

How does Science Transform futures and build lives?

- Science at HTL aims to develop a fun, practical and engaging high-quality curriculum that inspires the next generation to succeed and excel in science.
- We do this through fully adhering to the aims of the national curriculum and fostering a healthy curiosity and interest in the sciences.
- We believe science encompasses the acquisition of knowledge, concepts, skills and positive attitudes.



Implementation

- The acquisition of key scientific knowledge is an integral part of our science lessons. Linked knowledge organisers enable children to learn and retain the important, useful and powerful vocabulary and knowledge contained within each unit. The progression of skills for working scientifically are developed through the year groups and scientific enquiry skills are of key importance within lessons. At HTL, teachers create a positive attitude to science learning within their classrooms and reinforce an expectation that all children are capable of achieving high standards in science.
- Our whole school approach to the teaching and learning of science involves the following;
 - Science will be taught in planned, and arranged, topic blocks by the class teacher. Our strategy is to enable all children to be catered for through adapted planning suited to their abilities.
 - Planning involves teachers creating practical, engaging lessons with opportunities for precise questioning in class to test conceptual knowledge and skills, and assess children regularly to identify those children with gaps in learning.
 - Working Scientifically skills are embedded into lessons to ensure these skills are being developed throughout the children's school career, and new vocabulary and challenging concepts are introduced through direct teaching. This is developed through the years, in keeping with the topics.
 - Teachers demonstrate how to use scientific equipment, and the various Working Scientifically skills in order to embed scientific understanding. Teachers find opportunities to develop children's understanding of their surroundings by accessing outdoor learning and workshops with experts.
 - Through enrichment days, such as 'science week', we promote the profile of Science and allow time for the children to freely explore scientific topics.

Intent:

Our curriculum takes full account of the national curriculum's main characteristics of:

- Physics
- Chemistry
- Biology
- Working scientifically

Wherever possible we intend to deliver lessons where children learn through varied systematic investigations, leading to them being equipped for life to ask and answer scientific questions about the world around them. Throughout the programmes of study, the children will acquire and develop the key knowledge that has been identified within each unit and across each year group, as well as the application of scientific skills. We ensure that the Working Scientifically skills are built-on and developed throughout children's time at the school so that they can apply their knowledge of science when using equipment, conducting experiments and investigation, building arguments and explaining concepts confidently, being familiar with scientific terminology and, most importantly, to continue to ask questions and be curious about their surroundings



Impact:

Because the national curriculum specifies on a year-by-year basis what has to be taught, we use end of unit quizzes alongside, teacher assessment to keep track of pupil progress.

The working scientifically part does not conform with the knowledge-rich system as it is checking on pupils' ability to, amongst other things, carry out research, ask questions and carry out tests. There for this part if tracked on our progress ladders.

Pupil voice is used to further develop the Science curriculum, through questioning of pupils' views and attitudes towards Science, to assess the children's enjoyment of science, and to motivate learners.

Nursery

Communication and Language	Personal, Social and Emotional Development	Understanding the World
<p>Understand 'why' questions, like: "Why do you think the caterpillar got so fat?"</p>	<p>Make healthy choices about food, drink, activity and tooth brushing.</p>	<p>Use all their senses in hands-on exploration of natural materials.</p> <p>Explore collections of materials with similar and/or different properties.</p> <p>Talk about what they see, using a wide vocabulary.</p> <p>Begin to make sense of their own life-story and family's history.</p> <p>Explore how things work.</p> <p>Plant seeds and care for growing plants.</p> <p>Understand the key features of the life cycle of a plant and an animal.</p> <p>Begin to understand the need to respect and care for the natural environment and all living things.</p> <p>Explore and talk about different forces they can feel.</p> <p>Talk about the differences between materials and changes they notice.</p>

Reception		
Communication and Language	Personal, Social and Emotional Development	Understanding the World
<p>Learn new vocabulary.</p> <p>Ask questions to find out more and to check what has been said to them.</p> <p>Articulate their ideas and thoughts in well-formed sentences.</p> <p>Describe events in some detail.</p> <p>Use talk to help work out problems and organise thinking and activities, and to explain how things work and why they might happen.</p> <p>Use new vocabulary in different contexts.</p>	<p>Know and talk about the different factors that support their overall health and wellbeing:</p> <ul style="list-style-type: none"> • regular physical activity • healthy eating • tooth brushing • sensible amounts of 'screen time' • having a good sleep routine • being a safe pedestrian 	<p>Explore the natural world around them.</p> <p>Describe what they see, hear and feel while they are outside.</p> <p>Recognise some environments that are different to the one in which they live.</p> <p>Understand the effect of changing seasons on the natural world around them.</p>
ELG		
Communication and Language	Personal, Social and Emotional Development	Understanding the World
Listening, Attention and Understanding	Managing Self	The Natural World
<p>Make comments about what they have heard and ask questions to clarify their understanding.</p>	<p>Manage their own basic hygiene and personal needs, including dressing, going to the toilet and understanding the importance of healthy food choices.</p>	<p>Explore the natural world around them, making observations and drawing pictures of animals and plants.</p> <p>Know some similarities and differences between the natural world around them and contrasting environments, drawing on their experiences and what has been read in class.</p> <p>Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.</p>

Year 1

Biology			Chemistry	Physics
Animals, including Humans	Animals, including Humans	Plants	Everyday Materials	Seasonal Change
<ul style="list-style-type: none"> Name common animals Carnivores, etc 	<ul style="list-style-type: none"> Human body and senses 	<ul style="list-style-type: none"> Common plants Plant structure 	<ul style="list-style-type: none"> Properties of materials Grouping materials 	<ul style="list-style-type: none"> The four seasons Seasonal weather
<ul style="list-style-type: none"> Know how to classify a range of animals by amphibian, reptile, mammal, fish and birds Know and classify animals by what they eat (carnivore, herbivore and omnivore) Know how to sort by living and non living things 	<ul style="list-style-type: none"> Know the name of parts of the human body that can be seen 	<ul style="list-style-type: none"> Know and name a variety of common wild and garden plants Know and name the petals, stem, leaves and root of a plant Know and name the roots, trunk, branches and leaves of a tree 	<ul style="list-style-type: none"> Know the name of the materials an object is made from Know about the properties of everyday materials 	<ul style="list-style-type: none"> Name the seasons and know about the type of weather in each season

Working Scientifically

- Ask questions such as:
 - Why are flowers different colours?
 - Why do some animals eat meat and others do not?
- Set up a test to see which materials keeps things warmest, know if the test has been successful and can say what has been learned
- Explain to someone what has been learned from an investigation they have been involved with and draw conclusions from the answers to the questions asked
- Measures (within Year 1 mathematical limits) to help find out more about the investigations undertaken

Year 2

Year 2				
Biology			Chemistry	
All living things and their habitats	Animals, including Humans	Plants	Everyday Materials	
<ul style="list-style-type: none"> • <i>Alive or dead</i> • <i>Habitats</i> • <i>Adaptations</i> • <i>Food chains</i> 	<ul style="list-style-type: none"> • <i>Animal reproduction</i> • <i>Healthy living</i> • <i>Basic needs</i> 	<ul style="list-style-type: none"> • <i>Plant and seed growth</i> • <i>Plant reproduction</i> • <i>Keeping plants healthy</i> 	<ul style="list-style-type: none"> • <i>Identify different materials</i> • <i>Name everyday materials</i> • <i>Properties of materials</i> 	<ul style="list-style-type: none"> • <i>Compare the use of different materials</i> • <i>Compare movement on different surfaces</i>
<ul style="list-style-type: none"> • Classify things by living, dead or never lived • Know how a specific habitat provides for the basic needs of things living there (plants and animals) • Match living things to their habitat • Name some different sources of food for animals • Know about and explain a simple food chain 	<ul style="list-style-type: none"> • Know the basic stages in a life cycle for animals, (including humans) • Know why exercise, a balanced diet and good hygiene are important for humans 	<ul style="list-style-type: none"> • Know and explain how seeds and bulbs grow into plants • Know what plants need in order to grow and stay healthy (water, light & suitable temperature) 	<ul style="list-style-type: none"> • Know how materials can be changed by squashing, bending, twisting and stretching 	<ul style="list-style-type: none"> • Know why a material might or might not be used for a specific job
Working Scientifically				
<input type="checkbox"/> Ask questions such as: <ul style="list-style-type: none"> • Why do some trees lose their leaves in Autumn and others do not? • How long are roots of tall trees? • Why do some animals have underground habitats? 				
<input type="checkbox"/> Use equipment such as thermometers and rain gauges to help observe changes to local environment as the year progresses				
<input type="checkbox"/> Use microscopes to find out more about small creatures and plants				
<input type="checkbox"/> Know how to set up a fair test and do so when finding out about how seeds grow best				
<input type="checkbox"/> Classify or group things according to a given criteria, e.g. deciduous and coniferous trees				
<input type="checkbox"/> Draw conclusions from fair tests and explain what has been found out				
<input type="checkbox"/> Use measures (within Year 2 mathematical limits) to help find out more about the investigations they are engaged with				

Year 3

Biology

Chemistry

Physics

Animals, including humans

Plants

Plants

Rocks

Forces

Light

- Skeleton and muscles
- Nutrition
- Exercise and health

- Plant life
- Basic structure and functions

- Life cycle
- Water transportation

- Fossil formation
- Compare and group rocks
- Soil

- Different Forces
- Magnets

- Reflections
- Shadows

- Know about the importance of a nutritious, balanced diet
- Know how nutrients, water and oxygen are transported within animals and humans
- Know about the skeletal and muscular system of a human

- Know the function of different parts of flowering plants and trees

- Know how water is transported within plants
- Know the plant life cycle, especially the importance of flowers

- Compare and group rocks based on their appearance and physical properties, giving reasons
- Know how soil is made and how fossils are formed
- Know about and explain the difference between sedimentary, metamorphic and igneous rock

- Know about and describe how objects move on different surfaces
- Know how a simple pulley works and use to on to lift an object
- Know how some forces require contact and some do not, giving examples
- Know about and explain how magnets attract and repel
Predict whether magnets will attract or repel and give a reason

- Know that dark is the absence of light
- Know that light is needed in order to see and is reflected from a surface
- Know and demonstrate how a shadow is formed and explain how a shadow changes shape
- Know about the danger of direct sunlight and describe how to keep protected

Working Scientifically

Use research to find out how reflection can help us see things that are around the corner

Test to see if their right hand is as efficient as their left hand

Use bar charts and other statistical tables (in line with Year 3 mathematics statistics) to record findings

Use research to find out what the main differences are between sedimentary and igneous rocks

Set up a fair test with different variables e.g. the best conditions for a plant to grow

Know how to use a key to help understand information presented on a chart

- Ask questions such as:
- Why does the moon appear as different shapes in the night sky?
 - Why do shadows change during the day?
 - Where does a fossil come from?

Explain to a partner why a test is a fair one e.g. lifting weights with right and left hand, etc.

Be confident to stand in front of others and explain what has been found out, for example about how the moon changes shape

Measure carefully (taking account of mathematical knowledge up to Year 3) and add to scientific learning

Present findings using written explanations and include diagrams when needed

Observe at what time of day a shadow is likely to be at its longest and shortest

Use a thermometer to measure temperature and know there are two main scales used to measure temperature

Make sense of findings and draw conclusions which help them to understand more about scientific information

Observe which type of plants grow in different places e.g. bluebells in woodland, roses in domestic gardens, etc.

Gather and record information using a chart, matrix or tally chart, depending on what is most sensible

Amend predictions according to findings

Test to see which type of soil is most suitable when growing two similar plants

Group information according to common factors e.g. plants that grow in woodlands or plants that grow in gardens

Be prepared to change ideas as a result of what has been found out during a scientific enquiry

Year 4

Biology

Chemistry

Physics

Animals, including humans

All living things and their habitats

States of Matter

Electricity

Sound

- Digestive system
- Teeth
- Food chains

- Grouping living things
- Classification keys
- Adaptation of living things

- Compare and group materials
- Solids, liquids and gases
- Changing state
- Water cycle

- Uses of electricity
- Simple circuits and switches
- Conductors and insulators

- How sounds are made
- Sound vibrations
- Pitch and Volume

- Identify and name the parts of the human digestive system
- Know the functions of the organs in the human digestive system
- Identify and know the different types of human teeth
- Know the functions of different human teeth
- Use and construct food chains to identify producers, predators and prey

- Use classification keys to group, identify and name living things
- Know how changes to an environment could endanger living things
- Group materials based on their state of matter (solid, liquid, gas)

- Know the temperature at which materials change state
- Know about and explore how some materials can change state
- Know the part played by evaporation and condensation in the water cycle

- Identify and name appliances that require electricity to function
- Construct a series circuit
- Identify and name the components in a series circuit (including cells, wires, bulbs, switches and buzzers)
- Predict and test whether a lamp will light within a circuit
- Know the function of a switch
- Know the difference between a conductor and an insulator; giving examples of each

- Know how sound is made, associating some of them with vibrating
- Know how sound travels from a source to our ears
- Know the correlation between pitch and the object producing a sound
- Know the correlation between the volume of a sound and the strength of the vibrations that produced it
- Know what happens to a sound as it travels away from its source

Working Scientifically

- Use research to find out how much time it takes to digest most of our food

- Measure carefully (taking account of mathematical knowledge up to Year 4) and add to scientific learning

- Write up findings using a planning, doing and evaluating process

Use research to find out which materials make effective conductors and insulators of electricity

- Use a data logger to check on the time it takes ice to melt to water in different temperatures

- Make sense of findings and draw conclusions which helps them understand more about the scientific information that has been learned

- Ask questions such as:
 - Why are steam and ice the same thing?
 - Why is the liver important in the digestive systems?
 - What do we mean by 'pitch' when it comes to sound?

- Use a thermometer to measure temperature and know there are two main scales used to measure temperature

- When making predictions there are plausible reasons as to why they have done so

- Gather and record information using a chart, matrix or tally chart, depending on what is most sensible

- Able to amend predictions according to findings

- Carry out tests to see, for example, which of two instruments make the highest or lowest sounds and to see if a glass of ice weighs the same as a glass of water

- Group information according to common factors e.g. materials that make good conductors or insulators

- Prepared to change ideas as a result of what has been found out during a scientific enquiry

- Set up a fair test with more than one variable e.g. using different materials to cut out sound

- Use bar charts and other statistical tables (in line with Year 4 mathematics statistics) to record findings

- Explain to others why a test that has been set up is a fair one e.g. discover how fast ice melts in different temperatures

- Present findings using written explanations and include diagrams, when needed

Year 5

Biology

Chemistry

Physics

All living things and their habitats

Animals, including humans

Properties and changes in materials

Forces

Earth and Space

- Life cycles – plants and animals
- Reproductive processes
- Famous naturalists

- Changes as humans develop from birth to old age

- Compare properties of everyday materials
- Soluble/ dissolving
- Reversible and irreversible substances

- Gravity
- Friction
- Forces and motion of mechanical devices

- Movement of the Earth and the planets
- Movement of the Moon
- Night and day

- Know the life cycle of different living things e.g. mammal, amphibian, insect and bird
- Know the differences between different life cycles
- Know the process of reproduction in plants
- Know the process of reproduction in animals

- Create a timeline to indicate stages of growth in humans

- Compare and group materials based on their properties (e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets
- Know and explain how a material dissolves to form a solution
- Know and show how to recover a substance from a solution
- Know and demonstrate how some materials can be separated (e.g. through filtering, sieving and evaporating)
- Know and demonstrate that some changes are reversible and some are not
- Know how some changes result in the formation of a new material and that this is usually irreversible

- Know what gravity is and its impact on our lives
- Identify and know the effect of air and water resistance
- Identify and know the effect of friction
- Explain how levers, pulleys and gears allow a smaller force to have a greater effect

- Know about and explain the movement of the Earth and other planets relative to the Sun
- Know about and explain the movement of the Moon relative to the Earth
- Know and demonstrate how night and day are created
- Describe the Sun, Earth and Moon (using the term spherical)

Working Scientifically

Set up an investigation when it is appropriate e.g. finding out which materials dissolve or not

Make predictions based on information gleaned from investigations

Able to give an example of something focused on when supporting a scientific theory e.g. how much easier it is to lift a heavy object using pulleys

Set up a fair test when needed e.g. which surfaces create most friction?

Create new investigations which take account of what has been learned previously

Keep an on-going record of new scientific words that they have come across for the first time

Set up an enquiry based investigation e.g. find out what adults / children can do now that they couldn't when a baby

Able to present information related to scientific enquiries in a range of ways including using IT such as power-point and iMovie

Able to relate causal relationships when, for example, studying life cycles

Know what the variables are in a given enquiry and can isolate each one when investigating e.g. finding out how effective parachutes are when made with different materials

Use diagrams, as and when necessary, to support writing

Frequently carry out research when investigating a scientific principle or theory

Use all measurements as set out in Year 5 mathematics (measurement), including capacity and mass

Is evaluative when explaining findings from scientific enquiry

Use other scientific instruments as needed e.g. thermometer, rain gauge, spring scales (for measuring Newtons)

Clear about what has been found out from recent enquiry and can relate this to other enquiries, where appropriate

Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs

Their explanations set out clearly why something has happened and its possible impact on other things

Year 6

Biology			Physics	
Animals, including humans	All living things and their habitats	Evolution and Inheritance	Electricity	Light
<ul style="list-style-type: none"> The circulatory system Water transportation Impact of exercise on body 	<ul style="list-style-type: none"> Classification of living things and the reasons for it 	<ul style="list-style-type: none"> Identical and non identical off-spring Fossil evidence and evolution Adaptation and evolution 	<ul style="list-style-type: none"> Electrical components Simple circuits Fuses and voltage 	<ul style="list-style-type: none"> How light travels Reflection Ray models of light
<ul style="list-style-type: none"> Identify and name the main parts of the human circulatory system Know the function of the heart, blood vessels and blood Know the impact of diet, exercise, drugs and lifestyle on health Know the ways in which nutrients and water are transported in animals, including humans 	<ul style="list-style-type: none"> Classify living things into broad groups according to observable characteristics and based on similarities and differences Know how living things have been classified Give reasons for classifying plants and animals in a specific way 	<ul style="list-style-type: none"> Know how the Earth and living things have changed over time Know how fossils can be used to find out about the past Know about reproduction and offspring (recognising that offspring normally vary and are not identical to their parents) Know how animals and plants are adapted to suit their environment Link adaptation over time to evolution Know about evolution and can explain what it is 	<ul style="list-style-type: none"> Compare and give reasons for why components work and do not work in a circuit Draw circuit diagrams using correct symbols Know how the number and voltage of cells in a circuit links to the brightness of a lamp or the volume of a buzzer 	<ul style="list-style-type: none"> Know how light travels Know and demonstrate how we see objects Know why shadows have the same shape as the object that casts them Know how simple optical instruments work e.g. periscope, telescope, binoculars, mirror, magnifying glass etc.

Working Scientifically

<input type="checkbox"/> Know which type of investigation is needed to suit particular scientific enquiry e.g. looking at the relationship between pulse and exercise	<input type="checkbox"/> Make accurate predictions based on information gleaned from their investigations and create new investigations as a result	Use diagrams, as and when necessary, to support writing and be confident enough to present findings orally in front of the class
<input type="checkbox"/> Set up a fair test when needed e.g. does light travel in straight lines?	<input type="checkbox"/> Able to present information related to scientific enquiries in a range of ways including using IT such as power-point, animoto and iMovie	<input type="checkbox"/> Able to give an example of something they have focused on when supporting a scientific theory e.g. classifying vertebrate and invertebrate creatures or why certain creatures choose their unique habitats
<input type="checkbox"/> Know how to set up an enquiry based investigation e.g. what is the relationship between oxygen and blood?	<input type="checkbox"/> Use a range of written methods to report findings, including focusing on the planning, doing and evaluating phases	<input type="checkbox"/> Frequently carry out research when investigating a scientific principle or theory
<input type="checkbox"/> Know what the variables are in a given enquiry and can isolate each one when investigating	<input type="checkbox"/> Clear about what has been found out from their enquiry and can relate this to others in class	
<input type="checkbox"/> Justify which variable has been isolated in scientific investigation	<input type="checkbox"/> Explanations set out clearly why something has happened and its possible impact on other things	
<input type="checkbox"/> Use all measurements as set out in Year 6 mathematics (measurement), including capacity, mass, ratio and proportion	<input type="checkbox"/> Aware of the need to support conclusions with evidence	
<input type="checkbox"/> Able to record data and present them in a range of ways including diagrams, labels, classification keys, tables, scatter graphs and bar and line graphs	<input type="checkbox"/> Keep an on-going record of new scientific words that they have come across for the first time and use these regularly in future scientific write ups	