



# Science - the Lovelace Way

**At Lovelace we believe that all children are born scientists.**

Children are naturally curious about the world around them and from a young age they are constantly observing, exploring and discovering. As toddlers, children will happily dig up plants to see what they look like out of the soil, take toys apart to see how they work, break an egg to see what's inside, in order to discover. At Lovelace, we aim to further develop the children's inquisitive spirit and ability to work scientifically by combining discovery with learning, enabling the children to learn more, do more and remember more. Through the careful planning and teaching of science, our children will become smarter, healthier and happier.

## **The purpose of study**

Science is a significant part of human culture and represents one of the pinnacles of human thinking capacity. It provides the basis of common experience for development of language, logic, and problem-solving skills in the classroom. It is therefore our duty as teachers to prepare the children for their futures. By teaching science, we are preparing the next generation of STEM (Science Technology Engineering Maths) practitioners. Our enquiry-orientated approach encourages students to explore and ask questions. Teaching the history and philosophy of science creates a coherent and cohesive world picture that inspires pupils. We learn from science's great stories from evolution with Charles Darwin to the light bulb with Thomas Edison.

At Lovelace, we believe that science should be taught in a creative way that encourages the highest level of engagement and progress for all children.

All year groups follow the National Curriculum for science, and therefore in each year group the following areas are taught:

**Early Years Foundation Stage follows the seven areas of learning and development.**

- communication and language
- physical development
- personal, social and emotional development
- Literacy
- Mathematics
- understanding the world
- expressive arts and design

By the end of reception class children should have experienced the following scientific knowledge and skills.

<b>Plants</b> <ul style="list-style-type: none"><li>• Make observations of plants</li><li>• Know some names of plants, trees and flowers</li><li>• May be able to name and describe different plants, trees and flowers</li><li>• Show some care for their world around them</li></ul>	<b>Animals Including Humans</b> <ul style="list-style-type: none"><li>• be able to identify different parts of their body.</li><li>• Have some understanding of healthy food and the need for variety in their diets. 🍌</li><li>• Be able to show care and concern for living things. 🐾</li><li>• Know the effects exercise has on their bodies.</li><li>• Have some understanding of growth and change. 🌱</li><li>• Can talk about things they have observed including animals</li></ul>
<b>Living things and their Habitats</b> In Early Years children should:	<b>Electricity</b> In Early Years children:

<ul style="list-style-type: none"> <li>Comments and questions about the place they live or the natural world.</li> <li>Shows care and concern for living things and the environment.</li> <li>Can talk about things they have observed such as plants and animals.</li> <li>Notifies features of objects in their environment.</li> <li>Comments and asks questions about their familiar world.</li> </ul>	<ul style="list-style-type: none"> <li>May have some understanding that objects need electricity to work.</li> <li>May understand that a switch will turn something on or off.</li> </ul>
<b>Forces</b> In Early Years children should: <ul style="list-style-type: none"> <li>know about similarities and differences in relation to places, objects, materials and living things.</li> <li>talk about the features of their own immediate environment and how environments might vary from one another.</li> <li>make observations of animals and plants, explain why some things occur, and talk about changes.</li> </ul>	<b>Seasons</b> <ul style="list-style-type: none"> <li>Developing an understanding of change.</li> <li>Observe and explain why certain things may occur (e.g. leaves falling off trees, weather changes).</li> <li>Look closely at similarities, differences, patterns and change.</li> <li>Comments and questions about the place they live or the natural world.</li> </ul>
<b>Materials</b> <ul style="list-style-type: none"> <li>be able to ask questions about the place they live.</li> <li>Talk about why things happen and how things work.</li> <li>Discuss the things they have observed such as natural and found objects.</li> <li>Manipulates materials to achieve a planned effect.</li> </ul>	

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Knowledge	Plants  Animals, Including Humans  <u>Seasonal Changes</u>  Everyday Materials	Plants  Animals, Including Humans  Living Things and Their Habitats  Uses of Everyday Materials	Plants  Animals, Including Humans  Rocks  Forces and Magnets  Light	Animals, Including Humans  Living Things and Their Habitats  States of Matter  Sound  Electricity	Animals, Including Humans  Living Things and Their Habitats  Properties of material Change  <u>Earth and Space</u>  Forces	Animals, Including Humans  Living Things and Their Habitats  Light  Electricity  Evolution and Inheritance

How clearly are expectations, the 'sticky' knowledge, science vocabulary and end goals built into curriculum plans? What specifically do pupils need to know? What does science mastery look like?

[W Lovelace Primary\\_Science\\_Curriculum\\_Progression.docx](#)

As science is a core subject, it should be taught once a week, for a whole afternoon. Some year groups currently follow a weekly rota where they teach science every afternoon for a week; this will also suffice. This science curriculum at Lovelace is progressive and is outlined in [this document](#). By following the progression of teaching map through the school from EYFS to Year 6, we are ensuring that the key science concepts are taught and built upon, enabling our children to know more, remember more and do more. Sticky knowledge, science vocabulary and end goals are a key part to every curriculum plan and should be referred to in every lesson. Children should also learn the importance of working scientifically, using all of the key skills, as outlined in the National Curriculum: questioning; observing over time; identifying patterns and relationships; identifying and classifying; researching using secondary sources; and understanding comparative and fair testing. Through the progression model of 'why this?', 'why now?', and 'what next?' children are continually building on their 'working scientifically' skills so that by the time children are in Year 6, they are able to use all of the skills successfully and independently.

Children must also take part in practical experiments to secure and develop their scientific understanding. Science also lends itself to observing nature and being outdoors, thereby not being confined to the classroom. Having excellent school grounds, we are able to utilise it to embed learning, while also celebrating Science Week. Below are examples of Science around the school.



## How Teachers Plan Science Learning

English	ICT	MFL	Science	History	Geography	RE	Art	D & T	Music	PE & Sport	PSHE/SMSC	MATHS
			x									

Sequence, week or progression	Key objectives [OLI] for Key Skills / Attitudes / Knowledge & Understanding	Learning Tasks & Activities	Differentiation & Personalisation	Key Vocabulary	Resources / ICT	Success Criteria 'I can...'
	<ul style="list-style-type: none"> <li>compare and group materials together, according to whether they are solids, liquids or gases</li> <li>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)</li> <li>identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature</li> </ul>					
1	OLI: I can compare and group materials.  I can define what a solid, a liquid and a gas is.	<a href="https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/zsgwvwx">https://www.bbc.co.uk/bitesize/topics/zkgg87h/articles/zsgwvwx</a> Define what a solid, a liquid and a gas is. Identify some through images on the board. Including ones which may be trickier like sand. <a href="https://www.bbc.co.uk/bitesize/clips/zrdkixs">https://www.bbc.co.uk/bitesize/clips/zrdkixs</a> - particular for gasses.	Challenge – why have is it that state of matter. Giving their own reasons from grouping them in that way.	Solid Liquid Gas Group States of matter		I can name the three states of matter. I can define the three states of matter.

- All science planning is recorded on the Lovelace Medium Term Subjects plan, please see example above.
- All lessons should have a clear learning objective and success criteria that are appropriate for the age range of the children. It is often necessary to have a learning objective for the knowledge aspect of the lesson and the skills aspect of the lesson shown in the lesson plan above.
- Within planning, teachers should consider how the children are going to record each piece of work and there should be a variety of ways of doing this (see below).
- Within planning, sticky knowledge should be identified and revisited, linking previous learning to the new learning.
- Key vocabulary should be included in each lesson. The key vocabulary should be hand-written and displayed in the classroom.
- Over the year, children should cover the National Curriculum for their year group and experience each of the areas of working scientifically.
- Key ICT, English and mathematical skills should be used appropriately during science lessons.
- Risk assessments should be completed when necessary.
- Please visit <http://primary.cleapss.org.uk/>, Username: light, Password: bulb22

## **How we record and monitor science learning**

Content of the lesson should be evidenced in science books. At Lovelace we use 'Scrap Book' style books. These are bigger than A4 so that sheets can be stuck in.

**KS1 and KS2:** Complete only science in their 'scrap' book. It is a red covered book with black pages from TTS (AR01164)

- All science work should comply with the Lovelace presentation policy (see separate document). For example, the date and learning objective should be at the top, left hand side of the page. All handwriting should be in Kingston cursive script in KS2 and written in pen or pencil (pen licence rules apply).
- Diagrams should be drawn in pencil. All work for each lesson should be completed and teachers should encourage the children to take intense pride in their work at all times.
- The nature of the 'scrap' book means that children should be given the opportunity to present their work in a variety of ways. Such ways may include (but are not limited to): tables, graphs, collages, photographs, observational drawings, bullet pointed notes, labelling objects, written explanations and creating models.
- Separate topics should be clearly demarcated with 'unit target' pages, a knowledge organiser for the topic, a larger concept map or a concept cartoon to show what the children already know and what they would like to learn.
- Pupils should use specific scientific language during science lessons to communicate their ideas.

Ideas for introducing and developing scientific vocabulary should include:

- Using a glossary which the children can fill in with definitions throughout the topic, this is currently being trialled in Year 4.
- Following modelling from the teacher (my turn, your turn), using stem sentences ask pupils to reference the topic-specific scientific vocabulary (that should also be on the working wall) during lessons.

## **Facilities and resources**

The facilities and resources available are highly conducive to enquiry-based and outside learning. Resources have been organised within topics taught and are found in the Art Cupboard. The school grounds allow us to explore our surroundings and conduct investigations and experiments in line with the curriculum; these spaces include: the woodland walk, the meadow, the amphitheatre, the field and the vast number of trees. You will also find all the nature related resources in the cupboard by the Dolly Lee Lodge.

## WOW Curriculum: - how Science is special at Lovelace

### **101 Must Have Lovelace Learning Experiences**

Bronze:

- Plant seeds and watch them grow.
- Explore and investigate water, sand or mud.
- Watch an egg hatch and hold a newborn chick/duck.
- Explore sounds by making your own musical instruments.
- Explore colour and textures in exciting ways e.g. cornflour, gloop, rice, gel, shaving foam, spaghetti.
- Go on a woodland walk.
- Dig in the allotments.

Silver:

- Go on a mini-beast hunt/ experience animals in their habitat.
- Use your own grown food in a recipe.
- Build and create with a range of materials (inside and out.)

Gold:

- Take responsibility to look after someone or something.
- Adopt a native tree or plant for a year and watch it grow.
- Go on a nature walk at night.
- Create an exploding volcano.
- To go cloud spotting.
- Mummify a tomato.

Platinum:

- Understand how to live a healthy lifestyle.
- Visit a planetarium to visit the stars.
- Make a home for a wild animal.
- Stargaze.
- Be able to identify at least 5 native British trees.
- Launch a rocket.

### **Trips and workshops**

- Planetarium
- Science Museum
- Science school assemblies

### **Moderation & Assessment**

Teachers should use the examples from the best-practice books from each Year group to assess and moderate the children's work. Please see below examples of work and our expectations:

#### **Year 1**

##### **Seasonal change**

##### **Animals Including Humans**

**Plants**

**Everyday Materials**

**Year 2**

**Animals including Humans**

**Materials**

**Living things and their habitats**

**Plants**

**Year 3**

**Rocks**

**Animals including humans**

[IMG\\_3281.JPG](#)

**Forces and Magnets**

[forces magnets.JPG](#)

**Light**

[IMG\\_3283.JPG](#)

**Plants**

[IMG\\_3285.JPG](#)

**Year 4**

**Animals Including Humans**

**Electricity**

**Sound**

[IMG\\_3162.JPG](#)

**Living things and their Habitats**

[IMG\\_3163.JPG](#)

**States of Matter**

[IMG\\_3164.JPG](#)

## **Year 5**

### **Earth and Space**

[IMG\\_3287.JPG](#)

### **Animals including Humans**

### **Properties and changes of materials**

[IMG\\_3286.JPG](#)

### **Living things and their habitats**

[IMG\\_3288.JPG](#)

[IMG\\_3289.JPG](#)

### **Forces**

## **Year 6**

### **Light**

### **Animals including Humans**

### **Electricity**

### **Evolution**

A useful assessment resource for all year groups:

<https://pstt.org.uk/resources/curriculum-materials/assessment>

## **Impact**

The national curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of scientific enquiries that help them answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

Our aim at Lovelace is that our pupils leave here with curious minds, reasoning skills and an unquenchable thirst for knowledge.



## **Feedback and Marking Science Work**

All science work must be marked in green pen and in line with the Lovelace Marking Policy (see separate document). Children should be given 'Next Step' progressive marking, where appropriate and should be given adequate time to respond to that marking. Children should up-level work and respond to marking in their purple polishing pen, this means that sometimes a feedback dialogue might occur. Children should be encouraged to correct spellings and word banks may need to be given that include science specific words. At the end of each unit, a teacher may choose to give a short science assessment; this should also be marked accordingly. These can be found in the Rising Star Science assessments for your year group.

## **Assessment**

Evidence of progress should be recorded using both formative and summative assessment methods. This will help to target any gaps in the children's learning as well as enable the teachers to target those who require a further challenge.

## **Targeted questioning and observations**

Targeted questioning and recording the children's verbal observations are key methods for all year groups and is particularly effective in EYFS and KS1 and/or where the children may have more difficulty recording/articulating their own observations into their work.

## **Evidence in books**

Each topic should produce a number of pieces of work that clearly show the pupils' understanding and progress.

## **Active Assessment**

Active Assessment (Millgate House Publishers) is an excellent tool that can be used for summative assessment from KS1 up to upper KS2. The aim is to encourage the children to apply their learning from each topic in a variety of ways that challenges their thinking and develops their ability to reason. Please see the examples below. *R:\Subject Resources\Science\Active Assessment*

*R:\Subject Resources\Science\Resources\Concept cartoons EYFS - KS2*

Concept Cartoons can be used at the beginning of a topic to assess pupils' prior knowledge and understanding and then again at the end to see how they have progressed. As with the Active Assessment, Concept Cartoons are designed to encourage the children to apply their learning in a range of contexts, enabling them to develop their reasoning and problem solving skills.