

Pontarddulais Primary School

Science Policy



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Science Policy

Introduction

Science teaches an understanding of natural phenomena. It aims to stimulate a child's curiosity in finding out why things happen in the way they do. It teaches methods of enquiry and investigation to stimulate creative thought. It also teaches children to ask scientific questions and begin to appreciate the way Science will affect their future on a personal, national and global level.

Aims and Objectives

The aims of teaching Science at Pontarddulais Primary School are:

- To develop an everyday application of scientific knowledge in the world around.
- To promote the learning of skills, understanding and key vocabulary through a scientific attitude to the solving of problems.

We aim to:

- Provide every pupil with the scientific experience to which they are entitled
- Communicate and relate Science to everyday life and develop these experiences through scientific enquiry/investigations
- Relate Science to other areas of the curriculum
- Develop interest and enthusiasm for Science
- Teach children how to communicate their ideas effectively
- Teach appropriate scientific vocabulary
- Develop an understanding of the relevance of Science in an everyday context
- Help children understand that scientific knowledge relies on evidence
- Teach that scientific evidence can be obtained in a variety of ways
- Help children acquire scientific process skills
- Develop children's ICT capabilities
- Make children aware of Health and Safety issues
- Promote confidence in the use of appropriate scientific equipment correctly and safely, including the use of ICT to collect and display data
- Develop the skills of experimenting, devising and carrying out investigations and testing hypotheses by means of fair tests
- Communicate and record information following practical observations
- Encourage the ability to make predictions and suggest explanations based on an understanding of the world around them and scientific knowledge
- Ensure that each lesson incorporates some scientific enquiry skills. [pattern seeking, fair test, classifying and identifying, exploring, making things and using and applying models]
- Develop a respect for all living things and the environment and an understanding of their interdependence
- Develop an ability to understand and interpret scientific information presented in verbal, mathematical, diagrammatic or graphic form and translating such information from one form to another

- Make children aware of the Plan, Develop and Reflect cycle/process.

These aims are met by:

- Following the Foundation Phase Outcomes and the Skills Based Curriculum 2008
- Planning using Curriculum 2008 and the Science Scheme of Work which is based on the QCA schemes of work and Science Scheme 'Appendix' which includes skills based assessment sheets, reference material and examples of appropriate skills based activities, The Science scheme has been adapted to make it school specific and to include Cwricwlwm Cymreig.

Teaching Style and Classroom Management

We believe that good practice includes a variety of teaching and learning styles in Science lessons. These include visual, auditory and kinesthetic elements to ensure access for children with different learning needs. Using a variety of strategies we engage the children in an enquiry-based research activity. [It is important that the most appropriate teaching strategy is adopted to suit the purpose of a particular learning situation. All staff look for opportunities to praise co-operation and safe behaviour. Children work as individuals, pairs, groups, etc. as circumstances dictate] All lessons have clear learning objectives, to be shared and reviewed with the pupils. Lessons make effective links with other curriculum areas and subjects, especially literacy, numeracy and ICT. Activities should inspire the pupils to experiment and investigate the world around them, and help them raise their own questions such as "Why...?", "How...?" and "What happens if...?". They should challenge, motivate and extend pupils learning. We use ICT in Science lessons appropriately to enhance their learning. The children take part in role-play and discussions and they present reports to the rest of the class where appropriate. They engage in a wide variety of problem-solving activities. Wherever possible, we involve the pupils in 'real' scientific activities, for example, researching a local environmental problem or carrying out a practical experiment and analysing the results.

Activities should develop the skills of enquiry-[PLAN, DEVELOP AND REFLECT] through observation, locating sources of information, selecting appropriate equipment and using it safely, measuring and checking results, making comparisons, communicating and reflecting on results and findings.

The types of enquiry include:

- **Pattern seeking** where children compare natural events and environments. They include surveys and data; such as where are the most wood lice found? Is there a difference between the amount of litter found on the yard and the field? Does climbing steps affect a person's breathing?
- **Exploring**, which involves learners looking for changes in one thing at a time while making careful observations or measurements.
- **Classifying and identifying**, which is a process of arranging a large range of objects or events into manageable sets according to their features or the way, they behave.
- **Making things** that are often technological in nature and involve the learner in designing an artefact or system to meet a human need. Eg shadow puppet, lighthouse.
- **Fair testing** where the children only change on variable in an investigation and keep the others the same.

- **Applying and Using Models** where teachers can use models to help students make sense of their observations, and understand abstract ideas through the visualisation of:
 - objects that are too big, too small or positioned so it is difficult for them to be seen easily e.g. an ecosystem, cell, heart
 - processes that cannot easily be seen directly e.g. digestion
 abstract ideas e.g. particulate nature of matter, energy transfer.

Good practice recognises that there are children of widely different scientific abilities in all classes and as a school we ensure that we provide suitable learning opportunities for all children by matching the challenge of the task to the ability of the child. We achieve this in a variety of ways by:

- Setting common tasks, which are open-ended and can have a variety of responses
- Setting tasks of increasing difficulty (we do not expect all children to complete all aspects of the tasks)
- Grouping children by ability and setting different tasks for each ability group
- Providing resources of different complexity, matched to the ability of the child
- Using classroom assistants to support the work of individual children or groups of children.

There are a variety of ways in which teaching may be effective. Our school encourages learning through enquiry with an emphasis on first hand experience. However, it is also acceptable to use demonstration, research and teacher led investigations where circumstances and the needs of individuals and groups warrant these approaches.

Foundation Phase

In the Foundation Phase, we teach Science as an integral part of the topic work covered during the year. Scientific experience is centred around active, practical exploration which provides opportunities for children to observe processes, compare and classify materials, to begin to find out about outcomes, problem solving and decision making. Good enquiry/investigations arise from good exploratory play and this should lead the children to acquire increasing scientific vocabulary and to communicate their findings in a variety of ways, which may include drawing, painting, photographs, etc. Much of scientific learning, at this stage, can be incidental and involve children interacting and making sense of their environment. Through play activities children begin to develop an understanding of themselves, of living things and of natural materials. The learning environment in the Foundation Phase should be organised and structured to provide for stimulating and appropriate scientific experiences both indoors and outdoors – Forest Schools. During the Foundation Phase opportunities should be provided for children to:

- Use their senses to make observations of what they see, hear, taste, feel and smell.
- Play and experiment with a variety of materials – natural and man made.
- Investigate properties of materials.
- Care for and observe living things.
- Observe and investigate how things work.
- To use ICT to observe, record and enquire.
- Ask questions about the world around them.
- Observe and talk about the weather and changing seasons.

- Notice pattern and sequence.
- Notice colour and changes in colour.
- Use information books, photographs and pictures.
- Make discoveries indoors and outdoors.
- Record observations in a variety of ways.
- Predict outcomes and test ideas.

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What is assessed?

- Children acquire and apply skills in a whole range of situations. It is these skills, which have been ordered [Skills framework/level descriptors] that are assessed. We also want to assess if children can, recall, understand and use key ideas.
- The children's interpretation and use of language is naturally involved and this too must be assessed.
- A pupil's attitude, and willingness to respond to a lesson or the interest to participate in an activity is important for the teacher to know, so attitudes are assessed.

In every enquiry/investigation the teacher will encourage children to: -

- Plan-Ask questions, predict and hypothesise.
- Develop-Observe, measure and manipulate variables.
- Reflect-Interpret their results and evaluate scientific evidence.

[These strands will form the basis for three formal skills based assessments each year]

Children's work will be marked according to the agreed school policy and their performance continually assessed in accordance with Curriculum 2008 by the class teacher. End of topic tests and end of term tests are carried out (teachers use a variety of source material for these tests including the Folens Scheme, Optional Assessment Material and previous SATS papers) results of which are recorded in the teachers assessment file. The teacher will also formally assess the children's skills through the use of the Skills Assessment Sheet against one enquiry based activity each term. The teacher passes on relevant information to other teachers and the records of pupil progress [INCERTS/Sticker System] are updated when significant progress has been made. End of Key Stage teacher assessments against NC LEVELS are reported to parents, LEA and DFEE / DELLS as required by law. Staff hold regular parents meetings and written annual reports are forwarded to parents in the Summer Term.

An assessment file is kept by the teacher, which includes records of achievement in other subjects to provide an overall picture of the child. The children also have Green Science Files and Yellow Assessment Files where they keep evidence of their progress. (All work is marked according to the school's assessment policy). The files are passed onto the next teacher.

The Science Coordinator/Leader keeps samples of children's work in a portfolio and uses these to demonstrate what the expected level of achievement is in Science for each age group in the school. The Subject Leader also participates in school based and cluster standardization and moderation exercises to ensure consistency and understanding of the levels of attainment.

Record Keeping/Planning

- The school uses the 'QCA Scheme of Work for Science' as the basis of its own scheme of work and planning. The QCA Scheme has been adapted to the local circumstances of the school in that we make use of the local environment in our fieldwork and we choose a locality where the physical environment differs from that which predominates in our immediate surroundings.
- We carry out our curriculum planning in Science in three phases (long-term, medium-term and short-term). The long-term plan maps the scientific topics studied in each term during the key stage. The Science subject leader works this out in conjunction with teaching colleagues in each year group. In some cases we combine the scientific study with work in other subject areas, especially during the Foundation Phase and at Key Stage 1; at other times the children study Science as a discrete subject.
- Our medium-term plans, which we have based on the QCA Scheme of Work in Science, give details of each unit of work for each term. The Science subject leader/Coordinator monitors and reviews these plans.
- The class teacher is responsible for planning and writing the weekly lesson plans (broadsheets) for each lesson (short-term plans). These plans list the skills and specific learning outcomes of each lesson. The class teacher keeps these individual plans; the coordinator and performance management team leaders monitor them.
- We have planned the topics in Science so that they build upon prior learning. We ensure that there are opportunities for children of all abilities to develop their skills and knowledge in each unit and we also build progression into the Science Scheme of Work, so that the children are increasingly challenged as they move up through the school.

Monitoring

It is the responsibility of the Science Subject Leader/Coordinator to monitor the standards of children's work and the quality of teaching in Science. The Science Subject Leader/Coordinator is also responsible for supporting colleagues in the teaching of Science, for being informed about current developments in the subject and for providing a strategic lead and direction for the subject in the school. The Science Subject Leader/Coordinator gives the Headteacher an annual summary report in which he/she evaluates strengths and weaknesses in the subject and indicates areas for further improvement [Action Plan]. The Science Subject Leader/Coordinator has specially allocated time for fulfilling the vital task of reviewing samples of children's work and visiting classes to observe teaching in the subject.

Additional Learning Needs

We teach Science to all children, whatever their ability. Science forms part of the school teaching and learning policy to provide a broad and balanced education for all children. We provide learning opportunities that are matched to the needs of children with learning difficulties.

Health and Safety

Safety in all its aspects is promoted at all times

All practical activities undertaken will be in line with our Health and Safety Policy. This should be consulted in the case of any query.

Resources

Pontarddulais Primary School is well resourced in Science. We keep Science Resources in a central store [Photocopy Room] where there is a box of equipment for most topics/units of work. There is also a collection of miscellaneous Science equipment. Consumables (food stuffs, seeds, compost etc) are purchased as and when required to minimize waste.

The library contains a good supply of Science topic books and computer software to support children's individual research.

Children are trained to treat animals and plants safely and in a considerate way and to treat equipment carefully.

Equal Opportunities

The teaching of Science will be in accordance with the present policy for Equal Opportunities. We aim to provide equal access to Science for those children with Additional Learning Needs and those pupils who are very able and require extension activities, through small group work and through the use of Classroom Assistants.

Every effort is made to ensure that all Science activities are equally interesting for boys and girls. Children with Additional Learning needs are involved at an appropriate level to help them fulfil their potential.

Cwricwlwm Cymreig

Cwricwlwm Cymreig is considered to be an integral part of the children's education. Teacher's Long Term, Medium Term and Short Term plans are used to ensure inclusion throughout not just Science. The National Curriculum for Wales and the QCA scheme of work, is used and adapted to include the uniqueness of Wales and the children's local heritage as and when appropriate/possible. Pupils are given the opportunity to develop and apply their knowledge and understanding of the cultural, economic, environmental, historical and linguistic characteristics of Wales.

Developing Welsh as a second language

Where appropriate using and developing Welsh in Science sessions is encouraged.

This policy will be reviewed on -

Signed:

The Science Policy will be reviewed bi- annually.



Appendix 1

Aspects of Good Practice

- Children have the opportunity for learning Science when they are:
- Handling materials themselves, living and non-living
- Designing, making or manipulating apparatus using a variety of materials including junk items
- Moving around feely and finding the materials they need
- Discussing their work with each other or with the teacher
- Busy doing things which they feel are important
- Trying to work out for themselves what to do from step to step, and not expecting to be told what to do
- Puzzling over a problem [cognitive conflict]
- Comparing their ideas or observations with those of others
- Planning their work
- Developing ideas
- Reflecting on their work

The Science in a situation will be developed where children:

- Have a clear idea of what they want to find out, investigate or observe
- Take the initiative in suggesting what to do and how to set about it
- Try out ideas ‘to see what happens’
- Observe things closely – perhaps watching, listening, touching, and smelling
- Try different things according to their properties or characteristics
- Make some record of what they find out or observe
- Take the initiative in suggesting what to do and how to set about it
- Use instruments for aiding observation or measurement
- Devise and apply tests to find out what things will do
- Make predictions of what they expect to find or to happen
- Look for evidence to support the statements they make
- Try to quantify their observations
- Confirm their finding carefully before accepting them as evidence

Appendix 2

Cross Curricular Aspects of Science

The contribution of Science to teaching in other curriculum areas

English

Science contributes significantly to the teaching of English in our school by actively promoting the skills of reading, writing, speaking and listening. Some of the texts that the children study are of a scientific nature. The children develop oral skills in Science lessons through discussions (for example of the environment) and through recounting their observations of scientific experiments. They develop their writing skills through writing reports and projects and by recording information.

Mathematics

Science contributes to the teaching of mathematics in a number of ways. The children use weights and measures and learn to use and apply number. Through working on investigations they learn to estimate and predict. They develop the skills of accurate observation and recording of events. They use numbers in many of their answers and conclusions.

Information, communication and technology (ICT)

Children use ICT in Science lessons where appropriate. They use it to support their work in Science by learning how to find, select and analyse information on the Internet and on CD-ROMS. Children use ICT to record, present and interpret data and to review, modify and evaluate their work and improve its presentation. E-mail is available to communicate their mathematical findings with other children in other schools and countries.

Personal, social and health education (PSE) and citizenship

Science makes a significant contribution to the teaching of personal, social and health education. This is mainly in two areas. Firstly, the subject matter lends itself to raising matters of citizenship and social welfare. For example, children study the way people recycle material and how environments are changed for better or worse. Secondly, children benefit from the nature of the subject in that it gives them opportunities to take part in debates and discussions. They organize campaigns on matters of concern to them, such as helping the poor or homeless. Science promotes the concept of positive citizenship.

Spiritual, moral, social and cultural development

Science teaching offers children many opportunities to examine some of the fundamental questions in life, for example, the evolution of living things and how the world was created. Through many of the amazing processes that affect living things, children develop a sense of awe and wonder regarding the nature of our world. Science raises many social and moral questions. Through the teaching of Science, children have the opportunity to discuss, for example, the effects of smoking and the moral questions involved in this issue. We give them the chance to reflect on the way we manage the earth's resources. Science teaches children about the reason why people are different and, by developing the children's knowledge of physical and environmental factors, it promotes respect for other people.

Appendix 3

Key Questions/Facts

Interdependence of Organisms

Tobacco, alcohol and other drugs can have a harmful effect on the body.
Some drugs are addictive.
The heart acts as a pump.
Exercise affects your heart rate.
Exercise is needed in order to keep healthy.
Blood circulates around the body through vessels (arteries, capillaries and veins).
Exercise affects how fast the blood is pumped.
Plants have different parts in order for them to make seeds and reproduce.
Female parts of a flower are called carpels; they are made up of the stigma, style and the ovary.
Male parts of the flower are called stamens; they are made up of the anther and the filament.
Plants need light, water, air and warmth in order to grow well.
Pollination can take place in two ways: by the wind or insects.
Male and female parts of a plant combine to form seeds.
Seeds can be dispersed in a number of different ways, e.g. by animals or the wind.
The leaves of green plants produce food in order for the plant to grow; this process is called photosynthesis.
Water and minerals are taken in by the roots and transported to the leaves.
Different plants and animals are found in different habitats.
Animals and plants in different habitats are suited to the conditions there.
Food chains show what eats what in a habitat.
Nearly all food chains start with a green plant.
Microorganisms are too small to be seen.
Some microorganisms are harmful.
Microorganisms can be helpful.
Yeast is an example of a helpful microorganism.

How Things Work

Materials have different properties, for example, hardness, flexibility and strength.
Some materials like iron and steel are magnetic; other metals are not magnetic.
Temperature is measured using thermometers.
Objects cool or warm to the temperature of their surroundings.
Materials that allow heat to pass through them quickly are called thermal conductors.
Materials that do not allow heat to pass through them quickly are called thermal insulators.
Many good insulators work because they trap air.
Thermal insulators keep warm things warm and cold things cold.
Electrical conductors let electricity pass through them.
Electrical insulators stop electricity passing through them.
All metals are electrical conductors.
Materials can be classified as natural (e.g. wood) or manufactured (e.g. plastic)
Soil is made from particles of rock.

Common types of soil are clay soil, sandy soil and peat.

The plant material in soil is called humus.

Solids have a fixed shape; liquids and gases take the shape of the container they are in.

Gases can be squashed or compressed; solids and liquids are not easily compressed.

Air is a mixture of gases.

Oxygen is the gas that humans and animals need to stay alive.

A solid dissolves when it is broken down by water into very small pieces.

When a solid dissolves, it forms a solution.

A solid that dissolves in liquid is soluble.

A solid that does not dissolve in liquid is insoluble.

The speed of dissolving can be increased by:

Breaking up the solid.

Stirring.

Heating the solution.

Melting, boiling, condensing, freezing and evaporating are reversible changes.

In the water cycle, water evaporates and forms water vapour then condenses to form clouds.

In an irreversible change, a new substance is made.

Burning is an example of an irreversible change.

Sieving can be used to separate solid particles of different sizes.

Filtering can be used to separate a solid from a liquid.

Filtering will not remove the solid dissolved in a solution.

Evaporation can be used to remove a liquid from a solution.

Electricity

Electricity will only flow when there is a complete circuit.

Electrical conductors (all metals) allow electricity to pass through them; electrical insulators do not.

Switches are used to control the flow of electricity.

The following components can be represented by symbols in an electrical circuit.

Cell, bulb, switch, motor, buzzer.

The brightness of a bulb in a circuit can be changed by:

Changing the number of cells; changing the number of bulbs; changing the length of the wire in the circuit.

Forces

Iron and steel are magnetic materials.

The ends of a magnet are called the North Pole and the South Pole.

Like magnetic poles repel each other, unlike magnetic poles attract each other.

Force is measured in Newtons using a Newton meter.

The direction of a force can be shown on drawings using an arrow.

Gravity is a force that pulls things towards the ground.

The force of gravity on the Moon is less than the force of gravity on the Earth.

Friction is a force that stops things from moving.

Lubricants are used to reduce friction and make things move easily.

Air resistance and water resistance are both friction forces.

Streamlining is used to reduce friction forces.

When a spring is stretched, the stretching force is opposed by a reaction force.

Light and Sound

There are a number of different sources of light.

Light travels from a source.

Light cannot pass through some materials; when this happens, a shadow is formed.

Light is reflected from surfaces.

Images can be seen in a mirror.

Sounds are made when objects vibrate.

Sound needs a medium through which to travel.

The pitch and loudness of a sound can be changed.

The pitch of a sound describes how high or low the note is.

Although sounds are made when objects vibrate, we cannot always see the vibrations.

Sustainable Earth

The Sun, Earth and Moon are spherical (the same shape as a football).

The length and direction of shadows change during the day.

The apparent movement of the Sun is due to the rotation of the Earth.

It takes the Earth one year to make a complete orbit of the Sun.

It takes the Earth 24 hours to make one complete rotation on its axis.

Day and night occur because the Earth rotates on its axis.

It takes the Moon 28 days to make one complete orbit of the Earth.