

JOHN BALL
PRIMARY SCHOOL

Science Policy

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Science Policy.

Introduction

Physicians take an oath that commits them to 'first do no harm'. The best science teachers, set out to '**first develop and maintain curiosity**' in their pupils. Without curiosity and wonder children lose their natural inclination to observe the world, ask questions of it and investigate to find answers. Like this, primary science should be child-led and enquiry based and be saturated with curiosity and wonder for both teachers and pupils.

National Curriculum 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, 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. Above all science should be interesting and fun.

Curriculum

At John Ball pupils learn science through the new national curriculum programme of study. This can be taught through using a variety of different resources to support the planning and teaching and, more importantly to suit the needs of the pupils. There are two aspects to science learning: key **subject knowledge** and key **scientific skills**.

Knowledge is about facts. The easiest way to find out whether children have learned these facts is through regular self, peer and teacher assessment whether written or oral. This is why dialogue and discussion should be at the heart of science learning. Teachers need to ensure that discussion and debate are a central theme in science lessons so that pupils share and debate science knowledge. Teachers should use the Science Subject Knowledge Tracker for their year group to ensure they are covering curricular content. However, this should be seen as a minimum entitlement from which to launch interesting topics and promote broader science learning above and beyond this; it is not simply a tick list of what to teach.

Skills are practical and experiential. They are not right or wrong; they are developmental so that children build their scientific skills over time. Scientific skills should be developed in the pursuit of 'finding out' so that children learn to apply their skills in order to investigate science questions. Like this, science skills and knowledge are not taught separately, but science skills are used in order to acquire knowledge. Through the different types of investigation children should find answers to their science questions. It is important that children begin to understand the five different types of investigation and which types of question each type will answer.

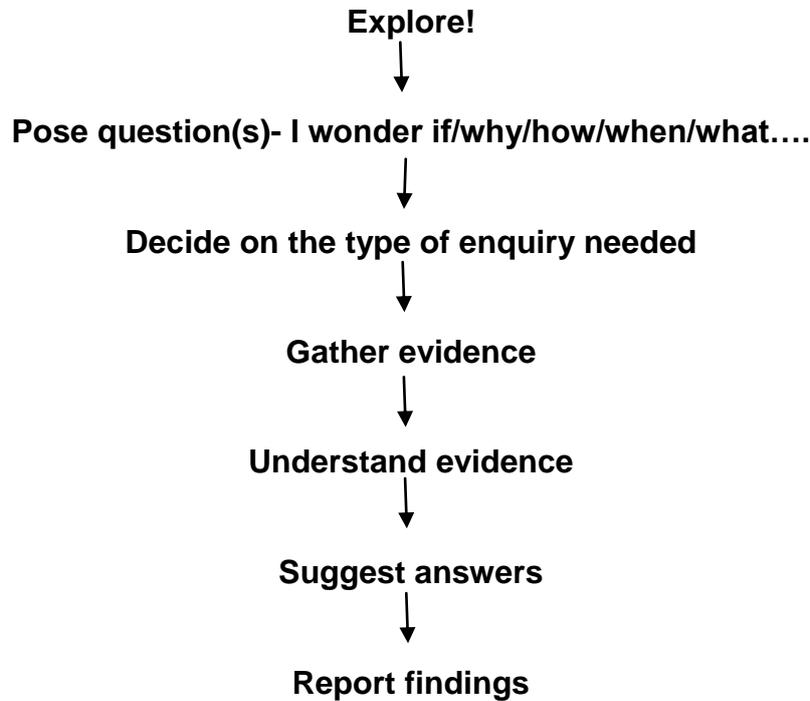
The Five types of investigation children should develop at primary school:

Type of investigation	Examples of investigation questions
Identifying and Classifying	<ul style="list-style-type: none">• What do different animals eat?• All the food in the shop has been muddled up – how can we sort it?• What type of shoes do most children have?• How can we sort the clothes in the play corner?• Are all the wheelie toys the same?
Observation over time	<ul style="list-style-type: none">• What happens to a seed when it grows?• What happens to bread if it's left out for a long time?• What happens to the ice cube in your hand?• What happens to the sun over the course of a day?
Pattern Seeking	<ul style="list-style-type: none">• Do birds feed at different times of the day?• Which flowers do mini-beasts prefer?• Do all oranges have the same number of seeds?• Do we all have the same size feet?• How many turns does it take to make the clockwork car go 1 metre?, 2 Metres?
Fair testing	<ul style="list-style-type: none">• What happens to a seed when it grows?• What happens to bread if it's left out for a long time?• What happens to the ice cube in your hand?• What happens to the sun over the course of a day?
Research	<ul style="list-style-type: none">• How does a dentist help us look after our teeth?• What's the most common minibeast in the UK?• How are candles made?• How is plastic made?

Teachers need to consider ensuring that pupils access the full range of these different types of investigations through children answering their own questions.

Teaching sequence:

Science topics should begin with children experiencing phenomena that interests and excites them and offers them the chance to wonder and pose questions. Then the children should have the opportunity to say what they **know**, what they **want** to find out, and later also a chance to say what they **learnt** at the end of the topic (KWL). Teachers then use the children's knowledge and questions to adapt the science planning. Importantly teachers should use the children's questions as the basis for investigations, adding in their own questions to ensure coverage of the different types of investigations and the national curriculum knowledge areas. This ensures science is largely child-led yet covers curriculum requirements. It is not acceptable to simply take science plans and teach because this is then not using the children's prior knowledge and creates repetition that is boring for children or leaves gaps in learning that need covering. The general teaching sequence for science can be summarised as follows:



Attainment and Assessment Expectations

By the end of Key Stage 1 and 2, children should have covered the skills (working scientifically) and knowledge programmes of study for that key stage. In John Ball we assess science skills **using the online learning ladders working scientifically ladder**. Teachers are expected to assess skills on an ongoing basis but update this ladder three times a year at least. However, assessment of science knowledge will not be formally recorded but tracked using the year group subject knowledge tracker (see appendix). This should be ticked off as units are taught and thought given to how to ensure the children know this content and are not left with gaps in their knowledge. Teachers need to keep these up to date as working, public documents. This ensures on going formative assessment as science is learnt and can inform planning in order to cater to the children's learning needs. Certain aspects of knowledge can be assessed using short tests and quizzes, but the skills (working scientifically) should be assessed during lesson time as children are engaged in investigations.

Planning Expectations

Planning is the responsibility of individual teachers who build on the science topics medium term unit plans by taking into account the needs of the children in their particular class. Before teacher's plan they carry out the KWL type task for the forthcoming topic, so that they can plan for the needs of the class. This can be part of the Knowledge Harvest type event at the start of a topic or as a specific part of the first science lesson.

Teachers should not change science curriculum topics **without first agreeing** this with the curriculum leader and science subject leader. This ensures curriculum continuity and coverage across the school. Science unit plans should be considered a structure from which to work from in order to meet the children's science learning needs. Many activities will need to be adapted to suit the children and the development of their investigative skills.

Planning and lesson content:

Good lessons need to be planned for. There is no specified planning format for science; however, the following should be included and evident on class planning:

For individual tasks/lessons:

- ❑ Shared Learning intentions – both skills and knowledge
- ❑ An agreed success criteria for the lesson or specific activities (this might be determined with the children during the lesson, but should be thought about before.)
- ❑ Differentiation – ensuring the different science learning needs are met through activities and adult support.
- ❑ Key questions to cause thinking and assess knowledge.
- ❑ Methods of recording the children's learning.
- ❑ Use of adults during the lesson.
- ❑ Resources
- ❑ Vocabulary

For Medium term unit plans (science topic overview):

- ❑ A stimulus – get them thinking, create an enquiry (concept cartoons/event)
- ❑ KWL type assessment at the start (knowledge harvest)
- ❑ Opportunities to investigate actively rather than through work sheets or excessive written tasks.
- ❑ Opportunities to develop the five types of investigations over the topic.
- ❑ Opportunities for assessment (individual, peer, teacher) through use of the success criteria and science assessment ladders.

(For the most part, science should be taught in mixed ability groups with support for some children provided, but also challenge and extension provided for those more able pupils. This challenge should also always be available to all children should they be able or wish to go forward.

Staff are to save/share their annotated unit plans, or other formats, on the school server under their year group as they plan. These need to be annotated 'afresh' and not simply photocopied/cut and pasted from previous years. They should also be easily able to be found in a labelled folder. Generally, our planning teams produce their plans collaboratively, then each teacher adds in differentiation for their own class. The Science Subject Leader is available to support teachers with planning. Annotated plans are seen as working documents, and should be kept available for consultation prior to teaching.

The learning environment

All classrooms should have a space for science vocabulary and on-going class enquires to be shown. This can be part of a topic display.

Inclusion

The pupils work individually, in pairs, or as part of a small group and as a whole class each term. They use a variety of means for communicating and recording their work, with discussion and debate being a central theme in science lessons. Children with literacy difficulties should not have this as a barrier to science learning. All children should be stretched and challenged

through the depth of investigation; some children will need more support than others. Differentiation should be considered as “...***the planned and spontaneous intervention or withdrawal of a teacher’s actions throughout the lesson...***” Like this, teachers need to plan for needs of their children, but also act according to their needs within the lesson and be ready to go ‘off plan’ when necessary. This should also include the actions of support staff in the class. It should be remembered that while children might need support at times, there are also times when teaching staff need to stand back and allow for discovery, intervening with questions to scaffold and support learning where necessary. Children learn more by finding out in science than being told.

Resources

Science resources are centrally stored in the science cupboard in the Key Stage 2 corridor. Equipment is stored in labelled trays in large open cupboard units. The responsibility for organising, setting up and maintaining this area is that of the Subject Leader. However, the whole staff are responsible for ensuring equipment is returned neatly, and cleaned, to the correct unit and that broken or used up equipment is reported to the Science Subject Leader so that, repairs, replacements or new orders can be made. **Equipment must be taken from and returned to the science cupboard by staff only and not children. When finished with equipment must be returned and not stored in classrooms indefinitely.**

N.B. Under **NO** circumstances are children allowed access to the science resource area alone.

Health and Safety

Science is taught in line with our general school Health and Safety Policy which all staff should be up to date with.

Science in our school is very safe. However, when children are engaged in a variety of practical activities, included open-ended investigations, there is always the possibility that something could go wrong, therefore, vigilance is needed.

Individual teachers will need to undertake their own specific risk assessment.

All science activities should be consistent with the ‘Be Safe! Some aspects of safety in Science and Technology for key stages one and two’ (ASE 2001).

The governing bodies code of practice for Health and Safety in Primary Science is encompassed in the booklet ‘Be Safe!’ Copies of this booklet are kept in the science resource area and the staff room. All staff are expected to be familiar with its contents and to follow its guidance.

The LEA maintains a subscription to CLEAPSS school Science service (Brunel University, Uxbridge) This organisation produces a termly newsletter, Primary Science and Technology and a wide range of guides about primary science, especially resources. They also provide a helpline number: 01895 814372 which teachers can use for health and safety advice and other issues concerning science.

It is the class teacher’s responsibility to ensure science activities are safe. Using the above advice it is up to the individual teacher to do their own risk assessment.

September 2015

Review Date: 1 year

Appendices:

Year 1 Science Knowledge Tracker

Teacher	Class		
Plants		Taught	Achieved
Identify and name a variety of common plants, including garden plants, wild plants and trees, and those classified as deciduous and evergreen.			
<i>Describe the</i> basic structure of a variety of common plants including roots, stem, leaves and flowers.			
Animals including humans			
Identify and name lots of common animals including fish, amphibians, reptiles, birds and mammals.			
Identify and name lots of common animals that are carnivores, herbivores and omnivores.			
Describe and compare lots of common animals (fish, amphibians, reptiles, birds and mammals, including pets) by how they look and how they move.			
Identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.			
Everyday Materials			
Understand the difference between an object and the material from which it is made.			
Identify and name lots 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.			
Seasonal Changes			
Observe changes across the four seasons.			
Observe and describe the weather within the seasons and how the length of the days changes.			

Year 2 Science Knowledge Tracker

Teacher	Class
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Living things and their habitats	Taught	Achieved
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 different plants and animals in their habitats, including micro-habitats.		
Describe how animals get their food from plants and other animals, using the idea of a simple food chain, and identify and name different sources of food.		
Plants		
Observe and describe how seeds and bulbs grow into mature plants.		
Find out and describe how plants need water, light and the right temperature to grow and stay healthy.		
Animals including humans		
Understand that animals, including humans, have offspring (babies) which grow into adults.		
Find out about and describe the basic needs of animals, including humans, for survival (water, food and air).		
Describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene (being clean).		
Uses of everyday materials		
Identify and compare how different materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard are used because of their properties.		
Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.		

Year 3 Science Knowledge Tracker

Teacher	Class	
Plants	Taught	Achieved
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.		
Animals including humans		
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.		
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.		
Rocks		
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.		

Light		
Recognise that they need light in order to see things and that dark is the absence of light.		
Understand 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 a solid object.		
Find patterns in the way that the size of shadows change.		
Forces and Magnets		
Compare how things move on different surfaces.		
Understand 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, and identify some magnetic materials.		
Describe magnets as having two poles.		
Predict whether two magnets will attract or repel each other, depending on which poles are facing.		

Year 4 Science Knowledge Tracker

Teacher	Class	
Living things and their habitats	Taught	Achieved
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.		
Animals including humans		
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.		
States of 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, and measure or research the temperature at which this happens in degrees Celsius (°C).		
Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature.		
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.		
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.		

Year 5 Science Knowledge Tracker

Teacher	Class	
Living things and their habitats	Taught	Achieved
Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.		
Describe the life process of reproduction in some plants and animals.		
Animals including humans		
Describe the changes as humans develop to old age.		
Properties and change of materials		
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.		
Understand that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.		
Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.		
Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.		
Demonstrate that dissolving, mixing and changes of state are reversible changes.		
Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.		
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.		
Forces		
Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.		
Identify the effects of air resistance, water resistance and friction that act between moving surfaces.		
Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.		

Year 6 Science Knowledge Tracker

Teacher	Class	
Living things and their habitats	Taught	Achieved
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.		
Animals including humans		
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 animals, including humans.		
Evolution and inheritance		
Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.		
Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents.		
Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.		
Light		
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.		
Electricity		
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.		