

Programme of Study for Science and Technology at Key Stage 2

2

KEY STAGE

Introduction

Building on experiences gained in Key Stage 1, pupils should continue to be given opportunities to develop their skills, understanding and knowledge of science and technology. They should build on the working vocabulary that has been developed in Key Stage 1 and be encouraged to communicate with other pupils and their teachers through group and class discussions.

Pupils should be given opportunities to increase their awareness of the importance of both science and technology in everyday life. This understanding may arise from everyday experiences in school, at home and in the local environment.

Pupils should develop an awareness and an understanding of the need to conserve the natural environment. They should appreciate the need for the sensitive collection and care of living things that are used as the subject of any study of the environment.

Activities and experiences in science and technology may sometimes link into themes and topics incorporating other areas of the curriculum, and may be integrated with them, where appropriate.

It is important in science and technology that pupils are given opportunities to:

- solve problems;
- carry out investigations;
- make observations;
- ask and answer questions;
- present their ideas;
- plan independently;
- record observations;
- work methodically;
- interpret evidence;
- construct using a wide variety of materials;
- plan and adapt as they work;
- evaluate and revise their work;
- make suggestions for improvement;
- develop oral, written and graphic communication skills.

Communication

During science and technology activities, pupils should be encouraged to use appropriate scientific language to communicate their ideas and findings to the teacher and other pupils. They should be encouraged to communicate by talking and listening, discussing, drawing, writing and making simple models and charts. These practical experiences should be supplemented as appropriate by using sources, *for example, books, charts, pictures, television and radio programmes, video resources, educational visits and the use of computers.*

Progression

The programme of study for science and technology is set out under 2 attainment targets - Investigating and Making in Science and Technology and Knowledge and Understanding of Science and Technology.

Progression in science and technology requires pupils to develop, in parallel, both their skills in investigating and making and their knowledge and understanding. They should progress from activities centred on more familiar to less familiar situations and context.

The programme of study has been set out in strands with sub-headings to indicate progression. Within each of these sub-sections, the order of the material indicates a line of progression. It should not be felt, however, that this order should restrict the planning of teaching schemes.

Technology

Elements of technology in Investigating and Making are identified by the use of (T). These elements should be integrated with work in science. When planning activities teachers should identify opportunities for technology from the Knowledge and Understanding strands - Materials and Physical Processes. There also may be opportunities for developing investigations in science from work in technology.

Contribution to Educational (Cross-curricular) Themes

During science and technology activities pupils should have opportunities to engage in discussion and to undertake activities which fulfil the objectives of the cross-curricular themes. The opportunities listed in this section should not be treated as a check list to be covered but as illustrations of some of the ways in which the cross-curricular themes can be developed as an integral part of science and technology.

Information Technology

Pupils should be given opportunities to develop and apply their knowledge, skills and understanding of information technology and in particular to collect, classify, enter and change information using a database, pose a question to retrieve information and to analyse their findings and present them in a variety of forms. They should also, where appropriate, be given opportunities to control a device using a sequence of commands.

Health Education

Science provides pupils with opportunities to develop positive attitudes to keeping healthy through exercise, diet and personal hygiene. They should be made aware of the importance of safety and careful actions in all science and technology activities particularly when using equipment.

EMU and Cultural Heritage

Pupils should have opportunities to develop an understanding of themselves and others by exploring similarities and differences between themselves and other children, and developing a sense of their own individuality. They should appreciate the environment around them, the need to take care of it and how human activities can upset the natural environment. They should consider how some toys and devices work and know that the technology which drives them has been developed over a period of time.

INVESTIGATING AND MAKING IN SCIENCE AND TECHNOLOGY

Investigating and Making in Science and Technology is set out under three strands - Planning, Carrying Out and Making and Interpreting and Evaluating. Investigating and Making is central to the Knowledge and Understanding of Science and Technology. Activities in Investigating and Making should be introduced through the Knowledge and Understanding section of the programme of study.

Pupils should be encouraged to adopt safe practices when undertaking science and technology activities. They should be made aware of potential hazards and the appropriate actions necessary to avoid risks.

Planning

Pupils should have opportunities to participate in practical activities which involve them in suggesting ideas for investigations and planning what to make.

Pupils should be given opportunities to:

- a recognise a fair test, for example, know that when testing the bounce of balls they must be dropped from the same height onto the same surface;
- b suggest ideas which can be investigated and make predictions, for example, find out which material is best for keeping ice cubes solid;
- c choose appropriate materials and components when planning what to make, for example, choose cartons, doweling, wheels and tape when planning how to make a toy vehicle (T);
- d suggest how to carry out a fair test, for example, know that when changing one factor and observing or measuring the effect of this change the other factors must be kept the same;
- e plan what they are going to make and talk about the materials and components they could use, for example, discuss ideas and decide how to construct a working model of a lighthouse taking into consideration the properties of the materials, the components to be used and the need for safe working procedures (T);
- f design a fair test, for example, in an investigation, find out which kitchen roll is best at soaking up water;

Carrying Out and Making

Pupils should have opportunities to participate in practical activities which involve them in carrying out fair tests, recording results and constructing.

Pupils should be given opportunities to:

- a reinforce measuring skills using non-standard measures and progress to using standard measures, for example, use string to measure the distance travelled by a toy car;
- b develop manipulative skills using a range of materials and tools, for example, use scissors or snips to cut paper, card, straws or string (T);
- c record what they have done or observed using appropriate methods, for example, use a simple table to record substances which do/do not dissolve in water or record findings using a computer database;
- d make decisions about what, when and how to measure, for example, decide when comparing which is the best paper helicopter, either to measure the time taken for it to fall or to observe the direction of spin;

- e carry out a fair test;
- f make observations and measurements, taking account of the need for care and accuracy, for example, know that when comparing how substances dissolve in water it is necessary to measure the amount of substance and water accurately;
- g develop competence in the safe use of appropriate tools and techniques to cut, shape and join materials, for example, use a low temperature glue gun to join wood (T);
- h record findings choosing appropriate methods, for example, use a computer database to record the height of pupils;
- i construct working models which incorporate an energy source and which can be controlled, for example, use syringes and tubing to make a working 'Jack in the Box', use a balloon to power a buggy, or use information technology to control a model they have made (T);
- j carry out a fair test that they have designed and record results systematically in tables, for example, devise a table to record the growth of plants.

Interpreting and Evaluating

Pupils should participate in practical activities which provide them with opportunities to develop further their skills in reporting, presenting and interpreting results and evaluating what they have made.

Pupils should be given opportunities to:

- a present their findings using appropriate methods, for example, block graphs, labelled pictures, drawings, bar charts, pictograms or a simple written record;
- b relate what happened to what they predicted;
- c talk about what they have made in terms of materials, colour, size or shape and make suggestions for improvement, for example, talk to the teacher about how well their model vehicle moves and suggest how it might be improved by changing the size of the wheels (T);
- d choose appropriate methods to present results and make a record of their conclusions, for example, bar charts, graphs, database mapping diagrams or a written record which presents their own ideas;
- e use results to draw conclusions or make comparisons, for example, state that the warmer the water is the faster the sugar will dissolve;
- f evaluate what they have made, in terms of appearance and fitness for purpose, and suggest improvements, for example, suggest how they might improve a model windmill they have made (T);
- g use results to identify patterns, for example, state that Kitchen Roll A is best, followed by Kitchen Roll B, followed by Kitchen Roll C;
- h evaluate a model that they have made bearing in mind their original intentions, for example, test if a balloon powered buggy can travel the required distance (T).

KNOWLEDGE AND UNDERSTANDING OF SCIENCE AND TECHNOLOGY

Knowledge and Understanding of Science and Technology is set out under three strands - Living Things, Materials and Physical Processes.

Living Things

Ourselves

Pupils should be given opportunities to:

- a find out about themselves, including how they grow, move and use their senses;
- b identify major organs, including brain, heart, lungs, stomach, liver, bladder, small and large intestines, kidneys, and place these organs on an outline of the human body;
- c learn about factors that contribute to good health including diet, exercise, hygiene and develop an awareness of the safe use of medicines and the harmful effects of tobacco, alcohol and other substances;
- d *develop an awareness of puberty-related changes, through discussion with the teacher or other professionals, for example, discuss with the teacher the changes that occur in their bodies during puberty;*
- e investigate how basic life processes including circulation, simple respiration and digestion relate in order to maintain healthy bodies, *for example, compare breathing and pulse rates before and after exercise;*
- f understand that humans have skeletons and muscles to support their bodies and help them move, *for example, make a hinged cardboard model of their joints.*

Animals and Plants

Pupils should be given opportunities to:

- a find out about other animals, including how they grow, feed, move and use their senses;
- b observe similarities and differences among animals and among plants;
- c discuss the use of colour in the natural environment, *for example, in camouflage, talk about how animals adapt to their surroundings;*
- d find out ways in which animal and plant behaviour is influenced by seasonal changes, *for example, find out about some trees losing their leaves in autumn, buds opening in spring or hibernation and migration in winter;*
- e investigate a local habitat, including the relationship between the animals and plants found there, and develop skills in classifying animals and plants by observing external features, *for example, classify minibeasts by observing the number of legs and note the conditions in which they were found;*
- f find out about the main stages in the life cycle of some animals including a butterfly and a frog, *for example, sequence pictures of the main stages of growth;*
- g investigate the conditions necessary for the growth of familiar plants including light, heat and water, *for example, place plants in different environments, varying the light, water and temperature and observe the results;*

- h learn about the life cycle of a flowering plant including how pollen is taken from the stamen into the stigma, fertilised in the ovule and a seed produced which is dispersed in a variety of ways;
- i order living things in a simple food chain and understand the dependency of one on the other, *for example, construct a food chain, such as grass/rabbit/fox.*

Materials

Properties

Pupils should be given opportunities to:

- a investigate similarities and differences in materials and objects and sort them according to their properties, *for example, sort plastics into those which are transparent and those which are opaque or sort fabrics into those which absorb water and those which are waterproof;*
- b find out about the origins of materials and learn that some are natural and others are manufactured, *for example, find out that wood is natural and plastic is manufactured;*
- c investigate the properties of materials and how these relate to their uses, *for example, investigate the strength of paper, or describe the different materials used in building a house;*
- d investigate the distinctive properties of solids, liquids and gases as exemplified by water, *for example, learn that solids have a definite shape and volume, that liquids have a definite volume but take the shape of containers and that gas will occupy the space available.*

Change

Pupils should be given opportunities to:

- a investigate which everyday substances dissolve in water, *for example, find out that salt and sugar dissolve in water and rice and sand do not;*
- b know that when materials are changed this may be desirable or undesirable, *for example, find out that the change brought about by baking is desirable whereas the change brought about by rusting is undesirable;*
- c investigate the changes of state brought about by heating and cooling everyday substances, *for example, investigate the effect of heat on ice and water and the reverse process;*
- d relate changes of state to the water cycle;
- e understand that when new materials are formed, change is permanent, *for example, learn that plastics are made from oil, paper is made from wood and that these changes are permanent;*
- f investigate how rusting can be controlled, *for example, observe that the use of paints and oils (grease) will prevent rusting and protect iron.*

Environment

- a find out how human activities create a variety of waste products, *for example, match waste products to the activity that created them;*
- b find out that some materials decay naturally while others do not, *for example, find out that fruit and leaves decay while aluminium cans and glass do not;*
- c understand that some waste materials can be recycled and that this can be of benefit to the environment, *for example, discuss the recycling of bottles, cans and paper.*

Physical Processes

Forces and Energy

Pupils should be given opportunities to:

- a find out about the range of energy sources used in school and at home, *for example, create a class database of methods used to heat their homes;*
- b find out the sources of energy in a variety of models and machines, *for example, find out the source of energy in a torch, land yacht or waterwheel, or make a model which incorporates an energy source;*
- c investigate how forces can affect the movement and shape of objects, *for example, describe what happens when different weights are placed on sponges;*
- d investigate the effect of friction on the movement of objects, *for example, carry out grip tests with shoes or blocks on a variety of surfaces;*
- e understand the differences between renewable and non-renewable energy resources and the need for fuel economy.

Electricity

Pupils should be given opportunities to:

- a know about the safe use of mains electricity and its associated dangers;
- b construct simple circuits using components, such as switches, bulbs and batteries, *for example, light a bulb using two wires and a battery;*
- c investigate materials as to whether they are insulators or conductors, *for example, identify materials which can be used to complete a circuit;*
- d investigate the effects of varying current in a circuit to make bulbs brighter or dimmer, *for example, use two bulbs or two batteries to observe changes in brightness.*

Sound

Pupils should be given opportunities to:

- a investigate how sounds are produced when objects vibrate, *for example, find out that vibrations caused by plucking an elastic band make sounds, or make instruments which produce sounds;*
- b investigate that sound travels through a variety of materials, *for example, recognise that sound travels through string in a string telephone and through metal when tapping pipes.*

Light

Pupils should be given opportunities to:

- a explore how light passes through some materials and not others, *for example, use a torch to sort a variety of papers into those which allow light to pass through and those which do not;*
- b find out that when light travelling from a source does not pass through materials, shadows are formed, *for example, draw an object and the shadows formed when the light shines from different positions;*
- c investigate the reflection of light from mirrors and other shiny surfaces, *for example, observe images formed by a range of objects with reflective surfaces.*