	By Whom?	When?	Success Criteria	Financial Implication	Monitoring -Who? When?
Ensure teachers have a clear understanding of prior learning and next steps in children's learning, to promote consistently high expectations of children's learning.	Ensure teachers know what the prior knowledge is of the unit, including progression of key vocabulary.	AC and teachers	Look ahead to next unit termly.	Teachers will recap or teach relevant knowledge that is required to build upon. Children will be able to make at least expected progress.	None	Discussions with teachers. Refer to the curriculum scheme.
Quality teaching and learning in all year groups to ensure full coverage.	Supporting teachers in the planning of science where required as well as ensuring teachers are supported with the correct resources to teach the unit. Following Kent scheme of work.	AC and all teachers delivering science lessons.	Termly	All children will have access to quality teaching of the relevant curriculum. Learning will be built upon in subsequent year groups.	None	Observation. Liaise with teachers Looking at books. Survey to be completed beginning of Term 2.
Ensure planning shows clearer progression of skills and knowledge throughout each year group, building on prior knowledge.	Planning using the Kent scheme of work. Ensure prior knowledge is recapped before teaching unit. Document shared with teachers to show the progression of key vocabulary and units from Years 2-6. Ensure website has up to date progression of skills	AC and all teachers.	Termly T3 staff meeting time	Curriculum overview documents. Previous plans. Look at previous years planning.	None	By AC at the beginning of each term. Staff meeting time T3 to discuss why we teach units where we teach them.

	and knowledge and that teachers know why they are teaching units.					
Percentage of children reaching the expected standard in Science to be in line with the national average.	6x Assessment data in the year linking to the NC. Teachers to keep track of learning through assessment. AC to monitor knowledge retention from prior learning of units. Monitor use of Science unit 'end points'.	AC All staff	Termly tracker updated with data from unit taught.	Under-achieving pupils to have focused support from the class teacher. The majority of children will be working at age expected.	None	Book monitoring. Assessment data Pupil voice
Ensure that resources being used in lessons are of high quality and suit the task.	Keep check on the science cupboard resources. Replace/order any missing resources. Look at CPD opportunities for teachers.	AC and all staff	Termly check ins regarding resources.	Children are engaged in lessons. Children continue to make good progress, building on from prior knowledge with depth of understanding.	Small cost as and when required. £500 Science budget.	Discussions with teachers. Inventory check.
Ensure that SEN children access work at the correct level of development with high expectations for their learning.	Adapting lessons to enable all children access the learning. Teachers to have InPrint software to support scaffolding for all children, specifically SEN.	All staff	Termly	Children make good progress from their starting points even when disadvantaged by other factors.	None	Pupil voice. Discussions. Book monitoring.
Provide experiences and enrichments for children	Look into experiences and visitors who can come to school to enrich the curriculum or unit for each year group.	AC to organise.	Throughout the year and looking ahead to next year.	Experiences and activities will be valuable to the expansion of knowledge and skill.	Science week to be organised. Cost tbc Visits mostly free from Pfizer	Photo evidence and pupil consultation.
Ensure books reflect quality of teaching in class and are of a high quality in terms of presentation,	High expectations for presentation in science books. Marking will be developmental.	AC and teachers SLT	Termly	Books are of a high quality and reflect the learning in lessons.	None	Book monitoring Discussions with teachers and SLT.

learning and assessment.						
Further develop front covers to ensure that it is a purposeful assessment tool for teacher and children.	Complete first section of front cover at the start of the unit. Ensure front cover is finished at the end of the unit and the children self-evaluate what they have learned against objectives and termly end points. Include an overarching enquiry question for each unit for the children to work towards and add to throughout the unit.	AC and teaching staff	Ongoing termly	Front covers are complete for all children. Children can use them to recap knowledge. Teachers can use them to see what the children remember and a useful way to assess how well the child has understood the unit. Retrieval practise is built into all lessons.	None	Book monitoring. Pupil voice.
Promote science across school	Ensure that Science week is organised and shared with teachers. Include Science events throughout the year across all year groups. Run a Science club during one term to promote STEM learning.	AC	Termly events	Children will speak positively about science. Children will take part in experiences.	Cost dependant on event	Pupil voice.
Milestones	End of Term 1	End of Term 2	End of Term 3	End of Term 4	End of Term 5	End of Term 6
	Front covers to be completed at the start and end of the term by all classes. Check which front covers teachers may need for each unit and adapt where necessary to help support children's learning.	Front covers to be completed at the start and end of the term by all classes. Science tracker to be updated by class teachers.	Front covers to be completed at the start and end of the term by all classes. Science tracker to be updated by class teachers.	Front covers to be completed at the start and end of the term by all classes. Science week delivered with evidence of photos and engagement	Front covers to be completed at the start and end of the term by all classes. Release time monitoring used for pupil voice and book monitoring to see the impact of the training	Front covers to be completed at the start and end of the term by all classes. Release time monitoring – end of year data

	Science tracker to be updated by class teachers. Release time for monitoring of Science books and lessons. Check unit 'end points' are being referenced. Ensure key questions are used on displays Look into support for Science planning where needed. Start to organise a survey for teachers to share their understanding of teaching Science and any gaps they may have for future training. Organise a STEM club for Term 2 to share an engineering project. Attend training as a new Subject leader for Science to share with the teachers within a teacher meeting in Term 2/3.	Inventory check for the rest of the year within the Science cupboard. Use the teacher survey completed to identify gaps that may indicate specific training for staff to have. Release time to be used for pupil voice and book monitoring to better understand how Science is being taught and learnt. Ensure all teachers know the progressive key vocabulary to use within each unit.	Release time to be used to plan for a teacher meeting to share what was highlighted during pupil voice and teacher survey in Term 2. Training to be shared with teachers on ways to teach Science to promote engagement of the subject and retention of learning. Science week planned and organised with dates in place. This to be shared within the teacher meeting. Organise CPD for teachers relating to upcoming units. New Scheme of work updated and shared for with staff members across the school. Visit local feeder school and them to St Laurence to share professional advice, specifically linking to working displays and pupils working scientifically.	across the year groups. Science tracker to be updated by class teachers. Release time monitoring to conclude Science week and prepare for Science enrichment day in Term 5.	and Science week on the children's learning. Science tracker to be updated by class teachers. Science enrichment day completed.	Science tracker to be updated by class teachers. Feedback to teachers for the following academic year on units and discussion on what worked/what needs improving.

Whole School Cultural Capital /Enrichment Opportunities

Whole School Enrichment Opportunities		
Term (s)	**Event**	**Science link**
1	Archaeological Dig	Cross-curricular with Geography, History and Science
2	Virtual Reality workshop	Cross-curricular link to Science and History across the school. Exploring and reinforcing Scientific knowledge and information linked to a specific unit for that year group.
3	STEM Space workshop	Online Space workshop recapping prior learning for Years 4 and 5.
4	Science Week	Class Dojo challenges for children to access at home throughout the week Link to British Science week poster competition
1-6	Opportunities for extra-curricular Science	Extra-curricular clubs in Terms 2 and 3 linking to Engineering and a Book review competition for Years 3-6 children St Laurence College Competition Year 5 children

Science Progression of Skills (KS1 included as reference)

St. Laurence C of E Junior Academy					
Science Progression of Skills					
PLANTS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees. Identify and describe the basic structure of a variety of common flowering plants, including trees	Observe and describe how seeds and bulbs grow into mature plants. Use microscopes and magnifying glasses to observe in more detail. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. Develop vocabulary so explanations are more Scientific.	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 Compare the effect of different factors on plant growth. Investigate the way in which water is transported within plants. Observe how water is transported and relate this to the idea that plants make their own food. Explore the part that flowers play in the life cycle of flowering plants, including pollination, seed		See living things and their habitats	

		formation and seed dispersal			
ANIMALS INCUDING HUMANS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals identify and name a variety of common animals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals, including pets). Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.	Notice that animals, including humans, have offspring which grow into adults. Compare and discuss different types of offspring – do they look like the adult? (e.g. caterpillars into butterflies, calves into cows) Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Compare how animals get their food and how they breathe Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene. Make links with investigations and compare data, using charts and diagrams (effects on their	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 Understand that there are different food groups and how these keep us healthy. Compare diets of different animals (including pets) Identify that humans and some other animals have skeletons and muscles for support, protection and movement Recognise the main bones in a human skeleton. Compare different animals' skeletons	Describe the simple functions of the basic parts of the digestive system in humans. (ie mouth, tongue and teeth, oesophagus, stomach, small intestine, large intestine) Identify the different types of teeth in humans and their simple functions. (Relate shape to function) Find out what damages teeth and how to look after them. Compare teeth of carnivores, omnivores and herbivores and suggest why there are differences. Construct and interpret a variety of food chains, identifying producers, predators and prey	Describe the changes as humans develop to old age Use a timeline to indicate stages of growth and development in humans. Understand the changes experienced in puberty (in terms of physical. emotional, independence, responsibility) Compare humans with other animals	Identify the main body parts and understand that these all need to receive blood from the heart in order to function. Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood. Know where the heart and lungs are positioned and describe how they work together in order to pump oxygenated blood to all parts of the body. Understand that the pulse is a measure of the heart rate. Explore and explain the effect of exercise on the pulse rate. Describe the ways in which nutrients and water are

	body after 1 minute of exercise compared to 5 minutes?)				transported within animals, including humans Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function Understand what is meant by a balanced diet. Know and explain the different food groups and the importance of each. Describe how to keep their bodies healthy.
LIVING THINGS AND THEIR HABITATS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	Explore and compare the differences between things that are living, dead and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including micro-habitats. Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and		Understand how the environment / habitat changes over a year. Recognise that living things can be grouped in a variety of ways. Compare living things and explore ways to group living things. Understand how scientists group living things ie animals into vertebrates and invertebrates and plants into flowering and non-flowering Explore and use classification keys to help	Describe the life process of reproduction in some plants and animals Understand what reproduction is and why it is vital. Identify the parts of a flower responsible for reproduction. Understand the role of each in the processes of pollination and fertilization. Recognise that this is an example of sexual reproduction Recognise how different seeds are suited to their method of dispersal.	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 Understand how scientists classify living things and know the main groups (including sub-groups) and know the classification characteristics for each group. Explore similarities and differences. Classify a range of living things using this classification system

	identify and name different sources of food.		group, identify and name a variety of living things in their local and wider environment. Recognise that environments can change and that this can sometimes pose dangers to living things. Explore the impact of humans on the environment (both positive and negative)	Compare different ways of growing new plants eg from cuttings, tubers, bulbs – recognize this as assexual reproduction Find out about reproduction in mammals. Research the life cycles of different types of animals, amphibian, insect, bird) and compare Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird	Understand that microorganisms are living things through research and /or exploration. Research how microorganisms are classified. Understand how micro-organisms can be either beneficial or harmful and describe some examples. Give reasons for classifying plants and animals based on specific characteristics
SEASONAL					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Look closely at similarities, differences, patterns and change.	Observe changes across the four seasons.				
MATERIALS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Distinguish between an object and the material from which it is made. Identify and name a variety of everyday	Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.		Compare and group materials together, according to whether they are solids, liquids or gases Explore and develop simple descriptions of each state eg solids hold their shape, liquids take the shape of	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	

materials, including wood, plastic, glass, metal, water, and rock. Describe the simple physical properties of a variety of everyday materials. Compare and group together a variety of everyday materials on the basis of their simple physical properties.	Compare natural and manmade materials. Find out how these materials are made. Use tests, ask questions and compare data to evaluate and observe uses of different materials. (What happens if….?) Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. Use tests and observations to compare, evaluate and predict what happens when you squash, bend, twist or stretch different materials. Report findings using data.		the container they are in, gases escape from an unsealed container) Observe and explore water as a solid, liquid and gas and recognise the effect that temperature has on this. Recognise real life examples of water changing state eg puddle evaporating, washing on a line, making/ melting ice cubes 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) Research or explore the effect temperature has on different substances eg chocolate, butter Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	Relate to learning on magnetism and electricity in years 3 and 4, testing materials as required. Understand the concepts of thermal insulation and conduction. Identify examples of good conductors and insulators in real life. Investigate which material is the best insulator. Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution Recognise that other materials are insoluble and know how to recover the substance. Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including	

				through filtering, sieving and evaporating 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	
ROCKS					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		Compare and group together different kinds of rocks on the basis of their appearance and simple physical properties Use a hand lens to observe and compare rocks eg whether they have crystals Observe a range of rocks in the local environment and how different rocks are used. Explore and compare properties of rocks and record findings			

		Describe in simple terms how fossils are formed when things that have lived are trapped within rock Explore how fossils are formed Recognise that soils are made from rocks and organic matter Explore and compare different soils. Explore the constituents of soil.			
LIGHT					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		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 Explore how different surfaces reflect light 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			Recognise that light appears to travel in straight lines Explore and explain how shadows are made relating to the fact that light travels in a straight line 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 Explore how light is reflected from different surfaces. Make

		Explore shadows made by different shaped objects / materials Find patterns in the way that the size of shadows change Explore the length of shadows throughout the day and recognise how the shadow changes			generalisations and predictions. Explore how light is reflected when the beam is at different angles. Recognise and describe patterns. 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. Explore and describe how reflection is used in real life eg periscopes, rear view mirrors, dental mirrors Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them Investigate how the size of a shadow varies. Recognise and explain generalisations and patterns.
FORCES (INCLUDING MAGNETS)					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
		Understand that a force is a push or pull and know its effect.		Explain that unsupported objects fall towards the Earth because of the force of gravity acting between	

		Recognise forces in real life. Compare how things move on different surfaces. Understand and recognise friction as a force. 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 Explore the strength of different magnets Research how magnets are used in real life		the Earth and the falling object Identify the effects of air resistance, water resistance and friction, that act between moving surfaces Investigate the effect of air resistance and water resistance on different shapes / sizes. Relate water resistance to stream lining in real life. Investigate friction by making and recording measurements. Recognise and explain how friction can be useful / unhelpful in real life situations. Recognise that some mechanisms including levers, pulleys and gears allow a smaller force to have a greater effect Recognise real life examples of the use of levers, pulleys and gears.	
SOUND					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
			Identify how sounds are made, associating some of		

			them with something vibrating Explore and identify the way sound is made through vibration in a range of musical instruments eg plucking, striking, shaking Recognise that vibrations from sounds travel through a medium to the ear Explore vibrations through a string telephone, table top etc Find patterns between the pitch of a sound and features of the object that produced it Explore the pitch produced by different length / thickness elastic bands; water in bottles, different length straws, different sized saucepan lids Find patterns between the volume of a sound and the strength of the vibrations that produced it Recognise that sounds get fainter as the distance		

			from the sound source increases Investigate different materials to find the best sound insulator		
ELECTRICITY					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
			Identify common appliances that run on electricity. Distinguish between mains and battery power and relate to electrical safety. Learn the dangers of electricity. Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers Explore different components in the construction of a simple circuit and draw pictorially. Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete circuit with a battery		Construct simple circuits and explore different components. Understand and explain how a bulb lights up using scientific vocabulary. Associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit Explore and describe the effect of changing one component at a time. Use scientific knowledge to explain findings. 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

			Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit Recognise some common conductors and insulators, and associate metals with being good conductors		Use recognised symbols when representing a simple circuit in a diagram Group materials / objects according to whether they are electrical conductors or insulators. Identify how electrical conductors and insulators are used in real life Understand how a switch works. Use knowledge of conductors and insulators to design and make a switch. Know the dangers of electricity and describe how to keep safe, distinguishing between mains and battery.
EARTH AND SPACE					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
				Explore how the ideas about the solar system have developed. Describe the movement of the Earth and other planets relative to the sun in the solar system. Understand that the Sun is in the centre of the solar system and that it has 8 planets.	

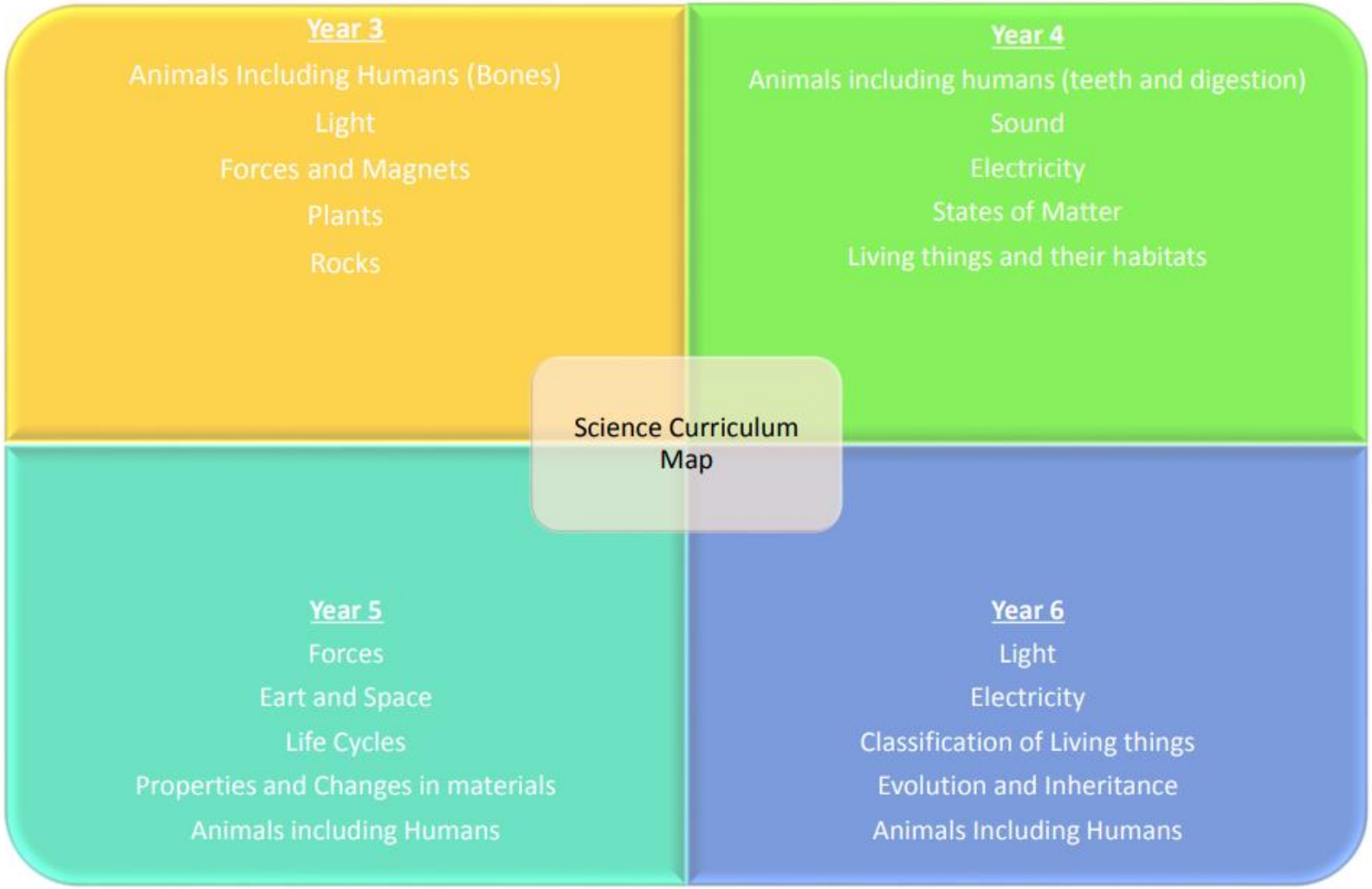
				Explain how the movement of the Earth gives the seasons. Compare sunrise and sunset times during the year and know why they differ. Describe the movement of the moon relative to the Earth. Describe how we see the moon and know the phases of the moon. Describe the sun, Earth and moon as approximately spherical bodies. Know their relative sizes. Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.	
EVOLUTION AND INHERITANCE					
Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
					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 Explore how the work of scientists has helped develop our understanding of the process of evolution. Recognise that living things have changed over time and that a number of factors can affect a species' evolution.
WORKING SCIENTIFICALLY					
Ask simple questions and recognise that they can be answered in different ways observing closely, using simple equipment Perform simple tests identifying and classifying		In year 3, children begin to learn these skills, supported by the teacher as needed.	In year 4, children build on the skills from year 3. They should be using and applying these skills with increasing independence and use of their scientific language.	In year 5, children continue to use skills learned in years 3 and 4 but begin to develop the following, supported as needed by the class teacher.	In year 6, children build on skills from year 5. They should be using and applying these skills with increasing independence and accuracy; choosing and using appropriate scientific vocabulary effectively.

using their observations and ideas to suggest answers to questions Gather and record data to help in answering questions		Ask relevant questions and use different types of scientific enquiries to answer them Set up simple practical enquiries, comparative and fair tests Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers Gather, record, classify and present data in a variety of ways to help in answering questions Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables, Report on findings from enquiries, including oral and written explanations,	Ask relevant questions and use different types of scientific enquiries to answer them. Set up simple practical enquiries, comparative and fair tests beginning to identify the variables where relevant. Make systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers with increasing accuracy. Gather, record, classify and present data in a variety of ways to help in answering questions Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables. Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs Use test results to make predictions to set up further comparative and fair tests Report and present findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results,	Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate; understanding the need for repeated measurements and finding averages as needed. Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. Recognise the most appropriate way to present including choice of graph. Use test results to make predictions to set up further comparative and fair tests Report and present findings from enquiries, including conclusions, causal relationships and

		displays or presentations of results and conclusions Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Identify differences, similarities or changes related to simple scientific ideas and processes Use straightforward scientific evidence to answer questions or to support their findings.	Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions Identify differences, similarities or changes related to simple scientific ideas and processes Use straightforward scientific evidence to answer questions or to support their findings.	in oral and written forms such as displays and other presentations Identify scientific evidence that has been used to support or refute ideas or arguments	explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations Identify scientific evidence that has been used to support or refute ideas or arguments

Science Curriculum Map



Science Progressive Key Vocabulary and Enquiry Questions

Year 3 Science Curriculum

Plants *(functions of parts and life cycles)*	Animals including Humans (T1) *(skeletons)*	Rocks *(simple properties, fossils and soils)*	Light *(dark is the absence of light, size of shadows)*	Forces and Magnets *(friction – how things move on different surfaces)*
Biology	Biology	Chemistry	Physics	Physics
Enquiry Question *What does a plant need to stay alive and why?*	Enquiry Question *What do animals and humans need to survive?*	Enquiry Question *How are different types of rocks formed?*	Enquiry Question *What is Light and how can it change?*	Enquiry Question *How do forces and magnets work?*
Key Vocabulary Germination Stem / Stamen Petals Carpel / Sepal Pollen / Pollination Fertilise / Fertilisation Evaporation	Key Vocabulary Skeleton Muscles Tendons Joints Healthy Diet / Nutrition Saturated / Unsaturated Energy Disease	Key Vocabulary Igneous rock Sedimentary rock Metamorphic rock Magma Lava Sediment Fossil Erode	Key Vocabulary Light Light source Dark Reflect / Reflection Reflective Shadow Ray	Key Vocabulary Forces Friction Surface Magnet Magnetic / Magnetic Field Attract / Repel Poles

Year 4 Science Curriculum

Living things and their habitats *(grouping and simple classifying / changes to habitats)*	Animals including Humans *(teeth, eating and digestion)*	States of Matter *(solids, liquids and gases – heating and cooling – the water cycle)*	Sound *(fainter sounds further away, vibrations, pitch and volume)*	Electricity *(simple circuit, conductors and insulators)*
Biology	Biology	Chemistry	Physics	Physics
Enquiry Question *How do living things depend on each other and the environment around them?*	Enquiry Question *What are the similarities and differences to humans and animals linked to teeth and the digestive system?*	Enquiry Question *How do materials change their state of matter (with examples)?*	Enquiry Question *Can you see sound?*	Enquiry Question *What is electricity and how does it relate to energy?*
Key Vocabulary Environment Organism Respiration Excretion Endangered species Extinct Specimen Vertebrate / Invertebrate	Key Vocabulary Digest / Digestion Stomach Small intestine Large intestine Oesophagus Rectum Producer / Prey / Predator Omnivore / Herbivore / Carnivore	Key Vocabulary Solids / Liquids / gases Particles State / Matter Melt / Freeze Water vapour Evaporate Condense Precipitation	Key Vocabulary Vibration Sound wave Volume Amplitude Pitch Particles Distance Soundproof Absorb Vacuum Ear drum	Key Vocabulary Cell Circuit Wire Switch Buzzer Battery Conductor Insulator Electricity

Year 5 Science Curriculum

Living things and their habitats *(life cycles / reproduction)*	Animals including Humans *(changes in humans)*	Properties and changes to materials *(thermal and electrical conductivity, mixing/separating)*	Earth and Space *(other Planets)*	Forces *(gravity, friction, air resistance)*
Biology	Biology	Chemistry	Physics	Physics
<u>Enquiry Question</u> *What is reproduction and how does it link to plants and animals?*	<u>Enquiry Question</u> *What are the changes as humans develop in old age?*	<u>Enquiry Question</u> *When does a change result in the formation of a new material?*	<u>Enquiry Question</u> *What are the movements that happen in Earth and Space?*	<u>Enquiry Question</u> *What mechanisms could change the gravity, friction and air resistance of an object?*
<u>Key Vocabulary</u> Life Cycles Metamorphosis Pollination Gestation Asexual Reproduction Amphibian Mammal Reptile Reproduction	<u>Key Vocabulary</u> Infancy Childhood Adolescence Puberty Adulthood Life Expectancy Old Age Development Growth rate	<u>Key Vocabulary</u> Materials Dissolve Solution Separate Mixing Burning Filtering Sieving Reversible / Irreversible	<u>Key Vocabulary</u> Sun / Moon / Star Planet Sphere Spherical bodies Orbit / Rotate Axis Geocentric model Heliocentric model	<u>Key Vocabulary</u> Gravity (Earth's) Gravitational pull Weight / Mass Air resistance Water resistance Buoyancy Streamlined Mechanism

Year 6 Science Curriculum

Living things and their habitats *(classifying including micro-organisms)*	Animals including Humans *(Circulatory system, functions of the heart and blood)*	Evolution and Inheritance *(fossil adaptation)*	Light *(travels in straight lines / how we see things)*	Electricity *(what affects bulb brightness / buzzer volume)*
Biology	Biology	Biology	Physics	Physics
Enquiry Question *How can living things be grouped and classified?*	Enquiry Question *What organ is this? How does it work and what job does it do? (heart)*	Enquiry Question *How do living things evolve?*	Enquiry Question *What is the difference between refracted light and reflected light?*	Enquiry Question *What additional components can be added to a simple circuit to change the brightness of a bulb or loudness of a buzzer?*
Key Vocabulary Classifying Characteristics Taxonomist Bacteria Microorganism Species Microscope	Key Vocabulary Circulatory System Heart Blood Vessels Oxygenated blood Deoxygenated blood Drug Alcohol	Key Vocabulary Fossilisation Species Permeable / Impermeable Adaptation Evolution Offspring Inheritance Adaptive traits Inherited traits	Key Vocabulary Incidence ray Reflected ray Refraction Visible Spectrum Prism Transparent Translucent Opaque	Key Vocabulary Symbol Current Amps Resistance Voltage Electrons Protons Component Appliance

Knowledge Organisers Term 4

Year 3 - Rocks

Key Vocabulary:

Igneous rock
Rock that solidifies from molten earth material.

Sedimentary rock
Rock made when erosion, or the breaking down of the land around you, takes place.

Metamorphic rock
Rock formed when other rocks are affected by great temperatures and pressures.

Magma
Molten rock that is found below the earth's surface.

Lava
Hot, liquefied rock that flows from a volcano or other Opening in the surface of the Earth.

Sediment
Solid material that is moved and deposited to a new location.

Fossil
The remains of ancient life that have been preserved by natural processes.

Erode
To diminish or destroy

Erosion
The process when materials on a land surface are broken down and carried by wind, water, or ice.

Rocks
Knowledge Organiser
Chemistry

Enquiry question

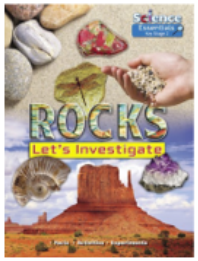
How are different types of rocks formed?

Prior Learning:

Everyday Materials – Year 1

Use of Everyday Materials – Year 2

Living things and their habitats – Year 2



Sticky Knowledge:

What is rock?
The Earth's crust is made up of lots of different types of rocks which form naturally over a long period of time. Rocks are solid and can be large or small.

How are rocks formed?
Rocks are formed when mineral grains grow or are fused together. Every rock is made up or one or more minerals. Rocks gradually change overtime.

Why are different rocks suited for different purposes?
Different rocks have different properties. Some rocks are harder than others. Some of these rocks are called granite, marble, chalk, and slate. They are used for different reasons.

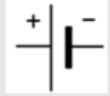
How are fossils made?
After an animal dies, the soft parts of the body decompose leaving the hard part, like the skeleton, behind. This becomes buried by small bits of rock. As more layers build up on top, the sediment around the skeleton begins to turn into rock.

What is soil?
Soil is a mixture of bits of rock, dead plants and animals, air and water. It is the very top layer of the Earth. It is made by these components interacting slowly yet constantly.

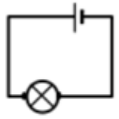
Year 4 - Electricity

Key Vocabulary:

Cell
An electrical power supply that converts stored chemical energy Into electrical potential energy.

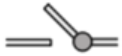


Circuit
A device made of other, smaller electrical devices that can move the flow of electricity through itself to power larger devices.



Wire
A long thin piece of metal covered in plastic that is used to carry an electric current.

Switch
A component within an electrical circuit which enables the flow of electricity to be turned on or off.

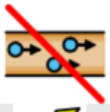


Buzzer
A component in a circuit that makes a sound when electricity goes through it.

Battery
The main source of energy that provides a voltage which allows the current to flow through.

Conductor
Materials that do allow electricity pass through them.

Insulator
Materials that do not allow electricity to pass through them.



Electricity
The flow of tiny particles called electrons and protons.

Electricity
Knowledge Organiser
Physics

Enquiry question

What is electricity and how does it relate to energy?

Prior Learning:

Use of everyday materials – Year 2

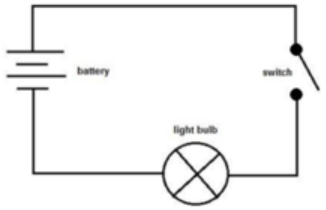
Light – Year 3

Sound – Term 3 topic – Year 4/5

Sticky Knowledge:

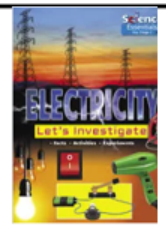
Where does electricity come from?
Electricity is a form of energy that can give things the ability to move and work. Electricity is primarily generated by fossil fuels (mainly gas and coal), nuclear energy and renewable energy.

How can we light a light bulb using a simple series electrical circuit?



Which material is the best conductor of electricity?
Metals like copper, iron, gold, aluminium and silver are the best materials for conducting electricity.

What components are needed to make a working circuit?
An electrical source (a battery), two wires and a light bulb.



Year 6 Evolution and Inheritance

Key Vocabulary:

Fossilisation
The process of turning into a fossil.

Species
A group of similar organisms that are able to reproduce.

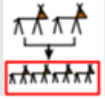
Permeable
A material which allows water or liquids to flow through.

Impermeable
Not allowing water or liquids to flow through.

Adaptation
Any physical or behavioural characteristics of an animal that help it to survive in its environment.

Evolution
The theory that all kinds of living things that exist today Developed from earlier types.

Offspring
The immediate descendant of a person or animal.



Inheritance
When a living thing reproduces and passes on genetic information to its offspring.

Adaptive traits
Any physical or behavioural characteristics of an animal that help it to survive in its environment

Inherited traits
The traits or characteristics that are transferred from parents to offspring genetically.

Evolution and Inheritance Knowledge Organiser

Biology

Enquiry question

How do living things evolve?

Prior Learning:

Animals, including humans – Year 2

Rocks – Year 3

Living things and their habitats – Year 4

Charles Darwin (1809-1882)

Sticky Knowledge:

How do scientists know that living things have changed over time?
Fossils give us evidence of what lived on Earth millions of years ago and provide evidence to support the theory of evolution. More recently, scientists such as Darwin and Wallace observed how living things adapt to different environments to become distinct varieties within their own characteristics.

How has variation lead to evolution?
Variation allows for natural selection to increase or decrease. Variation allows for populations to evolve.

What is the process of evolution?
Evolution is the process by which living things can gradually change over time.

Do all living things produce offspring of the same kind?
Living things produce offspring of the same kind, but these offspring vary and are not identical to their parents or each other.

How do plants and animals adapt to suit their environments?
Animals adapt to suit to their environments in may ways: body parts, body coverings and behaviours. Plants adapt to suit their environments by growing lower and closer to the ground to shield themselves from the wind and cold.

Assessing in Science

At St Laurence, we assess our children at the end of every science unit taken from the National Curriculum strands provided for Science. This allows teachers to assess each individual child for each lesson. A decision is then made whether a child is below, working towards, expected or greater depth for that unit. As well as this, each unit has an overarching enquiry question which allows the children to share their progress from the beginning of the unit to the end of the unit by answering the question and displaying this on class boards. Children are encouraged to reference the 'working scientifically' evaluation sheet below to self-assess at the end of each investigation or experiment, ticking how they feel they have worked scientifically. At St Laurence, we believe teachers are a fundamental way of assessing children via high level of questioning, responding to feedback from children and through pupil voice.

Children are asked to self-assess linking to working scientifically at the end of each investigation or experiment.

	A	B
1		**Science**
2	Living things and their habitats	Recognise that living things can be grouped in a variety of ways
3		Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
4		Recognise that environments can change and that this can sometimes pose dangers to living things
5	Animals, including humans	Describe the simple functions of the basic parts of the digestive system in humans
6		Identify the different types of teeth in humans and their simple functions
7		Construct and interpret a variety of food chains, identifying producers, predators and prey
8	States of matter	Compare and group materials together, according to whether they are solids, liquids or gases
9		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)
10		Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature
11	Sound	Identify how sounds are made, associating some of them with something vibrating
12		Recognise that vibrations from sounds travel through a medium to the ear
13		Find patterns between the pitch of a sound and features of the object that produced it
14		Find patterns between the volume of a sound and the strength of the vibrations that produced it
15		Recognise that sounds get fainter as the distance from the sound source increases
16	Electricity	Identify common appliances that run on electricity
17		Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
18		Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
19		Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
20		Recognise some common conductors and insulators, and associate metals with being good conductors
21	Working scientifically	Asking relevant questions and using different types of scientific enquiries to answer them
22		Setting up simple practical enquiries, comparative and fair tests
23		Making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
24		Gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
25		Recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
26		Reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
27		Using results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions
28		Identifying differences, similarities or changes related to simple scientific ideas and processes
29		Using straightforward scientific evidence to answer questions or to support their findings.
30		GDS
31		EXP
32		WTS
33		PEL

As an example, this is the Year 5 spreadsheet for teachers to assess their children linked to the individual strands of the units in the Year 5 science curriculum linked to the National Curriculum.

The Education People Science Scheme

THE EDUCATION PEOPLE | Primary Science Scheme of Work

The **Primary Science Scheme of Work** aligns with the National Curriculum, offering pupils the opportunity to learn about the products of science so that they can explain the material world and '*develop a sense of excitement and curiosity about natural phenomena*'.
Pupils will also learn about the practices of science so that they know how scientific knowledge becomes established through scientific enquiry. Through this programme of study, pupils will combine these two distinct types of knowledge, so they develop a solid understanding within meaningful context.

Knowledge and skills have been carefully placed across the units and years with sequential component knowledge clearly broken down into steps and composite tasks. Although they are taught together, there is clarity about which knowledge is disciplinary and which is substantive.

There is a brand-new section: 'Ten Big Ideas', which is underpinned by key concepts. As pupils move through the scheme, they will build comprehensive schemata for each of these big ideas, so that new information connects with prior knowledge and can be committed to long-term memory.

Each unit of the **Primary Science Scheme of Work** (from Year 1 through to Year 6) is helpfully divided into year groups and terms, and covers the relevant topics (depending on the required curriculum) for the full academic year. Within each unit, there is detailed and insightful information to assist teachers and science leads.

St Laurence-in-Thanet Junior Academy

Science	Year 3	Forces and Magnets

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

2	Living and **non-living things can be grouped in a variety of ways**
6	**Changing the movement of an object requires a net force (push or pull) to be acting on it**

Year 3

Forces and Magnets

The Education People Primary Science Scheme of Work

National Curriculum Objectives

Pupils should be taught to:

- 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

Links To Prior Learning

Everyday materials - this unit builds on pupils' knowledge and understanding where they will have already:

- described the simple physical properties of a variety of everyday materials (Year 1).

Uses of everyday materials - this unit builds on pupils' knowledge and understanding where they will have already:

- found out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching (Year 2) - *this will now be referred to as 'applying a force'.*

Vocabulary: property, material, metal

Common Misconceptions

! **The weight of an object affects how it moves on different surfaces.** The key factor influencing an object's motion on different surfaces is the presence and type of friction. Weight alone doesn't determine this. Friction opposes motion and is affected by the texture and material of the surfaces in contact.

! **All forces require direct contact between objects.** Magnetic forces can act at a distance, unlike many other forces (e.g., friction, tension). This is due to the field created by magnets, allowing them to exert forces on other magnetic objects without direct contact.

! **Magnets attract all materials equally.** Magnets primarily attract materials that contain ferromagnetic elements (e.g., iron, nickel, cobalt). Non-magnetic materials, such as wood or plastic, are not attracted. Additionally, magnets can repel each other if like poles face each other, demonstrating the repulsive aspect of magnetism.

! **All metals are magnetic.** While some metals are magnetic, not all of them are. Iron, nickel, and cobalt are commonly magnetic, but materials like aluminium and copper are not. Sorting materials based on their magnetic properties helps understand the distinction.

Building component knowledge - **Forces and Magnets**

1. What is a contact force?
2. How do different surfaces affect the movement of objects?
3. What is a magnet and how do they work?
4. What materials are attracted to a magnet?
5. Do all magnets have the same strength?

Science	Year 3	Light

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

1	There is a relationship between structure and function
9	Energy makes things happen and can be seen by its effects; it can be transferred (but is not used up)
10	The movement of the Earth affects the seasons and times of day

National Curriculum Objectives

Pupils should be taught to:

- 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

Links To Prior Learning

Year 1 - Animals, including humans - this unit builds on the knowledge and understanding that pupils will have learned in Year 1. Pupils will have already:

- identified, named, drawn and labelled the basic parts of the human body and say which part of the body is associated with each sense.

Year 1 and 2 - Everyday materials - this unit builds on the knowledge and understanding that pupils will have learned in Year 1 and 2. Pupils will have already:

- described the simple physical properties of a variety of everyday materials.
- identified and compared the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses.

Vocabulary:

Common Misconceptions

! **The sun that moves across the sky during the day.** Pupils may not know that it is the Earth rotating.

! **Objects such as the moon or cats' eyes in the road are sources of light**. There may be some confusion about the properties of a light source compared to an object that reflects light.

! **Light always travels in straight lines.** Light will travel in straight lines in all directions until it meets a material that changes its path. Some materials may stop light whereas others might allow light to travel through in a straight line.

! **Light is needed to see.** This is course true, however pupils often confuse light (from a light source) must directly enter the eye rather to see the object than the light reflecting off the object itself.

! **Light can only be reflected from shiny surfaces**. Our ability to see objects depends on the reflection of light.

! **An object cannot absorb and reflect light – it must do one or the other.** All objects absorb and reflect light to different degrees.

Year 3

Light

Building component knowledge - **Light**

Science	Year 3	Rocks

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

2 Living and non-living things can be grouped in a variety of ways

8 The diversity of organisms, living and extinct, is the result of evolution

National Curriculum Objectives

Pupils should be taught to:

- 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.

Year 3

Rocks

Building component knowledge - **Rocks**

Links To Prior Learning

In Years 1 and 2, pupils will have learnt to identify rock, consider its properties and therefore its suitability for different uses in everyday life (such as, as a building material).

Everyday materials - this unit builds on pupils' knowledge and understanding where they will have already:

- identified and named a variety of everyday materials, including…rock' (Year 1).

Uses of everyday materials - this unit builds on pupils' knowledge and understanding where they will have already:

- identified and compared the suitability of a variety of everyday materials, including…rock…for particular uses' (Year 2).

Living things and their habitats - this unit builds on pupils' knowledge and understanding where they will have already:

- explored and compared the difference between things that are living, dead, and things that have never been alive (Year 2).

Previous learning in geography, during Key Stage 1, will also link to this science unit. Pupils will have used basic geographical vocabulary to refer to key physical features such as rock, cliff, soil etc. They will also have explored key physical features of their surrounding environment.

Vocabulary: rock, soil, cliff, material

Common Misconceptions

! **All rocks that look similar must have the same properties.** Rocks can have similar appearances but possess different physical properties. Emphasising a range of physical properties (e.g., hardness, texture) helps pupils understand that looks alone do not determine rock types.

! **Fossils are the actual remains of living things turned into stone.** Fossils are often not the original living material but rather mineralised replicas or imprints. The misconception may arise from the idea that fossils are like stone statues of living things.

! **Soil is only composed of decomposed organic matter.** While organic matter is a crucial component of soil, soils are a mixture of mineral particles (from rocks), organic matter, water, and air. Some pupils might think that soil is entirely made up of decayed plants and animals.

St Laurence-in-Thanet Junior Academy

Science	Year 3	Plants

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Disciplinary knowledge

Big Ideas

2 Living and non-living things can be grouped in a variety of ways

1 There is a relationship between structure and function

National Curriculum objectives

Pupils should be taught to:

- 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.

Substantive knowledge

Year 3

Plants

Building component knowledge - **Plants**

How are seeds dispersed? → What are the main functions of the different parts of a flowering plant? → How do plants make food and how is water transported? → What does a plant need to stay alive? → Why does a plant need flowers?

Links To Prior Learning

Plants – this unit builds on pupils' knowledge and understanding where they have already:

- identified and named a variety of common wild and garden plants, including deciduous and evergreen trees (Year 1).
- identified and described the basic structure of a variety of common flowering plants, including trees (Year 1).
- observed and described how seeds and bulbs grow into mature plants (Year 2).
- found out and described how plants need water, light and a suitable temperature to grow and stay healthy (Year 2).

Vocabulary: plant, root, stem, leaf/leaves, flower, petal, deciduous, evergreen, trunk, branch, bark, seed, bulb, germinate, temperature, lifecycle

Common Misconceptions

! **Seeds need light to germinate or that plants will not grow without light**. Not necessary. While light is a critical part of the photosynthesis process for seedlings and plants (most varieties anyway), light is not necessary for seeds to germinate.

! **Soil is an inert substance, acting only to hold plants roots in place**. Not true. Soil is alive! A handful of soil has more microorganisms in it than there are people on the planet.

! **Plants get their nutrients and energy from 'plant food' or DIRECTLY from the sun**. Plants do receive essential nutrients and vitamins from soil and fertilizer, but this is not a plant's main source of energy.

! **A plant's leaves main function is to catch and take in water**. The leaves' main function is photosynthesis, and the roots have the function of the intake of water.

! **Plants breath like humans do**. Words like 'breathing' refer to how animals take air into their lungs. Plants do not breathe. They absorb air through the stomata (pores) in their leaves.

St Laurence-in-Thanet Junior Academy

Science	Year 3	Animals, Including Humans

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

3	Humans move through different stages of growth and development
5	Living things have characteristics and requirements for life, growth and health

National Curriculum Objectives

Pupils should be taught to:

- 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.

Year 3

Animals, Including Humans

Building component knowledge - **Animals, Including Humans**

1. What food do humans need?
2. How can we keep our pets healthy?
3. Why do humans need a skeleton?
4. How do muscles work?
5. Do people who do more physical activity have stronger muscles?

Links To Prior Learning

Animals, including humans - this unit builds on pupils' knowledge and understanding where they will have already:

- identified and name a variety of common animals that are carnivores, herbivores and omnivores (Year 1)
- described and compare the structure of a variety of common animals; identify, name, draw and label the basic parts of the human body (Year 1).

Animals, including humans - this unit builds on pupils' knowledge and understanding where they will have already:

- found out about and describe the basic needs of animals, including humans, for survival (Year 2).
- described the importance for humans of exercise, eating the right amounts of different types of food (Year 2).

Vocabulary: carnivore, herbivore, omnivore, bones, food, exercise

Common Misconceptions

! **Animals, including humans, can make their own food**. Humans and most animals are heterotrophs, relying on external sources for their nutritional needs. They cannot produce their own food through processes like photosynthesis.

! **Animals, including humans, don't need a specific type or amount of nutrition; any food will do**. Animals, including humans, require specific types and amounts of nutrients such as carbohydrates, proteins, fats, vitamins, and minerals for proper growth, maintenance, and functioning of the body. A deficiency or excess of certain nutrients can lead to health problems. Pupils may think that fat is bad for you. A small amount of fat is part of a healthy diet, particularly for our brain and nerves.

! **Humans and animals don't need skeletons and muscles for support, protection, and movement**. The skeletal system provides support and structure to the body, protects vital organs, and facilitates movement. Muscles, attached to bones, enable movement by contracting and relaxing.

! **Only large animals need skeletons and muscles for support, protection, and movement**. Even small animals, including humans, rely on skeletons and muscles for support, protection, and movement. The size and structure of these systems may vary, but their fundamental roles remain essential across different species.

St Laurence-in-Thanet Junior Academy

Science	Year 4	Sound

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

9 **Energy makes things happen and can be seen by its effects (light, sound, electricity). Energy can be transferred but is not used up.**

National Curriculum Objectives

Pupils should be taught to:

- identify how sounds are made, associating some of them with something vibrating
- recognise that vibrations from sounds travel through a medium to the ear
- find patterns between the pitch of a sound and features of the object that produced it
- find patterns between the volume of a sound and the strength of the vibrations that produced it
- recognise that sounds get fainter as the distance from the sound source increases

Year 4

Sound

Building component knowledge - **Sound**

How do we hear sounds? → What patterns can you find between the strength of vibrations and volume of a sound? → What happens to sound as the distance from the sound source increases? → What material provides the best insulation against sound? → How do the features of an object affect the pitch of the sound it makes?

The Education People Primary Science Scheme of Work

Links To Prior Learning

Properties of materials - this unit builds on pupils' knowledge and understanding from Year 2 where they will have already:

- found out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.

Light - this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- noticed that light is reflected from surfaces (i.e. linking how sound and light travel and be reflected).

Vocabulary: sound, hearing (as one of the senses), material (properties of), vibrate, pitch, volume, energy (in context of light)

Common Misconceptions

! **Sound is generated by the object itself rather than understanding that sound is the result of vibrations**. Sound is produced when an object vibrates, creating waves of pressure in the surrounding medium (such as air).

! **Sound can travel through a vacuum or empty space without a medium**. Sound requires a medium (solid, liquid, or gas) for transmission. In a vacuum, where there's no air or other medium, sound cannot travel because there are no particles to carry the vibrations. This is why we don't hear sound in space.

! **The pitch of a sound is directly related to the size or mass of an object**. The pitch of a sound is primarily determined by the frequency of vibrations. It's the properties of the vibrations, not the physical characteristics of the object, that influence pitch.

! **Louder sounds always result from stronger vibrations**. While the amplitude of vibrations influences volume, other factors such as the size of the vibrating object and the medium through which sound travels also play a role. Loudness depends on a combination of factors.

! **Sound remains equally loud regardless of the distance from the source**. As sound waves propagate through a medium, they spread out and lose energy. The farther you are from the sound source, the more the energy is dispersed, resulting in a decrease in loudness.

St Laurence-in-Thanet Junior Academy

Science	Year 4	States of Matter

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

1	There is a relationship between structure and function
2	Living and non-living things can be grouped in a variety of ways
4	All matter on earth exists in one of three states: solid, liquid, gas and the state of matter can change
9	Energy makes things happen and can be seen by its effects; it can be transferred (but is not used up)

National Curriculum Objectives

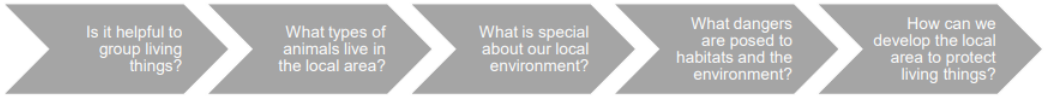
Pupils should be taught to:

- 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

Year 4

States of Matter

Building component knowledge - **States of Matter**



Links To Prior Learning

Properties of materials - this unit builds on pupils' knowledge and understanding where they will have already:

- described the simple physical properties of a variety of everyday materials (Year 1).
- found out how the shapes of solid objects made from some materials can be changed… (Year 2).

Forces and magnets - this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- noticed that some forces need contact…
- compared and grouped together a variety of everyday materials.

Vocabulary: physical properties, materials, solid, group, compare, impact (of forces on objects)

Common Misconceptions

! **Materials are exclusively either solids, liquids, or gases.** Materials can change states under different temperature and pressure conditions. For example, water can exist as a solid (ice), liquid (water), or gas (steam) depending on the temperature. Understanding that materials can transition between states is crucial for a more accurate classification.

! **All materials change state at the same temperature**. Different materials have different melting and boiling points. Each substance has its unique temperature at which it undergoes a change in state.

! **Some may not fully grasp the role of evaporation and condensation in the water cycle**. Evaporation is the process by which water changes from a liquid to a gas (water vapor), and condensation is the reverse process. In the water cycle, water evaporates from bodies of water, condenses to form clouds, and then falls back to the Earth as precipitation. The rate of evaporation is influenced by factors such as temperature and humidity.

! **Higher temperatures always result in faster evaporation**. While temperature is a significant factor affecting the rate of evaporation, it's not the only one. Humidity, surface area, and air movement also play roles. Higher temperatures generally increase evaporation rates, but it's a more complex interplay of factors.

Science	Year 4	Electricity

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

2	Living and non-living things can be grouped in a variety of ways
9	Energy makes things happen and can be seen by its effects (light, sound, electricity); it can be transferred but is not used up

National Curriculum Objectives

- identify common appliances that run on electricity
- construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- recognise some common conductors and insulators, and associate metals with being good conductors.

Year 4

Electricity

Building component knowledge - **Electricity**

1. Where does electricity come from and what is it used for?
2. How can we light a bulb using a simple, series electrical circuit?
3. How does a simple switch work?
4. What material is the best conductor of electricity?
5. What components are needed to make a working circuit?

Links To Prior Learning

Use of everyday materials - this unit builds on pupils' knowledge and understanding where they will have already:

- found out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching (Year 2)' - *this will have introduced the idea that energy makes things happen and can be seen by its effects.*
- identified and compared suitability of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses (Year 2) – *this will be expanded in this unit to include grouping materials into those which make good electrical insulators and those which make good electrical conductors.*

Light - this unit builds on pupils' knowledge and understanding where they will have already:

- noticed that light is reflected from surfaces (Year 3). - *this will have introduced the idea that light is a form of energy and how it travels.*

Sound

- identified the way that sound is a made through vibration (Year 4). - *this will have introduced the idea that sound is a form of energy and how it travels.*

Vocabulary: energy, material, object

Common Misconceptions

! **Electricity is a substance.** Some pupils may think that electricity could leak out of a broken circuit.

! **Mains electricity does not flow in a circuit.** It does but the wires are not immediately visible or encased in a single cable.

! **A switch must be placed before a component in an electrical circuit to work.** A switch can be placed anywhere in a circuit.

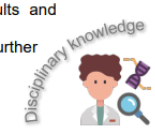
St Laurence-in-Thanet Junior Academy

Science	Year 4	Animals, Including Humans

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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



Big Ideas

1	**There is a relationship between structure and function**
2	**Living** and non-living **things can be grouped in a variety of ways**
5	**Living things have characteristics and requirements for life, growth and health**
7	**Living things depend on each other and on the environment; humans can have both a positive and negative impact**

National Curriculum Objectives

Pupils should be taught to:

- describe the simple functions of the basic parts of the digestive system in humans
- identify the different types of teeth in humans and their simple functions
- construct and interpret a variety of food chains, identifying producers, predators and prey

Year 4

Animals, Including Humans

Building component knowledge - **Animals, Including Humans**

1. Why do we have different shaped teeth?
2. What can we tell about an animal from looking at its teeth?
3. What happens to our food when we eat it?
4. Can models help us understand human processes?
5. Why are food chains important?

Links To Prior Learning

Animals, including humans- this unit builds on pupils' knowledge and understanding where they will have already:

- identified and name a variety of common animals that are carnivores, herbivores and omnivores (Year 1).
- identified 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' (Year 3).

Vocabulary: carnivore, herbivore, omnivore, nutrition, diet, food groups, skeleton, muscles

Common Misconceptions

! **Digestion mainly happens in the stomach.** This is incorrect:
- Mouth: Chews food and mixes it with saliva to start breaking it down.
- Oesophagus: Transports food from the mouth to the stomach using muscular contractions.
- Stomach: Secretes acids and enzymes to further break down food into a soupy mixture.
- Small Intestine: Absorbs nutrients from the broken-down food.
- Large Intestine: Absorbs water and forms waste (faeces).

! **All teeth serve the same purpose in chewing.** This is incorrect:
- Incisors: Front teeth for cutting and biting.
- Canines: Pointed teeth for tearing and gripping.
- Premolars: Flat-topped teeth for grinding and crushing.
- Molars: Large, flat teeth at the back for further grinding.

! **All living things in a food chain directly eat each other**. Living things play different roles in a food chain, either producing food or consuming it at various levels.

! **We have one tube for both eating and breathing**. Food travels from the mouth to the stomach through the oesophagus and the larynx connects the mouth to the lungs.

! **The stomach is found near your belly button or lower**. It is higher up, underneath the lungs.

Science	Year 4	Living Things and Their Habitats

Working Scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- 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/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

Big Ideas

2	Living and non-living things can be grouped in a variety of ways
7	Living things depend on each other and on the environment; humans can have both a positive and negative impact

National Curriculum Objectives

Pupils should be taught to:

- recognise that living things can be grouped in a variety of ways
- explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment
- recognise that environments can change and that this can sometimes pose dangers to living things

Year 4

Living Things and Their Habitats

Building component knowledge - **Living Things and Their Habitats**

1. Is it helpful to group living things?
2. What types of animals live in the local area?
3. What is special about our local environment?
4. What dangers are posed to habitats and the environment?
5. How can we develop the local area to protect living things?

Links To Prior Learning

Living things and their habitats - this unit builds on pupils' knowledge and understanding where they will have already:

- identified that most living things live in habitats to which they are suited and describe how different habitats provide for the basic needs of different kinds of animals and plants, and how they depend on each other (Year 2).
- identified and named a variety of plants and animals in their habitats, including microhabitats (Year 2).

Animals, including humans- this unit builds on pupils' knowledge and understanding where they will have already:

- identified and named a variety of common animals including fish, amphibians, reptiles, birds and mammals (Year 1).
- identified and named a variety of common animals that are carnivores, herbivores and omnivores (Year 1).

Plants - this unit builds on pupils' knowledge and understanding from Year 1 where they will have already:

- identified and named a variety of common wild and garden plants, including deciduous and evergreen trees.

Seasonal changes - this unit builds on pupils' knowledge and understanding from Year 1 where they will have already:

- observed changes across the 4 seasons.

Vocabulary: living, features, environment, habitat, microhabitat, fish, amphibian, reptile, bird, mammal, carnivore, herbivore, omnivore,

Common Misconceptions

! **All living things are easily identifiable based on a single characteristic.** Living things can have diverse characteristics, and classification often involves considering multiple features.

! **Once classified, living things never change groups.** Changes in classification may occur as scientific understanding evolves.

! **Living things can adapt quickly to environmental changes.** Many living things can adapt quickly but some changes may occur too rapidly for successful adaptation.

! **Human activities do not significantly impact the environments of living things**. Human activities, such as deforestation, pollution, and climate change, can have profound effects on ecosystems, sometimes posing severe dangers to the living organisms within them.

St Laurence-in-Thanet Junior Academy

Science	Year 5	Animals, Including Humans

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

Big Ideas

3	Humans move through different stages of growth and development
5	Living things have characteristics and requirements for life, growth and health

National Curriculum Objectives

Pupils should be taught to:

- describe the changes as humans develop to old age

Year 5

Animals, Including Humans

Building component knowledge - **Animals, Including Humans**

How do humans change over time? → How can we investigate changes as we progress through the lifecycle? → What happens to us during puberty? → What can the size of animals incl. humans tell us about gestation periods?

The Education People

Primary Science Scheme of Work

Links To Prior Learning

Animals, including humans- this unit builds on pupils' knowledge and understanding where they will have already:

- Noticed that animals, including humans, have offspring which grow into adults (Year 2).
- Described the importance for humans of exercise, eating the right amounts of different types of food, and hygiene (Year 2).
- Identified that animals, including humans, need the right types and amount of nutrition…; they get nutrition from what they eat (Year 3).

Vocabulary: human, mammal, offspring, hygiene, nutrition, growing into adults (reference to baby, toddler, child, teenager, adult)

Common Misconceptions

! **Babies are like blank slates, and their personalities are solely shaped by their parents.** While genetics and early experiences with caregivers play a role, infants also have individual temperaments and characteristics from birth. They actively engage with their environment and begin forming their own unique personalities.

! **Academic achievement is the only measure of a child's intelligence and potential.** Intelligence is multifaceted, encompassing various types of abilities such as emotional intelligence, creativity, and problem-solving skills.

! **Teenagers are inherently rebellious and difficult to manage.** While adolescence can bring challenges, many teenagers navigate this period with positive behaviour.

! **Puberty is the same for everyone.** Puberty onset and progression vary widely among individuals. While there is a general sequence of changes, the timing can be influenced by genetics, environmental factors, and overall health.

! **All puberty-related changes are visible.** Puberty involves not only physical changes but also emotional, psychological, and cognitive changes. Hormonal shifts can influence mood, self-perception, and interpersonal relationships.

! **Older adults are not capable of learning new things.** Cognitive abilities may change, but adaptability and continued growth are still possible.

! **Aging always leads to poor health and disability.** While aging can bring health challenges, many older adults maintain good health and well-being. Lifestyle factors, genetics, and access to healthcare play crucial roles in determining the health outcomes of older individuals.

St Laurence-in-Thanet Junior Academy

Science	Year 5	Earth and Space

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

Big Ideas

6	Changing the movement of an object requires a net force (push or pull) to be acting on it
10	The movement of Earth affects the seasons and times of day

National Curriculum Objectives

Pupils should be taught to:

- 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

Year 5

Earth and Space

Building component knowledge - **Earth and Space**

How does our position in the solar system impact life on Earth? → Does anything else orbit the sun? → How do we get night and day? → How can shadows show us that Earth is rotating?

The Education People

Primary Science Scheme of Work

Links To Prior Learning

Seasonal changes - this unit builds on pupils' knowledge and understanding from Year 1 where they will have already:

- observed and described weather associated with the seasons and how day length varies (i.e. Earth's movement).

Light - this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- recognised that light from the sun can be dangerous and that there are ways to protect their eyes.
- found patterns in the way that the size of shadows change (i.e. the sun as a source of light and energy).

Forces and magnets - this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- described magnets as having 2 poles (i.e. the basic idea of Earth's axis and movement around the sun).

Vocabulary: sun, light source, energy, Earth, North Pole, South Pole (pupils likely to have some understanding of planets, universe, space etc.)

Common Misconceptions

! **The Earth and other planets move in a perfect circular orbit around the sun.** Planets, including Earth, move in elliptical orbits around the sun. The orbits are not perfect circles but slightly elliptical.

! **The moon emits its own light.** The moon does not produce light; it reflects sunlight. The phases of the moon are a result of its changing position relative to the sun and Earth. The side of the moon facing the Earth is illuminated by the sun, creating the different moon phases.

! **The Earth is a perfect sphere, and the sun and moon are also perfectly spherical.** While the Earth is approximately spherical, it is not a perfect sphere; it's an oblate spheroid. The sun and moon are not perfect spheres either; they are slightly flattened at the poles and bulging at the equator due to their rotation.

! **The sun moves around the Earth.** The Earth rotates on its axis, causing day and night. The apparent movement of the sun across the sky is due to the Earth's rotation, not the sun moving around the Earth. The sun appears to rise in the east and set in the west because of the Earth's rotation from west to east.

Science	Year 5	Forces

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

Big Ideas

6	Changing the movement of an object requires a net force (push or pull) to be acting on it
10	The movement of Earth afffects the seasons and times of day

National Curriculum Objectives

Pupils should be taught to:

- 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

Year 5

Forces

Building component knowledge - **Forces**

How does friction affect the amount of force required to move an object? → What is gravity? → How does air resistance affect the speed at which an object falls? → What changes the effects of water resistance? → What impact do gears, levers and pulleys have on forces?

Links To Prior Learning

Forces and Magnets – this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- Comparing how things move on different surfaces.
- Noticing that some forces need contact between 2 objects, but magnetic forces can act at a distance.
- Observing how magnets attract or repel each other and attract some materials and not others.
- Comparing and grouping together a variety of everyday materials on the basis of whether they are attracted to a magnet and identify some magnetic materials.
- Describing magnets as having 2 poles.
- Predicting whether 2 magnets will attract or repel each other, depending on which poles are facing.

Pupils should know about contact forces, knowing that they require a push and a pull between two objects. They should understand that friction is a contact force that affects the movement of objects and acts in the direction opposite to that of the object moving on the surface.

Vocabulary: force, surface, contact/non-contact force, friction, resistance, gravity, magnetic field, magnetism, attract, repel

Common Misconceptions

! **Heavier objects fall more quickly.** Heavier objects do not always fall to the ground more quickly than lighter objects do.

! **There is no friction at all on smooth surfaces**. There are no frictionless surfaces. Smooth surfaces such as ice or glass have very little friction compared to rougher object such as rock or sand.

! **If an object is stationary, there are no forces acting on it**. An object at rest may still have forces acting on it, as long as they are balanced.

! **Heavy objects sink and light objects float**. Density plays a part in why some things float and some sink. Objects that are denser than water sink and those that are less dense float. Hollow things often float too as air is less dense than water.

St Laurence-in-Thanet Junior Academy

Science	Year 5	Properties and Changes of Materials

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

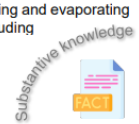
Big Ideas

1	**There is a relationship between structure and function**
2	Living and **non-living things can be grouped in a variety of ways**
4	**All matter on earth exists in one of three states: solid, liquid, gas and the state of matter can change**
9	**Energy makes things happen and can be seen by its effects; it can be transferred (but is not used up)**

National Curriculum Objectives

Pupils should be taught to:

- 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



Year 5

Properties and Changes of Materials

Building component knowledge - **Properties and Changes of Materials**

1. What material is most effective in keeping a cup of tea warm?
2. Which material would be best to keep an ice lolly cold?
3. When we change a material, is it always forever?
4. How can we separate a mixture?
5. When does a change make a new material?

Links to Prior Learning

Everyday materials - this unit builds on pupils' knowledge and understanding where they will have already:

- described the simple physical properties of a variety of everyday materials (Year 1).
- compared and group together a variety of everyday materials on the basis of their physical properties (Year 1).
- identified and compared the suitability of a variety of everyday materials…for particular uses (Year 2).
- found out how the shapes of solid objects made from some materials can be changed…(Year 2).

Forces and magnets - this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- compared and grouped together a variety of everyday materials on the basis of whether they are attracted to a magnet…

States of matter - this unit builds on pupils' knowledge and understanding from Year 4 where they will have already:

- compared and grouped materials together, according to whether they are solids, liquids or gases.
- observed that some materials change state when they are heated or cooled…
- identified the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.

Electricity - this unit builds on pupils' knowledge and understanding from Year 4 where they will have already:

- recognised some common conductors and insulators, and associate metals with being good conductors.

Vocabulary: object/material, wood, metal, plastic, glass, brick, rock, paper, cardboard, transparent, hard, permeable, impermeable, magnetic, solid, liquid, gas, evaporation, electrical insulator, electrical conductor

Common Misconceptions

! **Melting is the same as dissolving.** Melting is when a solid is heated to a high enough temperature to turn into a liquid. When solid materials dissolve in a liquid, they form a solution.

! **A solute (for example sugar or salt) disappears when it dissolves.** It doesn't – the solid has not disappeared (e.g. you can still taste the sugar dissolved in water).

! **Putting insulation layers on ice will 'warm it up'.** Thermal insulators have the opposite effect on ice as they slow the transfer of heat from the air to the ice.

Science	Year 5	Living Things and Their Habitats

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

Big Ideas

3	Humans move through different stages of growth and development
5	Living things have characteristics and requirements for life, growth and health

National Curriculum Objectives

Pupils should be taught to:

- 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

Year 5

Living Things and Their Habitats

Building component knowledge - **Living Things and Their Habitats**

1. Are there any differences between the lifecycles of mammals, amphibians, insects and birds?
2. How can we behave like naturalists?
3. What is sexual reproduction in plants?
4. Can plants reproduce without seeds?
5. Do all animals reproduce in the same way?

The Education People Primary Science Scheme of Work

Links to Prior Learning

Living Things and Their Habitats - this unit builds on pupils' knowledge and understanding where they will have already:

- explored and compared the differences between things that are living, dead, and things that will have never been alive (Year 2).

Animals, including humans - this unit builds on pupils' knowledge and understanding where they will have already:

- noticed that animals, including humans, have offspring which grow into adults (Year 2).

Plants – this unit builds on pupils' knowledge and understanding where they have already:

- observed and described how seeds and bulbs grow into mature plants (Year 2).
- explored the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal (Year 3).

Vocabulary: reproduce, offspring, lifecycle, growth, (human, child, toddler, teenager, adult), seed, bulb, parent plant, dispersal, flower, pollination, pollen, nectar, germination

Common Misconceptions

! **All mammals raise their young in the same way.** Parental care varies among mammals; some, like humans, provide care, while others have more independent young.

! **Amphibians stay in water throughout their lives.** Amphibians often begin life in water (as tadpoles) but transition to land as an adult.

! **All insects pupate in a cocoon.** Some insects form cocoons (e.g., butterflies), others undergo pupation without a cocoon (e.g., beetles).

! **All birds build nests.** While many birds build nests, some lay eggs in other types of environments, such as burrows or on the ground.

! **All plants reproduce through seeds.** While many plants reproduce through seeds, others use methods like spores, runners, or bulbs.

! **Mammals do not lay eggs.** Most mammals give birth to live young, but monotremes (platypus and echidna) are exceptions—they lay eggs.

St Laurence-in-Thanet Junior Academy

Science	Year 6	Living Things and Their Habitats

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

Big Ideas

2 **Living** and non-living **things can be grouped in a variety of ways**

National Curriculum Objectives

Pupils should be taught to:

- 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

Year 6

Living Things and Their Habitats

Building component knowledge - **Living Things and Their Habitats**

1. Is the classification of animals helpful?
2. Are there many similarities between animals in the local area?
3. How can plants be classified?
4. Is there a link between plant groups and the environment they grow in?
5. Do microorganisms matter?

The Education People Primary Science Scheme of Work

Links to Prior Learning

Animals, including humans- this unit builds on pupils' knowledge and understanding from Year 1 where they will have already:

- identified and named a variety of common animals including fish, amphibians, reptiles, birds and mammals.
- described and compared the structure of a variety of common animals.

Living things and their habitats - this unit builds on pupils' knowledge and understanding from Year 4 where they will have already:

- recognised that living things can be grouped in a variety of ways.
- explored and used classification keys to help group, identify and name a variety of living things in their local and wider environment.

Pupils also have knowledge of grouping and sorting living and non-living things from several earlier topics - this will not be a new concept/idea.

Vocabulary: group, category, classification, vertebrate, invertebrate, dichotomous key

Common Misconceptions

! **All living things are easily identifiable based on a single characteristic.** Living things can have diverse characteristics, and classification often involves considering multiple features.

! **All Similarities Mean Close Evolutionary Relationships.** Some might assume that if two organisms share a common characteristic, they must be closely related. However, some features may evolve independently in different groups due to convergent evolution.

! **Once classified, living things never change groups.** Changes in classification may occur as scientific understanding evolves.

! **Only physical features can be used to classify living things.** Taxonomy uses many features that cannot be seen, such as DNA, to determine relationships between organisms. As techniques improve, the classification of an organism can and does change.

! **Misunderstanding the Purpose of Classification.** Some might believe that classification is only for organising information neatly. However, one of its primary purposes is to reflect evolutionary relationships, allowing us to understand the shared ancestry of different organisms.

St Laurence-in-Thanet Junior Academy

Science	Year 6	Evolution and Inheritance

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments

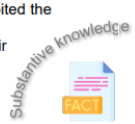
Big Ideas

8 **The diversity of organisms, living and extinct, is the result of evolution**

National Curriculum Objectives

Pupils should be taught to:

- 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



Year 6

Evolution and Inheritance

Building component knowledge – **Evolution and Inheritance**

1. How do scientists know that living things have changed over time?
2. How does variation explain the different features and characteristics of living things?
3. How has variation led to evolution?
4. Do all living things adapt in the same way?
5. How have plants in the local area adapted?

The Education People Primary Science Scheme of Work

Links to Prior Learning

Living thing and their habitats - this unit builds on pupils' knowledge and understanding where they will have already:

- explored and used classification keys to help group, identify and name a variety of living things in their local and wider environment (Year4).
- recognised that environments can change and that this can sometimes pose dangers to living things (Year 4).
- described how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including microorganisms, plants and animals (Year 6).

Animals, including humans - this unit builds on pupils' knowledge and understanding where they will have already:

- noticed that animals, including humans, have offspring which grow into adults (Year 2).

Rocks - this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

- described in simple terms how fossils are formed when things that have lived are trapped within rock.

Vocabulary: environment, offspring, lifecycle, reproduce, rock, fossil, remains, preserve, decay, palaeontologist, fossilisation, organic matter, sedimentary, sediment

Common Misconceptions

! **Fossils are the remains of the direct ancestors of modern species**. Fossils represent a snapshot of past life, but not all fossils are direct ancestors. They may belong to extinct branches or transitional forms.

! **Offspring will always be exactly like their parents.** While offspring inherit traits from their parents, there is always variation due to genetic recombination. This variation is crucial for natural selection and the evolutionary process.

! **Individuals can adapt during their lifetime, and these acquired traits are passed on to their offspring.** Adaptations that lead to evolution occur through genetic changes over generations, not within an individual's lifetime.

! **All adaptations are advantageous.** Adaptations are context dependent. What is advantageous in one environment may be a disadvantage in another. Evolution doesn't always lead to perfection but to better-suited traits for a specific environment.

St Laurence-in-Thanet Junior Academy

Science	Year 6	Electricity

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
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- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

Big Ideas

9 **Energy makes things happen and can be seen by its effects (light, sound, electricity); it can be transferred but is not used up**

National Curriculum Objectives

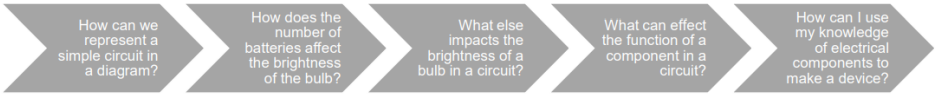
Pupils should be taught to:

- 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.

Year 6

Electricity

Building component knowledge - **Electricity**



The Education People Primary Science Scheme of Work

Links To Prior Learning

Electricity - this unit builds on pupils' knowledge and understanding from Year 4 where they will have already:

- identified common appliances that run on electricity
- constructed a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers
- identified whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery
- recognised that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit
- recognised some common conductors and insulators, and associate metals with being good conductors

Pupils should also know the basics of electrical safety and this knowledge will be revisited during the unit.

Vocabulary: series circuit, cell, battery, wire, bulb, switch, buzzer, electrical conductor, electrical insulator, mains electricity, electrical energy

Common Misconceptions

! **Electricity is a substance.** Some pupils may think that electricity could leak out of a broken circuit.

! **Mains electricity does not flow in a circuit.** It does but the wires are not immediately visible or encased in a single cable.

! **A switch must be placed before a component in an electrical circuit to work.** A switch can be placed anywhere in a circuit.

! **The more cells (batteries) used in a circuit, the brighter the lamp or louder the buzzer will be.** Brightness or volume depends on factors like the type of bulb or buzzer, resistance in the circuit, and not solely on the number or voltage of cells.

! **All components of a circuit, such as bulbs and buzzers, should function the same way regardless of variations in the circuit.** Variations in component function can result from factors like resistance, the type of component, and the arrangement of the circuit.

! **Any symbols can be used in a circuit diagram**. There are standardised symbols for components in circuit diagrams. Using recognised symbols ensures clear communication and understanding.

These misconceptions should have already been addressed in the Year 4 unit on electricity, but it would be worthwhile to check that pupils' have remembered this.

St Laurence-in-Thanet Junior Academy

Science	Year 6	Light

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
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- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and a degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.

Big Ideas

9 **Energy makes things happen and can be seen by its effects (light, sound, electricity); it can be transferred but is not used up**

National Curriculum Objectives

Pupils should be taught to:

- 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.

Year 6

Light

Building component knowledge - **Light**

Links to Prior Learning

Light – this unit builds on pupils' knowledge and understanding from Year 3 where they will have already:

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

Vocabulary: light, reflect, light source, visible, visibility, dark, shiny, bright, dull, matt, mirror, reflection, reflect, angle, opaque, translucent, transparent, shadows, UV rays, protection, retina, damage, rotation, compass direction

Common Misconceptions

! **Light always travels in straight lines.** Light will travel in straight lines in all directions until it meets a material that changes its path. Some materials may stop light whereas others might allow light to travel through in a straight line.

! **Light is needed to see.** This is course true, however pupils often confuse light (from a light source) must directly enter the eye rather to see the object than the light reflecting off the object itself.

! **Light can only be reflected from shiny surfaces**. Our ability to see objects depends on the reflection of light.

! **An object cannot absorb and reflect light – it must do one or the other.** All objects absorb and reflect light to different degrees.

Some of these misconceptions will have already been addressed in the Year 3 unit on light, but it would be worthwhile to check that pupils have remembered this.

St Laurence-in-Thanet Junior Academy

Science	Year 6	Animals, Including Humans

Working Scientifically

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
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- identifying scientific evidence that has been used to support or refute ideas or arguments

Big Ideas

1	There is a relationship between structure and function
5	Living things have characteristics and requirements for life, growth and health

National Curriculum Objectives

Pupils should be taught to:

- 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 ways their bodies function
- describe the ways in which nutrients and water are transported within animals including humans

Year 6

Animals, Including Humans

Building component knowledge - **Animals, Including Humans**

1. What is the purpose of the circulatory system?
2. Why is blood so important?
3. How does exercise affect our circulatory system?
4. How are nutrients and water transported within animals, including humans?
5. How do diet, exercise, drugs and lifestyle impact our bodies?

The Education People Primary Science Scheme of Work

Links To Prior Learning

Animals, including humans- this unit builds on pupils' knowledge and understanding where they will have already:

- described the importance for humans of exercise, eating the right amounts of different types of food, and hygiene (Year 2).
- identified 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 (Year 3).
- described the simple functions of the basic parts of the digestive system in humans (Year 4).
- identified the different types of teeth in humans and their simple functions (Year 4).

Vocabulary:

Common Misconceptions

- ! **Blood is blue inside the body and turns red when exposed to oxygen.** Blood is always red. It may appear blue through the skin due to the way light interacts with it. The colour change is not due to oxygenation.
- ! **More exercise always leads to better health.** While exercise is beneficial, excessive or improper exercise can have negative effects. A balanced approach is key.
- ! **All drugs are harmful.** Some drugs are necessary for medical treatment. It's important to differentiate between medicinal and recreational drug use.
- ! **Water is primarily transported in the body through food.** While food contributes to hydration, the primary way the body obtains water is through drinking fluids.
- ! **Nutrients move freely in the bloodstream without any control.** Nutrients are transported in the bloodstream, but the process involves regulation and specific mechanisms to ensure proper distribution.
- ! **All nutrients are absorbed in the same way in the digestive system.** Different nutrients are absorbed through various mechanisms in the digestive system. For example, some are absorbed in the stomach, while others are absorbed in the small intestine.

St Laurence-in-Thanet Junior Academy

Example lesson from The Education People

Year 6

Animals, Including Humans

Animals, Including Humans – Unit Preparation

Suggested Significant People

Beyond living memory…

William Harvey (1578-1657)

English physician known for describing the circulation of blood in the body

Within living memory…

Donald Palmer (1962-)

British-Jamaican scientist who researches the human immune system

Possible Enrichment Opportunities

Inside the classroom

- STEM offers lots of freely available practical ideas for extending learning inside the classroom.
- Share research journals: kids.frontiersin.org / Science Journal for Kids - YouTube

Out and about – the local area

- Arrange to work with a local secondary school to collaborate with dissecting a heart or on learning about the risks of drugs. http://www.timeanddate.com/worldclock/moonrise.html

Out and about – further afield

- Visit the world's largest display dedicated to the story of medicine at the Science Museum, London.

Vocabulary

Tier 2: pump, heart, lifestyle, drugs, medicine, illegal, vitamins

Tier 3: circulatory system, organ, blood vessels, arteries, veins, capillaries, living cells, oxygen, carbon dioxide, deoxygenated, oxygenated, platelets, plasma, red/white blood cells, antibodies, single/double circulatory system, nicotine, caffeine, proteins, stimulant, hallucinogen, depressant, nicotine, ethanol

Disciplinary (*non-statutory*): causal relationship, classification key, comparative test, conclusion, *control*, diagram, enquiry, *equipment*, evidence to support/refute, fair test, graph (scatter/bar/line), *information-record*, *measurement*, *observation*, *pattern*, prediction, repeat reading, *research*, results, *secondary source*, table, variable

Resources

Enquiry 1: images of heart and circulatory system

Enquiry 2: a plastic bottle, yellow + red food colouring, range of objects

Enquiry 3: pulse monitor, stopwatches

Enquiry 4: true or false statements, images of heart equipment

Enquiry 5: healthy snacks/packaging, diet case studies, medicine instructions

Reading List

'Disciplinary Literacy'

The Human Body Factory: A Guide To Your Insides - Dan Green

The Marvellous Adventure of Being Human: Your Amazing Body and How to Live in it - Max Pemberton

Human Anatomy For Kids - Scientific Kids Press

Why Is Blood Red? - DK

Science in Action: The Human Body - Your Heart & Lungs - Sally Hewitt

A journey through the circulatory system - by Ruby Leem

Medicine: Discover Amazing People - Jayri Gómez

Medical Invention Breakthroughs (Edge of Medicine) - Heather E Schwartz

Enquiry 1

What Is the Purpose of The Circulatory System?

Why this? Why now?

This first enquiry revisits prior learning about the skeletal, muscular and digestive systems. They will revisit the simple function of muscles - they relax and contract (Year 3) as well as concepts such as bloodstream and system processes (Year 4). Pupils will learn about the ongoing process of the circulatory system and the role this plays in keeping animals, including humans alive.

Substantive Knowledge

- Know that the circulatory system pumps blood around the body.
- Know that the heart, blood and blood vessels play an important role in the circulatory system.
- Know that blood vessels transport oxygenated blood around the body and return to the heart with deoxygenated blood.

Disciplinary Knowledge

- Use scientific diagrams and annotations to explain a scientific process.

Vocabulary: circulatory system, heart, organ, blood vessels, arteries, veins, capillaries, living cells, pump, oxygen, carbon dioxide, deoxygenated, oxygenated

Resources: images of the heart and circulatory system

Lesson outline

<u>Do not pack this lesson with lots of activities – the focus is on ensuring that pupils can articulate a process.</u>

Recap prior learning: What systems have we learnt about inside our bodies? Ask pupils to recall their knowledge about the digestive system.

Allow the children to place their hand over their chests. Ask them what they can feel. The children can do this again after jogging on the spot for 30 seconds. Ask them to discuss what is happening.

Explain that they can feel their heart beating faster because it is trying to pump more blood out to your body through the **circulatory system**. This system refers to the movement of blood through the **heart** and around the body. The heart is a muscular **organ** – what do we remember about muscles? Talk about contracting and relaxing.

Show the pupils a video, such as this one which explains the circulatory system: https://www.youtube.com/watch?v=mC7-XXmbF90

Pupils watch the first video again and make notes to capture the most important information. Alternatively, or to supplement, the BBC also offer information and more accessible videos of the circulation process for those that may need it: The circulatory system - BBC Bitesize

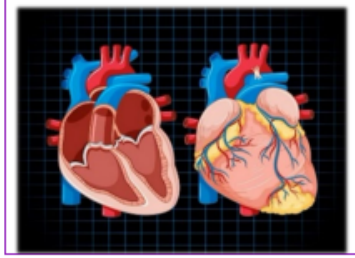
Come back together and discuss the process together, taking time and giving pupils time to talk this through:

1. When we inhale, **oxygen** enters our body and is transported to the lungs. The oxygen then travels to our heart in the blood.
2. Our **heart** is a muscular organ that works like a **pump**. It is divided into the left and right side. This is so that the blood with oxygen in it (**oxygenated** blood) can be kept separate from blood without oxygen in it (deoxygenated blood). Valves in the heart only open one way to stop the blood from flowing in the wrong direction. When the heart contracts, it squeezes the oxygenated blood out of the left-hand side of the heart through the aorta which is the main artery leaving the heart.
3. Blood travels through **blood vessels**. **Arteries** are blood vessels with thick walls that carry blood away from the heart. The blood can reach every living cell by travelling through a network of much smaller blood vessels called **capillaries**. Capillaries branch off from arteries and carry the oxygen close to cells so that oxygen can be diffused through their thin walls.
4. The living cells in the body take the oxygen from the blood so that they can continue to work and transfer their waste (**carbon dioxide**) into the blood.
5. This **deoxygenated** blood then travels back to the heart through blood vessels called **veins** to get rid of the carbon dioxide and collect more oxygen so that the process can start again.
6. When it gets back to the heart, the blood enters the right side of the heart where it is pumped into the lungs so that the carbon dioxide can be exhaled.

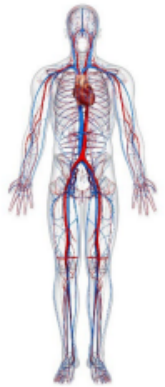
Give pupils diagrams like those below which show the heart and the circulatory system. Give them several opportunities to move around the classroom, finding different partners each time and taking it in turns to talk about the circulatory system, explaining how it works.

When you come back together, pupils recommend others who gave good explanations and listen to some. Summarise the above process through the following **little idea**:

- The **circulatory system** has three main parts: the **heart** (a muscular organ that pumps blood), **blood vessels** (arteries, veins, and capillaries), and **blood** (which carries oxygen, nutrients, hormones, and waste products).
- The **circulatory system** transports **nutrients**, **water** and **oxygen** to the entire body.



Consider bringing in pig hearts, which are similar to human hearts, and show pupils how to use scalpels to open the hearts and identify the features that have been discussed. This is something that a secondary school specialist might be able to support with.



- Pupils stick the images (see examples) into their books and annotate around them to show how the system works and the function of the heart in the circulatory system. *They should use the words: circulatory system, heart, organ, blood vessels, arteries, veins, capillaries, pump, oxygen, carbon dioxide, deoxygenated, oxygenated, travel.*

Reinforce learning from this lesson so that pupils can **identify and name the main parts of the human circulatory system and describe the functions of the heart, blood vessels and blood –**

- Pupils should independently answer the enquiry question from the session in their science books – **What Is the Purpose of The Circulatory System?** – this should be a written paragraph (to demonstrate disciplinary writing) and may include supporting diagrams.

Finish the lesson by revisiting the **little ideas** – pupils could use this to add any missing information (preferably in a different colour) to their recorded answers for the enquiry question (see above):

- The **circulatory system** has three main parts: the **heart** (a muscular organ that pumps blood), **blood vessels** (arteries, veins, and capillaries), and **blood** (which carries oxygen, nutrients, hormones, and waste products).
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Link to the Big Idea – 'there is a relationship between structure and function' and recap how are bodies are designed to include the parts that make the circulatory system possible.

Ask pupils how they think this relates to the digestive system. Pupils might think that the digestive system and the circulatory system do not work together but nutrients pass into the blood stream through the digestive system and the circulatory system transports these nutrients around the body to where they are needed.

Ready to progress?

- ☑ Do pupils understand the basic function of the human circulatory system?
- ☑ Can pupils use the key vocabulary, diagrams and annotations to explain the processes involved in the circulatory system?

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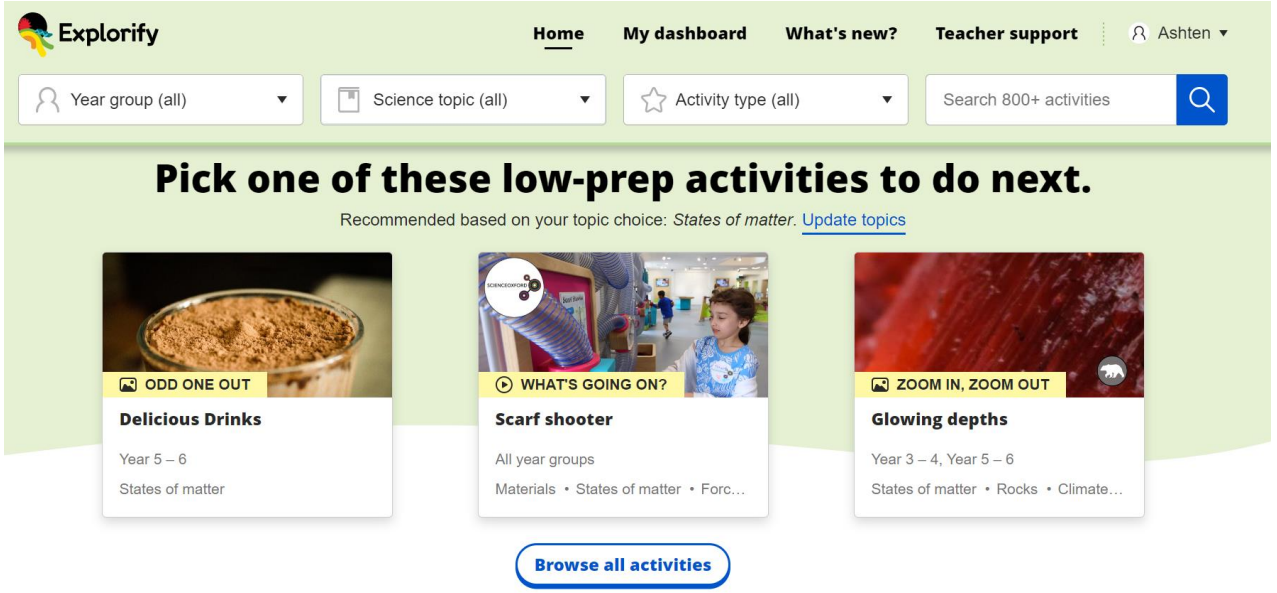
Explorify Membership



Explorify was created in 2016 as part of the Welcome Trust's commitment to investing in primary science. Using evidence-based research, we worked with teachers and other organisations in the science education sector to produce and test a set of activities that would help to develop pupils' thinking skills and lead to scientific enquiry.

Teachers at St Laurence are encouraged to use Explorify to enhance children's learning alongside The Education People scheme and embed within the timetable as smaller activities to recap on prior or current science learning.