Hyde Park Junior School

Science Policy

Policy date: 2021

Contents:

Appendix includes progression documents in scientific knowledge and working scientifically skills

HPJS Science Policy

The National Curriculum

At Hyde Park Junior School we follow the National Curriculum. In the science programme of study it says:

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, and 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 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*
- *develop 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*
- *are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future*

Our school currently holds the Primary Science Quality Mary Award, and therefore we created a science vision and key principles which reflect our values and which fit with our approach to teaching and learning.

Our Science Vision

At Hyde Park Junior School, we believe that science should be engaging and allow children to take ownership of their learning. We want our children to be active learners by finding things out for themselves, by asking 'how?', 'why?' and 'what if?'.

Science underpins our understanding of the world and is an integral part of our lives, which makes it vital that children at our school develop a lifelong love for the subject. While broadening children's understanding in science we will promote collaboration, exploration, curiosity, discovery and investigation. Science at Hyde Park Junior School encourages children to be critical and reflective learners, and inspires them to take risks and ask questions.

Five Key Principles:

- Science teaching and learning promotes ambition and endeavour by making real life links to scientists and engineers, in history and present day, and by reacting to current events.
- Children should be curious, explore and ask questions within their science learning.
- Children will reason and problem solve through practical investigations.
- Children are able to use a variety of scientific resources both inside and outside the classroom.
- Science learning will engage and fascinate children to enable them to become lifelong learners.

Types of enquiry:

We recognise that it is important our pupils are taught a variety of approaches to answer relevant scientific questions. Over the course of their time in Key Stage 2, pupils will develop greater understanding of how to work scientifically. Alongside specific scientific knowledge planned carefully into our lessons, children will also work practically to build skills linked to scientific investigations. 'Working scientifically' is described separately in the programme of study, but must always be taught through and clearly related to the teaching of substantive science content in the programme of study.

Types of scientific enquiry should include:

- observing over time
- pattern seeking
- identifying, classifying and grouping
- comparative and fair testing
- research using secondary sources

Progression:

It is essential prior knowledge is built upon, when children are learning new concepts and skills in science. Our teachers ensure that they work to progress their pupils and develop understanding of scientific knowledge through the Key Stage 2 programme of study, whilst building on what was taught in Key Stage 1. It is also vital that teachers know the next steps in learning, for example from LKS2 to UKS2. We have a clear progression document (See Appendix) for all areas of study for both knowledge and scientific investigative skills, to develop secure understanding in science.

Planning:

As discussed above in our Science Vision and Key Principles, and within Types or Enquiry, we strive to plan engaging science lessons which incorporate both skills and knowledge. We are beginning to develop knowledge schemas to map areas of the science curriculum with links across all year groups. This will help to embed knowledge and skills throughout KS2.

At Hyde Park Junior School, some of our science learning may be taught discretely, through Science or STEM weeks, or it may be linked into Topic areas within our medium term plans for each year group, for example Plants in Year 3 is linked to Rainforest in the Summer Term. By linking science into our Topic areas, we can ensure a cross-curricular approach.

We highlight and address children's misconceptions through careful planning, sometimes using concept cartoons to allow the children to deepen their thinking and explain their reasoning.

Assessment:

Children's learning is monitored closely to inform future planning. Children receive feedback on their learning, verbally or written from teaching staff. Assessment for learning is always a continuous process in the planning, teaching and learning cycle. We may also assess children more specifically through observing them at work; structured and directed questioning; and by considering work produced by children. Using our knowledge schemas, we can direct questions regarding knowledge in science.

The role of the Science subject leader:

- monitor the effectiveness of science teaching and learning by: sampling children's work; monitoring planning; conducting interviews with pupils to obtain their views; conducting learning walks and having discussions with staff
- work closely with head of curriculum to ensure our science curriculum remains relevant and appropriate
- attend subject leader meetings and CPD in the local area and beyond
- support colleagues in planning and delivery of science where needed
- monitor the science resource and budget for new items to support learning

Resources:

Resources for science are located in the admin room or the curriculum room above the Year 4 area. Consumables can be purchased when needed. It is important to model use of specific resources and equipment responsibly and safely. All staff present during science lessons will enforce and promote the safe use of these materials.

Health and safety:

All children are made aware of the importance and relevance of health and safety when undertaking work in science. In planning, class teacher are expected to assess the risks and adjust their lessons accordingly to ensure safe practice and appropriate levels of supervision.

The CLEAPSS website is an excellent source of information and advice about minimizing risk in Science teaching. Activities which take place away from the school's premises will require a risk assessment form to be filled in.

Appendix:

Progression in science. This can also be found as a separate document.

		EYFS	Y1	Y2	Y3	Y4	Y5	Y6
AS BIOLOGISTS	Seasonal changes	*Talk about the features of their own immediate environment and how environments might vary from one another *Talk about changes *Observe changes across the four seasons *Observe and describe weather associated with the seasons and how day length varies	*Talk about the features of their own immediate environment and how environments might vary from one another *Talk about changes *Observe changes across the four seasons *Observe and describe weather associated with the seasons and how day length varies					
	Animals	*Make observations of animals, explain why some things occur and talk about changes	*Identify and name a variety of common animals including fish, amphibians, reptiles, birds and mammals *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)	*Notice that animals, including humans have offspring which grow into adults *Find out about and describe the basic needs of animals, including humans, for survival (water, food, air)	*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	*Construct and interpret a variety of food chains, identifying producers, predators and prey		*Describe the ways in which nutrients and water are transported within animals (including humans)
	Humans		*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 humans have offspring which grow into adults *Find out about and describe the basic needs for survival (food, water, air) *Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene	*Identify that 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 have skeletons and muscles for support, protection and movement	*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	*Describe the changes as humans develop to old age	*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 way their bodies function *Describe the ways in which nutrients and water are transported within humans (and other animals)

		EYFS	Y1	Y2	Y3	Y4	Y5	Y6
AS BIOLOGISTS	Plants	*Make observations of plants, explain why some things occur and talk about changes	*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 *Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy	*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			
	Living things and their habitats (Evolution and inheritance Y6)	*Know about similarities and differences in relation to living things *Talk about the features of their own immediate environment and how environments might vary from one another		*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 microhabitats *Describe how animals obtain their food from plants and other animals using the idea of a simple food chain – identify and name different sources of food		*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	*Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird *Describe the life processes of reproduction in some plants and animals	*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 *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, but normally offspring vary and are not identical to their parents *Identify how animals and plants are adapted to suit their environment and that adaptations lead to evolution.

		EYFS	Y1	Y2	Y3	Y4	Y5	Y6
ASCHEMISTS	Materials Including: Everyday uses of materials, Rocks, Properties and changes, States of matter	*Know about similarities and differences in relation to materials and objects	*Distinguish between an object and the material from which it is made *Identify and name a variety of everyday 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	*Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses *Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching	*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	*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: measure or research the temperature at which this happens in degrees C (°C) *Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature	*Compare and group everyday materials based on their properties, including hardness, solubility, transparency, conductivity (electrical and thermal) and magnetism *Know some materials dissolve in liquid to form a solution and describe how to recover a substance from 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 these changes are not usually reversible	

		EYFS	Y1	Y2	Y3	Y4	Y5	Y6
AS PHYSICISTS	Light				*Recognise that light is needed 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			*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.
	Forces and Magnets				*Compare how things move on different surfaces *Notice that some forces need contact between two 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 *Identify some magnetic materials *Describe magnets as having two poles *Predict whether two magnets will attract or repel		*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	
	Sound					*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		

		EYFS	Y1	Y2	Y3	Y4	Y5	Y6
AS PHYSICISTS	Electricity					*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		*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
	Earth and space						*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	

Progression of Working Scientifically skills. These grids are taken from 'Working Scientifically: Progression of Enquiry Skills' created by www.ciec.org.uk

Progression of Enquiry Skills from Early Years Foundation Stage to Key Stage One

EYFS	Key Stage One
Show curiosity about objects, events and people Playing & Exploring Questions why things happen Speaking: 30-50 months	Explore the world around them and raise their own simple questions
Engage in open-ended activity Playing & Exploring	Experience different types of science enquiries, including practical activities
Take a risk, engage in new experiences and learn by trial and error Playing & Exploring	Begin to recognise different ways in which they might answer scientific questions
Find ways to solve problems / find new ways to do things / test their ideas Creating & Thinking Critically	Carry out simple tests
Develop ideas of grouping, sequences, cause and effect Creating &Thinking Critically Know about similarities and differences in relation to places, objects, materials and living things ELG: The World	Use simple features to compare objects, materials and living things and, with help, decide how to sort and group them (identifying and classifying)
Comments and asks questions about aspects of their familiar world such as the place where they live or the natural world The World: 30-50 months	Ask people questions and use simple secondary sources to find answers
Closely observes what animals, people and vehicles do The World 8-20 months Use senses to explore the world around them Playing & Exploring	Observe closely using simple equipment With help, observe changes over time
Make links and notice patterns in their experience Creating & Thinking Critically	With guidance, they should begin to notice patterns and relationships
Choose the resources they need for their chosen activities ELG: Self Confidence & Self Awareness Handle equipment and tools effectively ELG: Moving & Handling	Use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data
Create simple representations of events, people and objects Being Imaginative: 40-60+ months	Record simple data
Answer how and why questions about their experiences ELG: Understanding Make observations of animals and plants and explain why some things occur, and talk about changes ELG: The World	Use their observations and ideas to suggest answers to questions Talk about what they have found out and how they found it out
Develop their own narratives and explanations by connecting ideas or events ELG: Speaking Builds up vocabulary that reflects the breadth of their experience Understanding: 30-50 months	With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language

Progression of Enquiry Skills from Key Stage One to Key Stage Two

Key Stage 1	Lower Key Stage 2	Upper Key Stage 2
Explore the world around them and raise their own simple questions	Raise their own relevant questions about the world around them	Use their science experiences to explore ideas and raise different kinds of questions
Experience different types of science enquiries, including practical activities	Should be given a range of scientific experiences including different types of science enquiries to answer questions	Talk about how scientific ideas have developed over time
Begin to recognise different ways in which they might answer scientific questions	Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions	Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions
Carry out simple tests	Set up simple practical enquiries, comparative and fair tests Recognise when a simple fair test is necessary and help to decide how to set it up	Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why
Use simple features to compare objects, materials and living things and, with help, decide how to sort and group them (identifying and classifying)	Talk about criteria for grouping, sorting and classifying; and use simple keys	Use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment
Ask people questions and use simple secondary sources to find answers	Recognise when and how secondary sources might help them to answer questions that cannot be answered through practical investigations	Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact
Observe closely using simple equipment with help, observe changes over time	Make systematic and careful observations Help to make decisions about what observations to make, how long to make them for and the type of simple equipment that might be used	Make their own decisions about what observations to make, what measurements to use and how long to make them for
With guidance, they should begin to notice patterns and relationships	Begin to look for naturally occurring patterns and relationships and decide what data to collect to identify them	Look for different causal relationships in their data and identify evidence that refutes or supports their ideas
Use simple measurements and equipment (e.g. hand lenses, egg timers) to gather data	Take accurate measurements using standard units learn how to use a range of (new) equipment, such as data loggers / thermometers appropriately	Choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately. Take repeat measurements where appropriate.
Record simple data	Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys and help to make decisions about how to analyse this data	Decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
Use their observations and ideas to suggest answers to questions Talk about what they have found out and how they found it out	With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions	Identify scientific evidence that has been used to support or refute ideas or arguments
With help, they should record and communicate their findings in a range of ways and begin to use simple scientific language	Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusions	Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas, use oral and written forms such as displays and other presentations to report conclusions, causal relationships and explanations of degree of trust in results
	With support, they should identify new questions arising from the data, making predictions for new values within or beyond the data they have collected and finding ways of improving what they have already done.	Use their results to make predictions and identify when further observations, comparative and fair tests might be needed

Progression of Enquiry Skills from Key Stage Two to Key Stage Three

Upper Key Stage 2	Key Stage 3
Use their science experiences to explore ideas and raise different kinds of questions	Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience
Talk about how scientific ideas have developed over time	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
Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions	Select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables, where appropriate
Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why	
Use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment	
Recognise which secondary sources will be most useful to research their ideas and begin to separate opinion from fact	
	Make predictions using scientific knowledge and understanding
Choose the most appropriate equipment to make measurements with increasing precision and explain how to use it accurately Take repeat measurements where appropriate	Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety Evaluate the reliability of methods and suggest possible improvements Evaluate risks Pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility.
	Apply sampling techniques Apply mathematical concepts and calculate results Use and derive simple equations and carry out appropriate calculations Undertake basic data analysis including simple statistical techniques
Make their own decisions about what observations to make, what measurements to use and how long to make them for	Understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature Make and record observations and measurements using a range of methods for different investigations Present observations and data using appropriate methods, including tables and graphs
Decide how to record data and results of increasing complexity from a choice of familiar approaches: scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs	
Look for different causal relationships in their data and identify evidence that refutes or supports their ideas	Interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
Identify scientific evidence that has been used to support or refute ideas or arguments	Present reasoned explanations, including explaining data in relation to predictions and hypotheses Evaluate data, showing awareness of potential sources of random and systematic error
Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas Use oral and written forms such as displays and other presentations to report conclusions, causal relationships and explanations of degree of trust in results	
Use their results to make predictions and identify when further observations, comparative and fair tests might be needed	Identify further questions arising from their results