Sound Primary School
Science Policy

Rationale:
We teach science because we live in a world that is heavily dependent on science and to let children see how science can affect our lives.
Science offers an approach to learning that will be transferred to other areas of the curriculum.

"The most important goal for science education is to stimulate, nurture and sustain the curiosity, wonder and questioning of children and young people." A Curriculum for Excellence: Progress and Proposals: March 2006

Children will encounter Science:
- ❖ in as natural a context as possible.
- ❖ as an integral part of a topic.
- ❖ so that it builds on what they already know and can do.
- ❖ so it is relevant and meaningful to the child
- ❖ so that it makes links to their own environment.

At our school we aim to give pupils opportunities to:

- investigate their environment by observing, exploring, investigating and recording
- demonstrate a secure understanding of the big ideas and concepts of science
- make sense of evidence collected and presented in a scientific manner
- recognise the impact science makes on their lives, on the lives of others, on the environment and on culture
- express opinions and make decisions on social, moral, ethical, economic and environmental issues informed by their knowledge and understanding of science
- establish the foundation where appropriate, for more advanced learning and future careers in the sciences and technologies
- be treated equally irrespective of gender, ability, ethnicity and background

Content:

Programmes of study are being updated to take account of revised information relating to Curriculum for Excellence. In Nursery and P1 and P2 topics will include aspects of Our Living World, Our Physical World and Our Material World. Primaries 3, 5 and 7 will focus on aspects of Our Living World and Our Physical World while Primaries 4 and 6 will focus on aspects of Our Material World and Our Physical World. This allows there to be planned progression and continuity throughout the school with opportunities for pupils to reinforce and develop skills at an appropriate level.

Curriculum for Excellence:

Developing successful learners

Through science, children and young people develop their interest in, and understanding of, the living, material and physical world. They increase their understanding of scientific ideas and approaches. They become aware of the pace and significance of developments in the sciences and can evaluate the impact of these. Through first-hand observation, practical activities, open-ended challenges and investigations, and discussion and debate, children and young people can develop a range of skills in critical thinking as well as literacy, communication and numeracy.

Developing confident individuals

Science is an important part of our heritage and its applications are part of our everyday lives at work, at leisure or in the home. In order to develop as confident individuals, children and young people need to learn about current science in relevant, real-life contexts and acquire the confidence to use scientific terms and ideas. They can learn to express and justify their views on science-based issues of importance to society.

Developing responsible citizens

Children and young people should come to appreciate that science is a dynamic, creative, human process which contributes greatly to the development of human culture, both nationally and globally. They can recognise that the rate of development in science and technology and their impact have enormous implications for the wellbeing of our society. The values that guide scientific endeavour - respect for living things and the environment; respect for evidence and the opinions of others; honesty in collecting and presenting data; an openness to new ideas - are the basis of responsible citizenship.

Developing effective contributors

Science offers opportunities for children and young people to engage in a wide range of collaborative investigative tasks, both within and beyond the classroom, where they learn to design and use experiments, interpret data, make deductions and draw conclusions based on evidence. Through these experiences and activities they can develop important skills to be enterprising and creative adults in a world where the skills and knowledge of science are needed across all sectors of the economy.

Learning and Teaching

Aspects for consideration:

- Pupils come to Science activities with a number of ideas already formed from previous experiences. They are early attempts to make sense of the world around them and as such must be valued.
- The focus of Science education is to find out what the learners think and then to provide learning experiences that help them to consider and modify their ideas and to develop further their scientific understanding. Meaningful learning occurs when pupils construct their understanding by modifying their existing ideas in the light of new insights gained from scientific investigations.
- Science is an **active** process involving personal construction of meaning and understanding. In the learning and teaching of Science there should be a clear balance between the acquisition of **knowledge and understanding** and of **skills**.

Differentiation

Differentiation will be by task, outcome, teacher input or by resources. Pupils can be arranged in ability or social groupings, which can aid differentiation.

Cross Curricular

As stated above, Science topics are linked into many other areas of the curriculum, for example, Mathematics, ICT, technology, English language and PSHE.
(See Appendix 4)

The main skills we aim to teach the pupils through Science are:

- Observing
- Raising questions
- Predicting and making hypothesis
- Investigating and experimenting
- Interpreting and communicating

There are many skills, which are also integrated into other curricular areas, for example measurement skills, language skills, practical enquiry and field study skills. Science skills will be developed through a wide range of themes chosen from the man-made world, as well as from the natural world. Personal Learning Planning has been introduced to enable pupils and teachers to agree targets and areas for development.

Investigations

During their Scientific activities pupils will be provided with opportunities to try out, change or replace their ideas about how things are, thus developing more scientific understanding through their own ideas and experiences. This will most readily be done through an investigative approach to teaching and learning.
An investigative approach should:

- Encourage children to observe and ask questions.
- Reinforce the important of 'fair' testing
- Stimulate enquiries and give opportunity for experimenting and problem solving
- Be child centred
- Help children communicate and record, using a range of techniques.

Teaching methodology and classroom methodologies

The use of a range of teaching methodologies is essential when teaching Science. These may range from pupils undertaking individual tasks, working in groups on a task or solving a problem to whole-class teaching. The range of methods available to the teacher and their use will depend to an extent on the resources available, the space available, the activities that are planned and the purpose of learning.
The style adopted will depend on the class and the task and activities.

Forward Planning

Programmes of study have been devised to cover all science topics within the school. Teachers will indicate when they plan to cover each topic on their year plan. The programmes of study will then be used for weekly/daily planning as well as a check list to show areas covered.

Recording and Assessment

The programmes of study above will also form a record of work covered and work still to be done. Pre-topic and post topic assessments for knowledge and understanding will be carried out to help the teacher plan starting points and assess understanding of content.
Recording can also take the form of a model, which can be photographed, a picture or a skills self- assessment sheet. This can be by a brainstorming session, a quiz, a worksheet or a practical activity. Examples of assessment sheets are included in the teachers' assessment folder.

Monitoring and Review
Monitoring and review of Science is carried out according to the procedures in the Quality Assurance, Monitoring and Review policy.

CLASSROOM MANAGEMENT ISSUES IN SCIENCE

MANAGEMENT STYLES	ADVANTAGES	DISADVANTAGES
Whole class lesson teaching the class as a unit	Apparent control over progression Potential to deliver accurate information Teaching opportunity for gifted speakers	Differentiation only possible by questioning Child relatively passive Little equipment needed
Teacher demonstration practical performed by the teacher, perhaps with pupil help	Apparent control over progression Little equipment needed Safety issues under tight control	Hands-off experience No differentiation No opportunities to practice science skills
Whole class activity everyone does the same practical	Clear understanding of task Easy to equip Possible differentiation by outcome Opportunity to share experiences	No task differentiation High equipment demands Little progression
Individual learning programme every pupil follows their own course	Matching of pupil to task Complete differentiation Progression Easy to assess and record pupil progress	No shared group working Lacks stimulus Demanding on the teacher, especially with large groups
Practical group work each group is involved in a practical activity	Differentiation by task possible Progression likely Shared learning Low equipment demands Easier to assess and record	Complex equipment requirements Mental agility demands on teacher Constant demands for fresh tasks
Thematic group work all classes working on the theme, but some doing practical, and others book or resource work	Whole class involvement, but less teacher demands Progression possible Work given context Reflection possible Low equipment demands	Need for recording to ensure balanced work Differentiation needs attention Need for both good secondary sources and equipment
Circus of activities Groups move from task to task	Intense practical activity Sustained interest Potential for both group work and reporting common experiences	Progression impossible Differentiation only by outcome Complex equipment demands Stressful for the teacher
The Science table Groups visit a single task in turn through some days	Controllable Progression slow, but possible Differentiation by outcome Easily accessed and recorded Few equipment demands	Isolated activity with special status Little shared experience Hard to plan for individuals
Integration Science is one of many activities; pupils select when to tackle it	Flexibility of time and resources Differentiation by task is possible Progression, assessment and recording all possible	Needs very careful planning and accurate record keeping Pupils may skip or do inadequate work Equipment demands very varied.

Appendix 2

Science skills Overview - Nursery – Primary 7

Nursery & Primary 1	**Primary 2 & 3**	**Primary 4**
Ideas and evidence in science	*Ideas and evidence in science*	*Ideas and evidence in science*
Children have opportunities to ➢ collect evidence to try to answer a question	Children have opportunities to ➢ collect evidence to try to answer a question	Children have opportunities to ➢ collect evidence in a variety of contexts to answer a question or test an idea
Investigative skills *Planning*	*Investigative skills* *Planning*	*Investigative skills* *Planning*
Children have opportunities to ➢ test ideas suggested to them and say what they think will happen	Children have opportunities to ➢ suggest some ideas and questions based on simple knowledge and say how they might find out about them; ➢ say what they think might happen; ➢ think about and discuss whether comparisons and tests are fair or unfair	Children have opportunities to ➢ in a variety of contexts, to suggest questions and ideas and how to test them; ➢ make predictions about what will happen; to think about how to collect sufficient evidence in some contexts; ➢ consider what makes a test unfair or evidence sufficient and, with help, plan fair tests
Obtaining and presenting evidence Children have opportunities to ➢ make observations using appropriate senses; ➢ make some measurements of length using standard and non-standard measures; ➢ present some findings in simple tables and block graphs	*Obtaining and presenting evidence* Children have opportunities to ➢ make observations using appropriate senses; ➢ make some measurements of length using standard and non-standard measures; ➢ present some findings in simple tables and block graphs	*Obtaining and presenting evidence* Children have opportunities to ➢ make observations and comparisons; ➢ measure length, volume of liquid and time in standard measures using simple measuring equipment effectively; ➢ present results in drawings, bar charts and tables
Considering evidence and evaluating Children have opportunities to ➢ communicate observations orally, in drawing, by labelling and in simple writing; ➢ make simple comparisons and groupings that relate to differences and similarities between living things and objects; in some cases to say what their observations show, and whether it was what they expected; ➢ draw simple conclusions and explain what they did	*Considering evidence and evaluating* Children have opportunities to ➢ make simple comparisons, identifying similarities and differences between living things, objects and events; ➢ say what results show; to say whether their predictions were supported; in some cases to use knowledge to explain what was found out ➢ draw conclusions; and to explain what they did	*Considering evidence and evaluating* Children have opportunities ➢ draw conclusions from results and begin to use scientific knowledge to suggest explanations for them; ➢ make generalisations and begin to identify simple patterns in results presented in tables

Primary 5	Primary 6	Primary 7
Ideas and evidence in science	*Ideas and evidence in science*	*Ideas and evidence in science*
Children have opportunities to ➢ collect evidence in a variety of contexts to test an idea or prediction based on their scientific knowledge and understanding	Children have opportunities to ➢ consider how scientists have combined evidence from observation and measurement with creative thinking to suggest new ideas and explanations for phenomena	Children have opportunities to ➢ consider how scientists have combined evidence from observation and measurement with creative thinking to suggest new ideas and explanations for phenomena
Investigative skills Planning	*Investigative skills* *Planning*	*Investigative skills* *Planning*
Children have opportunities to ➢ suggest questions that can be tested and make predictions about what will happen, some of which are based on scientific knowledge; ➢ design a fair test or plan how to collect sufficient evidence; and, in some contexts, ➢ choose what apparatus to use and what to measure	Children have opportunities to ➢ make predictions of what will happen based on scientific knowledge and understanding, and suggest how to test these; ➢ use knowledge and understanding to plan how to carry out a fair test or how to collect sufficient evidence to test an idea; ➢ identify factors that need to be taken into consideration in different contexts	Children have opportunities to ➢ decide how to turn ideas into a form that can be tested and, where appropriate, ➢ make predictions using scientific knowledge and understanding; ➢ identify factors that are relevant to a particular situation; ➢ choose what evidence to collect to investigate a question, ensuring the evidence is sufficient; ➢ choose what equipment to use
Obtaining and presenting evidence Children have opportunities to ➢ make observations and comparisons of relevant features in a variety of contexts; ➢ make measurements of temperature, time and force as well as measurements of length; ➢ begin to think about why measurements of length should be repeated; and to present results in bar charts and tables	*Obtaining and presenting evidence* Children have opportunities to ➢ make relevant observations; ➢ consolidate measurement of volume, temperature, time and length; ➢ measure pulse rate; ➢ think about why observations and measurements should be repeated; ➢ present results in bar charts and line graphs	*Obtaining and presenting evidence* Children have opportunities to ➢ make a variety of relevant observations and measurements using simple apparatus correctly; ➢ decide when observations and measurements need to be checked, by repeating, to give more reliable data; and to use tables, bar charts and line graphs to present results
Considering evidence and evaluating Children have opportunities to ➢ identify simple trends and patterns in results presented in tables, charts and graphs and to suggest explanations for some of these; ➢ explain what the evidence shows and whether it supports any prediction made; ➢ to link the evidence to scientific knowledge and understanding in some contexts	*Considering evidence and evaluating* Children have opportunities to ➢ decide whether results support any prediction; to begin to evaluate repeated results; ➢ recognise and make predictions from patterns in data and suggest explanations for these using scientific knowledge and understanding; ➢ interpret data and think about whether it is sufficient to draw conclusions; ➢ draw conclusions indicating whether these match any prediction made	*Considering evidence and evaluating* Children have opportunities ➢ make comparisons; to evaluate repeated results; ➢ identify patterns in results and results that do not appear to fit the pattern; ➢ use results to draw conclusions and to make further predictions; ➢ suggest and evaluate explanations for these predictions using scientific knowledge and understanding; ➢ say whether the evidence supports any prediction made

Appendix 3

Science Topic Overview Nursery – Primary 7

Nursery	P1	P2	P3	P4	P5	P6	P7
Every Year	Seasons	Seasons	Birth, Care and Growth	Materials	Minibeasts	Light and Sound	Plants
Seasons	Myself	Dinosaurs	Vikings	Light & Sound	Habitats	Forces and Energy	Earth & Space • Formation • Rocks • Natural Disasters
Year 1	Farm	Hot and Cold	Animals and Plants	Forces and Energy	Earth and Space	Electricity	Classification and Food Chains
Growth	Toys	Sea and Seashore	Earth and Space	Electricity and Magnetism		Materials from Earth	
Pets		Houses and Homes	Seasonal change				
Year 2							
All About Me							
People who help us							
Sea and Seashore							

Appendix 4

Cross Curricular links and Science

Mathematics

This is the subject which most obviously links with science. Science offers opportunities for practical application of many mathematical skills from basic computation to the drawing and interpretation of graphs.
As well as recording using graphs, tables, histograms and pie charts, science also provides many opportunities for practical measurement of time, weight, length, capacity, area, volume and weather.

Literacy

The links between science and language development should not be restricted to writing about what has been seen or done. All areas of language can be developed through science in a variety of ways:

Speaking – science lends itself to class and group discussion, debate, verbal description and reporting back of findings from investigations.

Listening – pupils develop listening skills from hearing their classmates reporting and from video and other digital sources, as well as in the course of their investigations.

Reading – pupils must learn to read instructions. In order to carry them out, and in developing a theme, they must be able to research from written sources. Linking class novels to a science topic is also possible.

Writing – science can obviously provide situations for the development of non-fictional writing, reporting, recording, instructing and describing. It can also provide an exciting source for creative writing both in poetry and prose.

Social Subjects

In examining how scientific ideas affect the world we live in, links with geographical and historical aspects of our environment are inevitable. The study of the environment lends itself to work on habitats, land use, structures and forces, the nature of materials, energy transfer and other aspects of physical science.

Technologies

Through practical scientific experiments pupils will have opportunities to generate designs and test them. The use of ICT permeates the curriculum.

Health, Well-being and Physical Education

Both of these subjects lend themselves greatly to any scientific work on ourselves and growth. The practical application of the scientific concepts learned is in the pupils' enhanced awareness of how to maintain their bodies in a fit and healthy state. PE can also be linked with science by developing a range of performance activities to develop measuring and information processing skills.

Expressive Arts

Links with craft skills are apparent in aspects of technology. Other artistic activities could also be linked meaningfully with science, not only in directly studying colour and sound but in recording and developing various activities through painting, drawing, modelling, music, drama and dance.