

# SCIENCE AT GOSDEN HOUSE

## Key 'End Points' in our Learner's Journey

The Science curriculum supports the progress of our learners in achieving our purposeful and ambitious 'End Points'. These identified 'End Points' focus on 'tooling' up our eventual Gosden Graduates for their future pathways. In addition to these guiding End Points, all learners have ILPs (Individual Learning Plans) based on their EHCP individual outcomes within the four areas of need, which are developed and progressed throughout their time at Gosden.

### Primary End Points

EYFS / KS1 - I am learning to be curious about the world around me, through practical and creative exploration. I am excited to find out more.

KS2 - I am becoming more confident in exploring the wider world and I use my curiosity and creativity to investigate and to express my learning. I explore my own ideas and beliefs and value those of others.

### Secondary End Points

WIIFM (What's in it for me) KS3 /KS4 - I have the skills to be confident in my community and feel valued in making positive contributions. I am interested in the world outside my door and I want to play a part in it, understanding differences in people and my community.

## Why is the development of science skills essential for our Gosden learners and future graduates?

### National Curriculum Science Programme of Study:

Purpose of study: A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, so all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and

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curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

**Aims:** 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. They develop an understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them and are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

### **Gosden Learners:**

Science is a key subject our learners need to be immersed in from EYFS to Year 11. We aim to develop every child's fundamental scientific knowledge, vocabulary and understanding of a range of scientific concepts, methods, processes and skills. Science teaching is delivered through 'Creative and Curious' cross-curricular topics (Primary) and key questions (Secondary) within a spiral curriculum, being revisited many times throughout our learners' school careers but at increasingly higher levels. Coverage of the National Curriculum is adapted as it is essential that the content covered is both meaningful and relevant to our learners at Gosden, while being fun and engaging. While the areas of science studied are important, there needs to be particular focus on the processes and skills involved in scientific enquiry. Through opportunities to explore and understand the world we live in, our learners develop curiosity and wonder, along with enjoyment, appreciation and respect for the world in general. Developing these skills also contributes to the development of resilience and confidence in our learners, having significant implications for mental and physical well-being, well beyond the classroom. This focus also encourages additional types of learning such as critical thinking and problem solving, which will be applicable in many aspects of their adult lives.

As professionals invested in preparing our learners for the challenges of adulthood, we must ensure that all learners - whatever additional needs they have - receive meaningful and relevant science education. Learners should have personal experiences of finding out about and of making connections between new and previous experiences, which not only bring excitement and satisfaction but also the realisation that they can add to their knowledge through active inquiry. Integral to this is our commitment to building Learning Power in our Gosden students.

## **How do we develop, stretch and nurture our learners' science skills?**

Our science curriculum is based around enquiry where pupils are encouraged to be active participants in their learning journey through being supported to ask relevant questions. Many learning opportunities and adventures start with a Key Question aimed at inspiring interest and curiosity. Building Learning Power in our learners underpins all planning and delivery, not viewed as a 'bolt on'. This approach supports and strengthens all pupils 'Learning Habits/ Muscles', our identified essential skills for life.

### **Our Key Pedagogical Elements to the delivery of science at Gosden House**

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**Child led and practical** - The science curriculum must be meaningful and relevant to our learners, with topics and key questions carefully chosen so that our learners engage and see purpose in their learning. We want learning to excite them and make them curious about the world around them. Science learning is not be a passive experience, merely presented with information but one in which our learners are fully involved, discovering for themselves. They have personal experience of finding out about and making connections between new and previous experiences that not only brings excitement and satisfaction but also the realisation that they can add to their knowledge through active inquiry. Where possible, we aim to nurture and encourage our learners' passions and interests by being adaptable within our teaching to increase motivation and enjoyment, as well as empowering them to take ownership of their learning.

**Enquiry led learning** - An essential element of the science curriculum at Gosden is our enquiry based approach to teaching and learning, where students are provided with opportunities to investigate a problem, search for possible solutions, make observations, ask questions, test out ideas, think creatively and use their intuition. In this sense, inquiry-based science involves students doing science where they have opportunities to explore possible solutions, develop explanations for the phenomena under investigation, elaborate on concepts and processes, and evaluate or assess their understandings in the light of available evidence. This approach to teaching relies on teachers recognising the importance of presenting problems to learners that will challenge their current conceptual understanding, so they are forced to reconcile anomalous thinking and construct new understandings. In order to do this effectively it is crucial to differentiate appropriately, using approaches that enable pupils are taught effectively. It is also important to have a secure understanding of how a range of factors can inhibit pupils' ability to learn, and how best to overcome these and to have a clear understanding of the needs of all pupils, in order to engage and support them.

**Reasoning Skills** - Reasoning skills are a key aspect of the science curriculum. Reasoning skills are widely used/developed in science when interacting with partners while carrying out scientific investigations, evaluating how reliable examples of evidence are, coming up with alternative explanations, recognising patterns in data, generating ideas and hypotheses as well as problem-solving. Development of these skills is an integral part of scientific enquiry, but the benefits go far beyond this subject area. These skills are transferable to any subject and everyday life and developing them will equip our learners with a comprehensive set of skills to tackle a variety of problems. They can help learners make rational decisions based on evidence rather than prejudice and see things from different perspectives, thus encouraging empathy and understanding. Reasoning skills can also improve meta-cognition, allowing learners to monitor and assess their own thinking so that they have increased ownership of their learning and more awareness about what skills to use.

**Learning Outside the classroom** - The Science Curriculum lends itself brilliantly to learning outside the class. We believe with a focus on the world around us, and the importance of interaction and experience, it is crucial that children explore and investigate for themselves outside the confines of the classroom. In order to nurture curiosity and awe of the natural world, learners have essential opportunities to investigate and explore for themselves in a range of settings and contexts.

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## **PUPIL LEARNING JOURNEY**

Our science curriculum is based on the National Curriculum and modified where relevant, in order to ensure a cohesive, appropriate learning journey for every learner.

*Primary* - Topic based learning, within cross-curricular ‘Creative and Curious’ area.

*Secondary* - Our World – based on key questions.

*(The science curriculum is interwoven into other areas of the curriculum (Hidden Curriculum and Cross Curricular Links))*

### **PUPIL LEARNING JOURNEY –SCIENCE (detail within ‘Creative & Curious’ and ‘Our World’ Overviews and medium term plans)**

<b>Reception/ Year 1</b> (Three year rolling programme)	<b>Year 2</b> (Three year rolling programme)	<b>Year 3 &amp; 4</b> (Two year rolling programme)	<b>Year 5 &amp; 6</b> (Two year rolling programme)	<b>Year 7</b>	<b>Year 8</b>	<b>Year 9</b>	<b>Years 10 &amp; 11</b>
<b>EYFS Curriculum</b>	<b>PROGRAMME OF STUDY ADAPTED</b>	<b>PROG OF STUDY ADAPTED</b>	<b>PROG OF STUDY ADAPTED</b>	<b>PROG OF STUDY ADAPTED</b>	<b>PROG OF STUDY ADAPTED</b>	<b>PROG OF STUDY ADAPTED</b>	<b>KS4 Exams and Courses</b>

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	<p>ELG: The Natural World Children at the expected level of development will: - Explore the natural world around them, making observations and drawing pictures of animals and plants; 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 Understand some important processes and changes in the natural world around them, including the seasons and changing states of matter.</p>	<p><b>First Year:</b> <b>Animals, including humans KS1</b> identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense</p> <p><b>Everyday materials KS1</b> describe the simple physical properties, compare and group materials on the basis of their simple physical properties</p> <p><b>Animals, including humans KS1</b> identify and name a variety of animals that live in water, describe and compare the structure of a variety of water animals</p> <p><b>Second Year:</b> <b>Seasonal changes KS1</b> changes across the 4 seasons, observe and describe weather associated with the seasons and how day</p>	<p><b>First Year:</b> <b>Everyday Materials KS1</b> <b>Electricity LKS2</b> (Electrical appliances and electrical safety) <b>Green Plants LKS2</b> (Name, structure and function of parts)</p> <p><b>Animals including humans</b> (Name/structure of animals)</p> <p><b>Parts of the human body KS1</b> (incl. relating to senses)</p> <p><b>Living things and their habitats KS1</b></p> <p><b>Second Year:</b> <b>Everyday materials KS1</b> (name, describe and compare physical properties)</p> <p><b>Light and Dark LKS2</b></p> <p><b>Seasonal change KS1</b></p> <p><b>Animals incl.humans KS1</b> (carnivores etc..and offspring)</p> <p><b>Plants</b> (growth of seeds and</p>	<p><b>First Year:</b> <b>Forces LKS2</b> (Compare how things move of surfaces / forces that need contact between objects)</p> <p><b>Magnets LKS2</b> (Magnetic properties) Describe magnets as having 2 poles)</p> <p><b>Living things and habitats LKS2</b> (Grouping living things / Animal food sources and simple food chains)</p> <p><b>States of Matter LKS2</b> (solids,liquids &amp; gases and temp change</p> <p><b>States of Matter LKS2</b> (Water Cycle)</p> <p><b>Second Year:</b> <b>Light</b> (Reflections and shadows)</p> <p><b>Electricity</b> (Simple circuits incl switches and bulbs)</p> <p><b>Animals incl. humans</b> (Basic needs for</p>	<p><b>ANIMALS, INCLUDING HUMANS</b></p> <p>The Brain</p> <p>Describe the simple functions of the basic parts of the digestive system in humans (4)</p> <p>Identify the different types of teeth in humans and their simple functions (4)</p> <p><b>PROPERTIES AND CHANGES OF MATERIALS</b></p> <p>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 (5)</p>	<p><b>SOUND</b></p> <p>find patterns between the pitch of a sound and features of the object that produced it (4)</p> <p>find patterns between the volume of a sound and the strength of the vibrations that produced it (4)</p> <p>recognise that sounds get fainter as the distance from the sound source increases. (4)</p> <p><b>LIGHT</b></p> <p>recognise that light appears to travel in straight lines (6)</p> <p>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 (6)</p> <p>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 (6)</p>	<p><b>HEALTH KS3 N.C CONTENT</b></p> <p>the effects of recreational drugs (including substance misuse) vaping, energy drinks, smoking and alcohol on behaviour, health and life processes.</p> <p><b>Nutrition and digestion KS3 N.C CONTENT</b></p> <p>content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed</p> <p>calculations of energy requirements in a healthy daily diet</p> <p>the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts)</p> <p>the importance of bacteria in the human digestive system</p> <p>plants making carbohydrates in their leaves by photosynthesis</p>	<p><b>Food Preparation</b></p> <p>Entry Food preparation, cooking and serving aims to enable learners to acquire the knowledge and skills required to prepare, cook and serve a range of dishes. Learning about hygiene and safety, use of equipment including the oven, following recipes, measuring, washing up, healthy eating, food groups nutrition, balanced diets.</p> <p><b>Plant Care</b></p> <p>This unit aims to enables learners to gain basic skills and understanding in the care of plants. Students will grow fruit, vegetables, herbs and flowers in the school's allotment and set up a Garden Shop in which to sell it. Activities will provide rich numeracy and literacy opportunities. Students will complete a weekly photographic diary, recording all the work they do to produce food and flower crops from seed (or cutting) to harvest.</p> <p><b>Introduction to</b></p>
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Skills for Life	<b><u>WORKING SCIENTIFICALLY</u></b>					
	<b>Discussing/questioning</b>	<b>Comparative/ fair testing</b>	<b>Observe and measure</b>	<b>Recording</b>	<b>Identify/classify</b>	<b>Seeking patterns/relationships for predicting</b>
	Talk about what they observe and ask one or two questions e.g. most begin with “why?”	Show an awareness of treating things in the same way.	Observe one feature and say what they see. Sort a general set e.g. objects with a specific colour.	Collect simple data and begin to record. Gather things together and make collections of objects to record with	Describe simply what happened.	Refer to something they have already encountered. Notice simple similarities and differences.
	Asking simple questions and recognising that they can be answered in different ways	Performing simple fair tests	Observing closely, using simple equipment. Group and classify by given criteria.	Gathering and recording data to help in answering questions. Present findings in a prescribed way.	Begin identifying and classifying. Notice similarities and differences.	Using their own observations and ideas to suggest answers to questions.  Notice simple similarities and differences in data.
Asking relevant questions and using different types of scientific enquiries to answer them  Discuss results of an investigation.	Setting up simple practical enquiries, comparative and fair tests.	Making systematic and careful observations. Taking measurements using non-standard units. Where, appropriate, begin taking measurements using standard units and a range of equipment, incl. thermometers.	Gathering, recording, classifying, presenting data to help answer questions. Talk about/records findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, tables.	Identifying differences, similarities or changes related to simple scientific ideas and processes	Using straightforward scientific evidence to answer questions or to support findings.  Begin to notice patterns. Draws simple conclusions from results, make predictions and suggest improvements	



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## **EXTENSION SKILLS IN WORKING SCIENTIFICALLY**

<b>Scientific Attitudes</b>	<b>Experimental skills and investigations</b>	<b>Analysis and Evaluation</b>	<b>Measurement</b>
Pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility	Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience	Apply mathematical concepts and calculate results	Understand and use SI units

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Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review	Make predictions using scientific knowledge and understanding	Present observations and data using appropriate methods, including tables and graphs	Use and derive simple equations and carry out appropriate calculations
Evaluate risks	Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate	Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions	Undertake basic data analysis including simple statistical techniques
	Use appropriate techniques, apparatus, and materials during fieldwork, paying attention to health and safety	Present reasoned explanations, including explaining data in relation to predictions and hypotheses	
	Make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements	Evaluate data, showing awareness of potential sources of random and systematic error.	
	Apply sampling techniques	Identify further questions arising from their results	

**The following table shows objectives from the KS3 national curriculum. These are here as a guide to support pupils who have mastered the above progression.**

## **HOW DO WE KNOW OUR SCIENCE LEARNERS ARE ACTUALLY LEARNING? HOW DO OUR LEARNERS KNOW HOW THEY ARE DOING?**

Many scientific enquiry skills align to Gosden’s Learning Habits/Muscles for example noticing, asking questions, exploring etc. With Learning Habits seen as essential skills for life, they are now part of the ILP and every term targets will be set and assessed in this area for every pupil. As part of daily AFL practice, learners review their application of these skills after learning Learning Power Vision: To nurture in all our learners a lifelong love of learning. Our whole school curriculum will build resilience and grit in our learners, so when they leave Gosden House they are better equipped to face life’s challenges in a world that is forever changing.



activity, to identify which were used and give their reasoning behind their choice - the way in which this is done varies appropriately throughout the school but learners gradually reflect more deeply on their learning and the processes involved. Other strategies are being trialled to ensure teachers have a greater awareness of students' progress and frequency in the use of learning related skills. The aim of this assessment is also that students have feedback about the development of their learning skills. Within teaching practice, formative assessment strategies, including questioning and an expectation of pupil explanation are employed to assess pupils' levels of understanding. This is particularly important, as many of the topics covered can be abstract in nature. Evisense, an online communication tool provides an effective tool for sharing feedback to parents, particularly when incorporated with 'student voice' so that our learners are able to reflect on their own learning in meaningful ways.

### **DEIB in Science at Gosden House:**

From the outset, it is essential that teachers examine their practice whilst planning and teaching science for implicit bias and strive to elevate the status and esteem of all learners in the classroom. Within the Science curriculum, engagement with diverse role models allow learners to see themselves as scientists. Starting with primary pupils, is particularly important so children relate to these role models.

Sharing the life stories of scientists who represent a range of protected characteristics is a valuable way of highlighting being a minority in science, influences in their childhoods and the fun, relevance and importance of science to them as individuals.

Science lessons are the epitome of cooperative learning: learners are working together to conduct experiments, solve problems, build models. Teachers can leverage this environment to encourage collaboration among diverse learners. With careful grouping and delegation of responsibilities, teachers can inspire minority learners to assume new roles in the group that will help them discover new skills and build their confidence.

### **WHAT DO WE WANT FOR OUR FUTURE GOSDEN SCIENCE LEARNERS? (GOSDEN GRADUATE/ GOSDEN HOUSE VISION/ GOSDEN TOOLKIT )**

Our WIIFM (*What's in it for me*) long term learning outcomes are nurtured and developed through our Toolkit Curriculum. Our Science curriculum 'Skills for life', Toolkit 'Life Tools' and their learning outcomes are fundamental in preparing our future Gosden Graduates for life post 16, supporting them in their future lives including the workplace. All decisions made about our Curriculum have the Toolkit and the knowledge of our learners at the heart of it. SCIENCE Is key in developing the End Points that we identified, for future success.

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