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Introduction

As a child I first became interested in science when, aged nine, my teacher showed me that if I stood one metre away from a mirror my mirror image was one metre behind. This fascinated me and so began many hours of investigating. When shopping with my mother I loved to try and trick the department store mirrors. I would stand in front of mirrors and see whether I could 'catch out' my reflection. I would ask lots of questions such as 'Is the reflection in the mirror or behind it?' 'Does the metre 'rule' work with all mirrors?' 'Does the thickness of the mirror matter?' 'What happens if the mirror is made from plastic?'

For me science was, and still is today, about finding out why things happen and how things work. It is about developing understanding of our world and realising how different factors affect what happens. It is about asking questions, researching ideas, carrying out practical investigations and interpreting results. Most importantly science gives us the opportunity to develop a wide range of skills and to use our imaginations as we try to make sense of what we observe, read and are told.

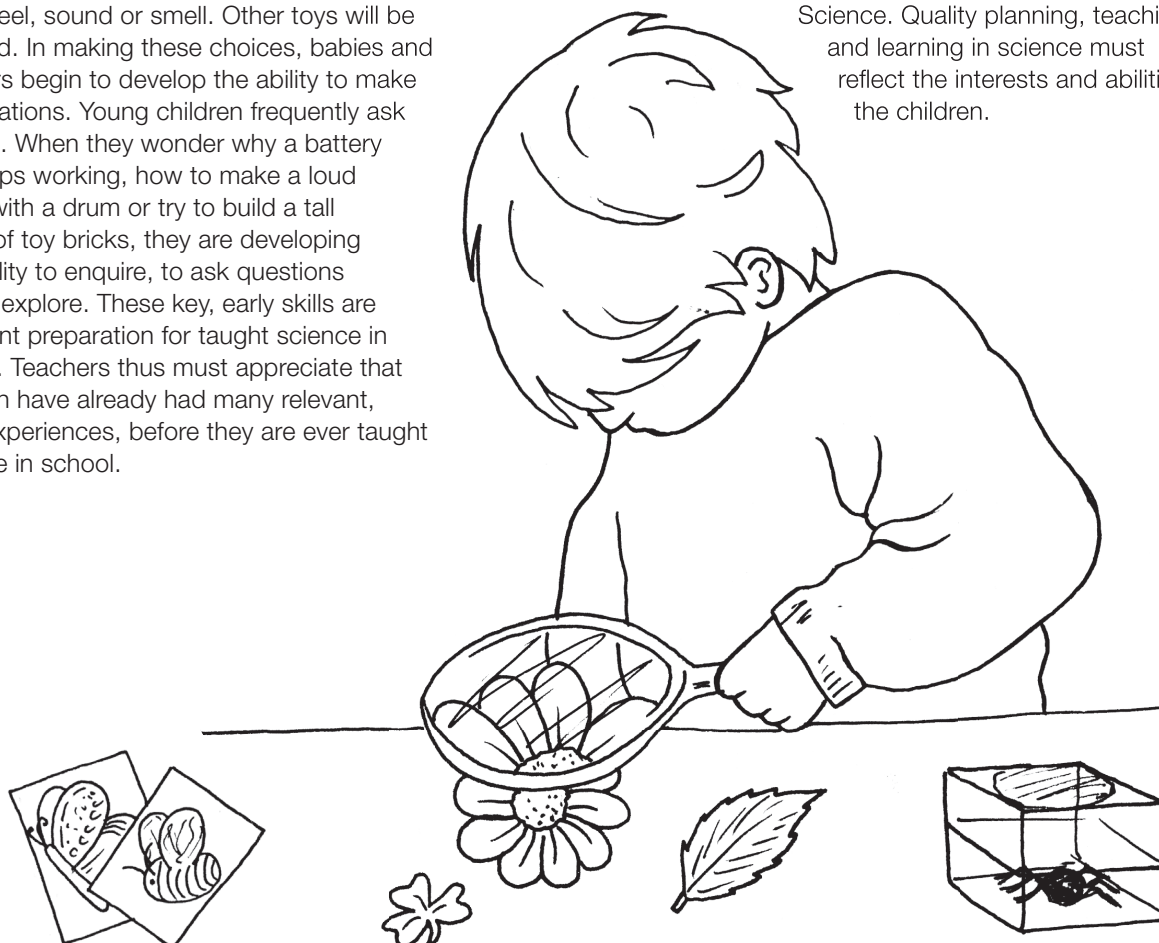
The majority of children have an instinctive desire to investigate and to explore. Babies will shake, feel, lick and look at rattles. Over time they begin to form preferences for a particular toy perhaps based on its feel, sound or smell. Other toys will be rejected. In making these choices, babies and toddlers begin to develop the ability to make observations. Young children frequently ask 'Why?'. When they wonder why a battery toy stops working, how to make a loud noise with a drum or try to build a tall tower of toy bricks, they are developing the ability to enquire, to ask questions and to explore. These key, early skills are excellent preparation for taught science in school. Teachers thus must appreciate that children have already had many relevant, prior experiences, before they are ever taught science in school.

Planning to Teach Science in the Primary Classroom

has been written for trainees, supply teachers and non-specialist science teachers to help with the planning, teaching and assessing of science. It provides information about the key characteristics of science that should be developed within teaching and learning, and explains how to plan for, teach and assess science. It gives ideas for activities for the concept areas given within the National Curriculum for Science at Key Stages 1 and 2 and, also, gives children the opportunity to plan and carry out their own investigations. Where appropriate, teacher subject knowledge is supplied. Copy Masters provide diagrams for topics such as the human body and parts of a plant; sheets to plan investigations and a balanced meal; sheets to identify plants, leaves, minibeasts and pond creatures and a 'Did you know?' fact sheet to promote discussion and stimulate interest in science. A tracking sheet shows how the given activities in Section 2 relate to the 'QCA Scheme of Work for Science'.

Planning to Teach Science in the Primary Classroom

does not set out to be a scheme of work. Instead the intention is to have a flexible resource to 'dip into' at the planning stage. It can be used as the initial place for ideas when planning a scheme of work or to support existing school schemes of work or ones such as the QCA Scheme of Work for Science. Quality planning, teaching and learning in science must reflect the interests and abilities of the children.

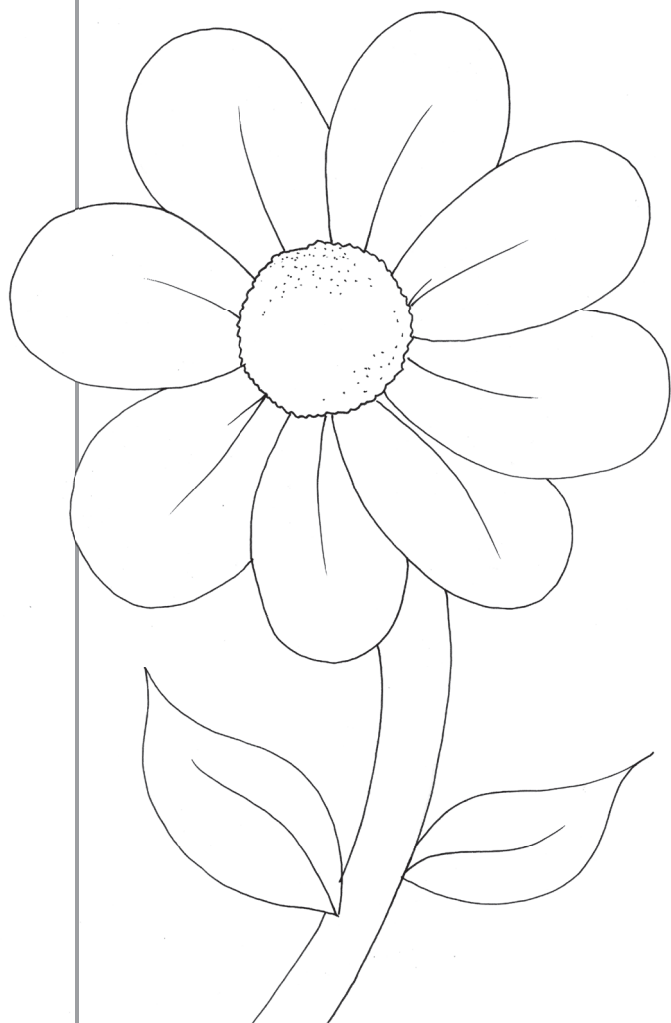


Section 2

Developing skills

Section 1 described how planning for science must consider both the skills and the concepts. Often the same activity can be carried out with a different age of class but for different learning intentions. Thus, it is vital for both the teacher and the children to consider what the activity intends to promote. For example, in Year 1 children might be given a selection of objects to sort according to whether they might float or sink and then be asked to test their predictions. In Year 6 the same activity might take place but the children would be expected to consider the forces involved and the concept of balanced and unbalanced. Children within Key Stage 1 might collaborate with an adult to list factors that affect the germination of cress seeds. At Key Stage 2 children, hopefully, could list and control the variables before planning and carrying out their investigation.

Section 2 gives details of activities, for teachers to select the ones that they feel would match the knowledge and understanding they wish their pupils to develop. Skills are not given for each activity because these will depend on the year group, the way the topic is introduced and the degree to which the children plan and carry out the activity and evaluate their findings.



In recent years there has been discussion on content overload and concern for the limited amount of practical investigation that children, particularly in Key Stage 2, have been able to do. There are, however, a number of key points to remember when planning science lessons for children. Firstly, although the National Curriculum states what children have to know it does not specify the methods for teaching science or what the children should actually do. As a result, it is up to schools and teachers to ensure that what they provide for children balances content and practical activity. Issues of content overload have been related to the use of Standard Assessment Tests (SATs).

Activity Levels

A number of published science schemes exist that specify an activity is suitable for a particular year group. Unfortunately such schemes do not account for the individual circumstances of a school or class, and can lead to inappropriate labelling of activities as appropriate or otherwise. To avoid this, the majority of activities within this book have not been allocated to a particular key stage. This is because some of the learning intentions within the National Curriculum for Key Stage 1 are similar to ones given for Key Stage 2 but expressed in simpler terms. Where intentions only appear in Key Stage 2, such as for micro-organisms, the Learning Intentions have been marked with the symbol *. It is though important that schools plan for progression. Care should be taken, if repeating activities in subsequent years, that children continue to be engaged and recognise the additional understanding that they have gained.

Safety

Although all the activities outlined within this book have been trialed with children aged five to eleven years, teachers should, in addition to the safety points noted in Section 1, consider the following when allowing children to work with animals and/or plants:

Safety when working with plants

Teach children to treat all plants and fungi as hazards until it is known that they are safe. In Great Britain it is illegal to dig up wild plants or to pick some wild flowers. In general it is acceptable to allow children to pick safe, common weeds. It must though be remembered that some plants contain toxic chemicals and as a result are poisonous. Poisonous plants include ones such as holly, laburnum, privet, ragwort, yew, white bryony, black nightshade and woody nightshade. Plants also can irritate the skin or cause dermatitis. Examples of these are stinging nettles, giant hogweed and some bulbs of the lily family.

When working with plants children should be taught:

- never to taste any part unless it is certain that it is safe to do so;
- to avoid touching eyes;
- to wash hands after touching plants or seeds.

Safety when pond dipping

Avoid areas with difficult or steep access. Weil's disease is a rare bacterial disease that can cause influenza like symptoms. It can be caught from water polluted by rats. Thus pond dipping should not take place from water where there is waste human food as this encourages rats to gather.

When pond dipping children should be taught:

- to avoid splashes that cause water to enter the eyes, nose or throat;
- to cover cuts and abrasions with waterproof plasters;
- to wash hands and other areas that have come into contact with the water (e.g. knees).

Activities to teach Life and Living Things at KS1/2

Life processes

Learning intentions

- Pupils will understand the difference between things that are living and things that have never been alive.
- Pupils will know that the life processes common to plants include growth, nutrition and reproduction.
- Pupils will be able relate life processes to animals and plants found in the local environment.

Activities

- Compare a doll or teddy with a human. List the similarities and the differences. How do the children know that the teddy/doll is not living?
- Tell the children an alien has arrived on the Earth. He has been sent to take three living things back to his planet but does not know the difference between what is living and what is not.

Ask the class to help him by making a list of characteristics for a living thing. (Note: Characteristics for things to be classified as living include an ability to: move, reproduce, be sensitive, take up nutrition, excrete, respire, and grow.)

Use the lists to sort the pictures in Copy Master 7 into 'living' and 'has never been alive'. As a class, tell the alien which three things to take back and explain what he will need to do to keep them alive.

- Take the children on a walk around the school. Identify living things.
- Take the children on a safe walk around the school grounds. Identify places where plants are growing and mark them on a plan. Inside discuss how the

plants' needs are met by their habitats.

- Use the internet to research the life processes for a plant such as an apple tree.

Humans and other animals

Learning intention

- Pupils will be able to recognise and compare the main external parts of the bodies of humans and other animals.

Activities

- Draw round a child wearing trousers. Label as many body parts as possible.
- Enjoy making hand and footprints. Cut them out and compare the similarities and differences.
- Use a digital camera to take photos of children. Ask each child to make a paper plate mask to represent their own face. Compare the similarities and differences.
- Play 'Simon says' using as many body part words as possible. Invite children to lead the game.
- Make imaginary animals. Encourage the children to use body part words to describe their animals. Use the pictures to play 'I spy an animal that has ...'
- Set out activities such as building towers of bricks, placing pegs in or out of a pegboard, spooning marbles through a hole in a margarine tub, removing pincer clothes pegs from a line using one hand and using chop sticks to stack sugar cubes. Compare the way that children use their hands. Use ICT to record what each hand can do.

Senses

Learning intention

- Pupils will know about the senses that enable humans and other animals to be aware of the world around them.

Activities

- Having first checked for potential food allergies, enjoy carrying out sense testing using foods. Which foods can be identified by smell? Can foods be identified by taste? If foods have been pureed can they be recognised or does the texture matter?
- Use ICT and books to research the similarities and differences in the eyes and ears of humans and other animals. Encourage the children to consider why particular senses are important for a specific animal and how animals' senses have adapted for their surroundings.
- Carry out hearing tests. Sit the class in a large circle around a child wearing a blindfold. Investigate whether the blindfolded child can identify where sounds are being made. Repeat the experiment with a child also wearing headphones and a hat that covers the ears. If hearing is less good, relate this to road safety and the need to listen.

Teeth

Learning intention

- Pupils will know about the functions and care of teeth.

Activities

- Invite a dental hygienist/dentist to talk to the class about teeth. Following the visit make posters or non-fiction books to describe the care and functions of teeth.
- Use secondary sources to research the function of canine, molar and incisor teeth. Provide raw carrots for the children to eat. Encourage the children to analyse how they use their teeth.
- Collect packaging from tooth brushes, dental floss and toothpaste. Investigate how the products claim to protect teeth.

Exercise and healthy diets

Learning intentions

- Pupils will know that humans and other animals need food and water to stay alive.
- Pupils will know that taking exercise and eating the right types and amounts of food help humans to keep healthy.

Activities

- Give each child Copy Master 9 which shows the proportions of foods that should be eaten to make a balanced diet. Ask them to either stick on pictures of food cut from magazines or draw foods to show a healthy, balanced lunch. Older children should know that protein is needed for growth and repair; carbohydrates are needed for energy, and fats are needed for healthy skin and stored energy. Talk about the importance of drinking water.
- Collect clean food packets. Make a large collage of the packets. Use the display to analyse the nutritional content. Compare the energy, fat and carbohydrate contents for 100g of given foods. Which foods provide minerals and vitamins? Talk about what is meant by 'the Recommended Daily Allowance' values given on foods such as boxes of cereal.
- Investigate the fat content in a variety of foods by pressing equal sized pieces of food such as crisps, croissant, chocolate, cake and pastry on a clean piece of paper. Remove the food and examine the paper for marks. Translucent marks that do not disappear on drying indicate fat. Wet patches that disappear on drying suggest the presence of water.
- Make a class display to show all the types of exercise that children do in a week. Talk about how the exercise helps people to be healthy. Which parts of the body are helped by different types of exercise? (The following table shows some examples of popular forms of exercise and the extent to which they build strength, suppleness and stamina.) Remember to include exercise such as walking up stairs, carrying shopping, and cleaning, which the children may not associate with the term 'exercise'.

Exercise	Stamina	Strength	Suppleness
Cycling	***	**	*
Football	**	**	**
Gymnastics	*	**	***
Jogging	***	*	*
Swimming	***	***	***
Trampolining	***	***	***

- During a PE lesson annotate a diagram of the human body to show safe ways to exercise different parts of the body. Copy Master 4 could be used.

Hearts

Learning intentions

- Pupils will know that the heart acts as a pump to circulate the blood through vessels around the body, including through the lungs.
- Pupils will know about the effect of exercise and rest on pulse rate.

Activities

- Measure the pulse rate for 30 seconds before and after carrying out exercises such as running on the spot or skipping. Check the children are aware that a pulse beats each time the heart beats. Explain that when we exercise our muscles require more oxygen and therefore the pulse/heart rate quickens.
- Use ICT and secondary sources to explain how the heart works.

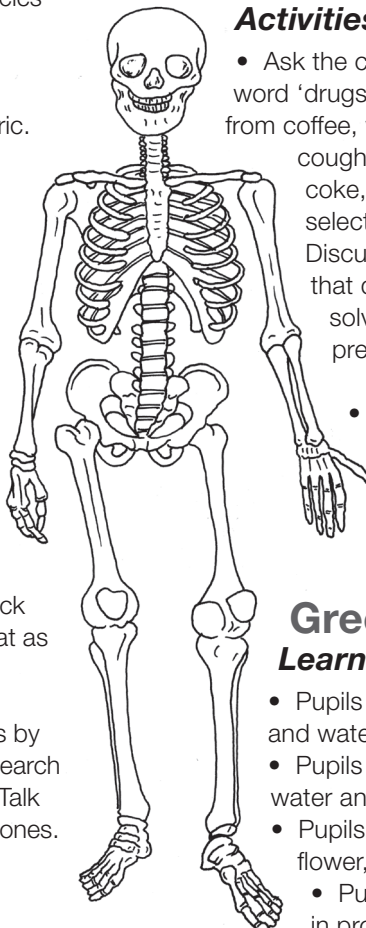
Skeletons

Learning intention

- Pupils will know that humans and some other animals have skeletons and muscles to support and protect their bodies and to help them to move.

Activities

- Use the skeleton (Copy Master 4) to analyse how joints work. Mark on the sheet ball and socket joints and hinge joints. Discuss how muscles work in pairs.
- Give pairs or small groups of children an A5 sized outline of a human cut from fabric. Challenge the children to get the body to stand up. Provide straws, pipe-cleaners, card etc for the children to make skeletons for their bodies. Discuss how skeletons provide support.
- Research skulls on the internet. Talk about the importance of cycle helmets for protecting skulls and brains.
- Tell children that muscles work in pairs and that to move a bone a muscle must contract/shorten. Encourage them to feel the muscles in the upper arm as the arm is bent and straightened. Push a block of dough or Plasticine to demonstrate that as muscles contract they get fatter.
- Prepare a collection of sterile meat bones by boiling the bones. Ask the children to research the bones using books and the internet. Talk about the different functions of specific bones. Sketch the bones with white crayons on black paper.



Life cycles

Learning intentions

- Pupils will know about the main stages of the human life cycle.
- Pupils will know that humans and other animals can produce offspring and that these offspring grow into adults.
- Pupils will know how to treat animals with care and sensitivity.

Activities

- Make a time line, using pictures, to show the human lifecycle.
- Observe and record the changes for frogspawn developing into frogs, eggs hatching to be chicks or caterpillars to butterflies.
- Make a time line, mobile or concertina book to show the lifecycle for an observed animal.

Drugs

Learning intentions

- Pupils will know about the role of drugs as medicines.
- Pupils will know about the effects on the human body of tobacco, alcohol and other drugs, and how these relate to their personal health.

Activities

- Ask the children what they think is meant by the word 'drugs'. Make a collection of packets/labels from coffee, wine, cigarettes, over-the-counter cough mixtures, prescription drugs, glue, coke, fizzy fruit drinks. Ask the children to select the ones that they feel are drugs. Discuss the children's choices and explain that drugs include nicotine, caffeine, various solvents and alcohol in addition to the prescribed and shop bought drugs.
- Invite a child who uses an asthma inhaler or insulin pen to explain their use. Emphasise that prescribed drugs are only for the person for whom they have been prescribed.

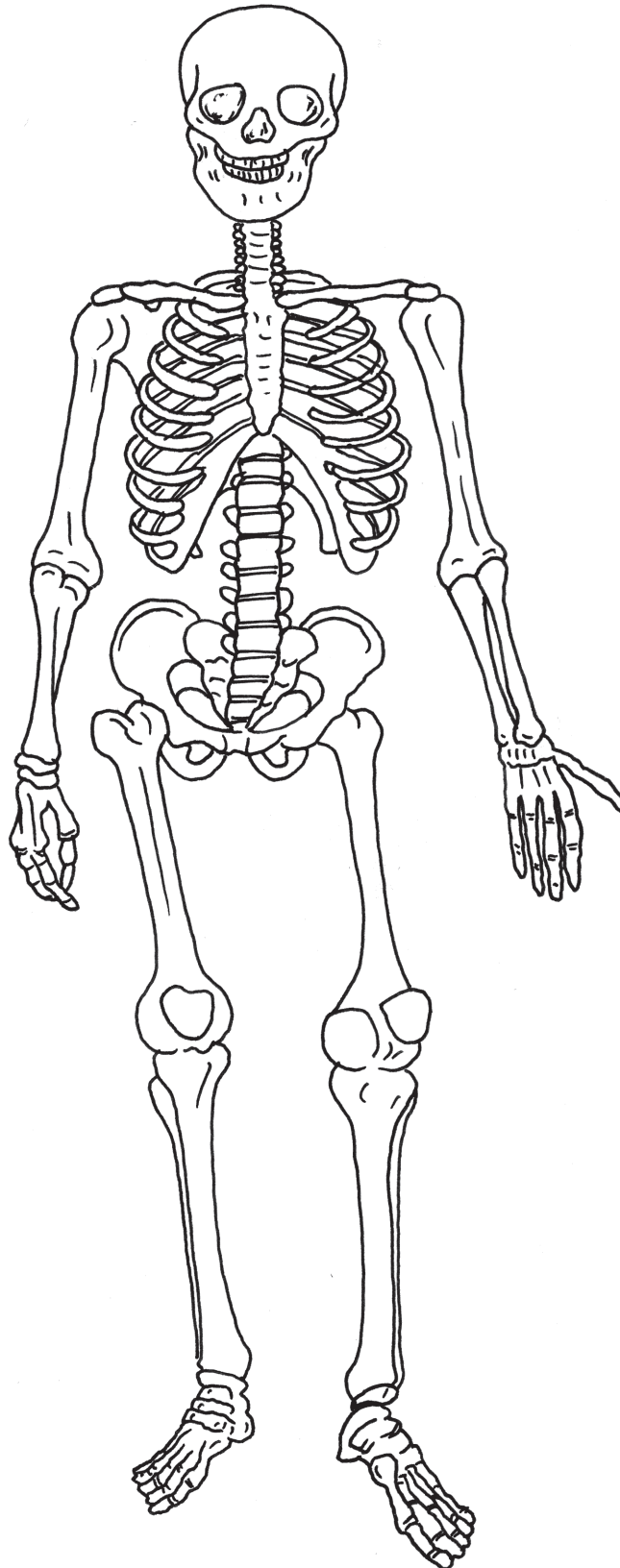
Green plants

Learning intentions

- Pupils will recognise that plants need light and water to grow.
- Pupils will understand the effect of light, air, water and temperature on plant growth.
- Pupils will recognise and name the leaf, flower, stem and root of flowering plants.
 - Pupils will understand the role of the leaf in producing new material for growth.



Human body skeleton





Name: _____

Where do minibeasts live?

Place a tick in the table to show where the minibeasts were found.

Minibeast	On a plant	Under a stone	Under a log	In the air	On a path	Other