

Ages
5-7

Living processes



TEACHERS' GUIDE

Trial schools

The SPACE Project and the Trust are grateful to the governors, staff, and pupils of all the trial schools. It will be obvious to readers of these publications how much we are indebted to them for their help, and especially for the children's drawn and written records of their hard work and their growing understanding of science.

All Saints Primary School, Barnet, Hertfordshire
Arnot County Primary Infant School, Arnot Street, Walton, Liverpool
Balladen Primary School, Rawtenstall, Rossendale
Blacko County Primary School, Blacko, Lancashire
Chalgrove JMI School, Finchley, London N3
Fairway JMI School, Mill Hill, London NW7
Fazakerley Junior School, Formosa Drive, Liverpool
Foulds Primary School, Barnet, Hertfordshire
Frenwood County Primary School, Preston, Lancashire
Hillbrook Primary School, Tooting, London SW17
Mawdesley Church of England Primary School, Lancashire
Padiham Green Church of England Primary School, Padiham, Lancashire
Roe Lee County Primary School, Blackburn, Lancashire
St Aloysius Roman Catholic Infants School, Knowsley
St Ambrose Junior School, Alderfield Drive, Speke, Liverpool
St Hughes RC JMI School, Earle Road, Liverpool
St Michael in the Hamlet Infant School, Neilson Road, Liverpool
St Stephen's Church of England School, Burnley
St Theresa's Roman Catholic Primary School, Finchley, London N3
Salterforth Primary School, Salterforth, Lancashire
Snaresbrook Primary School, Wanstead, London E18
Stubbins Primary School, Ramsbottom, Lancashire
Thorn County Primary School, Cowtoot Lane, Bacup, Lancashire
Trawden County Primary School, Dean Street, Trawden, Lancashire
Walton-le-Dale County Primary School, Preston
Water County Primary School, Burnley Road East, Water, Rossendale
Waterfoot County Primary School, Thornfield Avenue, Waterfoot, Rossendale
Whittlefield Infant School, Tabor Street, Burnley, Lancashire
Woodridge Primary School, North Finchley, London N12



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Explanation of symbols in the margins



Warning



Good opportunities to develop and assess work related to Experimental and Investigative Science.



Notes which may be useful to the teacher



Vocabulary work



Opportunities for children to use information technology



Equipment needed



Reference to the pupils' books



Planning

1.1 The SPACE approach to teaching and learning science

A primary class where the SPACE approach to science is being used may not at first seem different from any other class engaged in science activities; in either, children will be mentally and physically involved in exploring objects and events in the world around them. However, a closer look will reveal that both the children's activities and the teacher's role differ from those found in other approaches. The children are not following instructions given by others; they are not solving a problem set them by someone else. They are deeply involved in work which is based on their own ideas, and they have taken part in deciding how to do it.

The teacher has, of course, prepared carefully to reach the point where children try out their ideas. She or he will have started on the topic by giving children opportunities to explore from their own experience situations which embody important scientific ideas. The teacher will have ensured that the children have expressed their ideas about what they are exploring, using one or more of a range of approaches – from whole class discussion to talking with individual children, or asking children to write or draw – and will have explored the children's reasons for having those ideas.

With this information the teacher will have decided how to help the children to develop or revise their ideas. That may involve getting the children to use the ideas to make a prediction, then testing it by seeing if it works in practice; or the children may gather further evidence to discuss and think about. In particular, the teacher will note how 'scientific' children have been in their gathering and use of evidence; and should, by careful questioning, encourage greater rigour in the use of scientific process skills.

It is essential that it is the children who change their ideas as a result of what they find themselves, and that they are not merely accepting ideas which they are told are better.

By carefully exploring children's ideas, taking them seriously and choosing appropriate ways of helping the children to test them, the teacher can move children towards ideas which apply more widely and fit the evidence better – those which are, in short, more scientific.

You will find more information about the SPACE approach in the Nuffield Primary Science *Science Co-ordinators' handbook*.

1.2 Useful strategies

Finding out children's ideas

This guide points out many opportunities for finding out children's ideas. One way is simply by talking, but there are many others. We have found the following strategies effective. How you use them may depend on the area of science you are dealing with. In the teachers' guides you will find examples of these strategies, with suggestions as to where you might use them. More information about them is given in the *Science Co-ordinators' handbook*.

Talking and open questioning

Whole class discussions can be useful for sharing ideas, but they do not always give all children a chance to speak. It is often helpful if children are allowed to think of their own ideas first, perhaps working them out in drawings, and are then encouraged to share these with others – perhaps with just one other child, or with a larger group.

Annotated drawings

Asking children to draw their ideas can give a particularly clear insight into what they think. It also gives you a chance to discuss the children's ideas with them. Words conveying these ideas can then be added to the drawing, either by you or by the child, in the course of discussion to clarify what has been represented. Such work can be kept as a permanent record.

Sorting and classifying

This can be a useful way of helping children to clarify their ideas and to record their thinking. They could sort a collection of objects or pictures into groups.

Writing down ideas

When they have acquired some writing skill, this gives children the opportunity to express their own views. It will usually be in response to questions posed by you.

Log books and diaries

These can be used to record changes over a longer period of time. They need not necessarily be kept by individual children, but could be kept by a group or class as a whole. Children can jot down, as words or drawings, the changes they notice and something about what they think are the reasons for what they observe.

Helping children to develop their ideas

Letting children try out their own ideas

This will involve children in using some of the process skills of science: at first mainly observing, predicting, and communicating. Later, as children approach Key Stage 2, they will begin to make more use of measuring, hypothesizing, planning and carrying out fair tests, and interpreting results and findings.

As often as possible, children should see what happens when they put their ideas to test. They should be encouraged to observe and report carefully what happens and to give their ideas about why it happens.



Encouraging generalization from one context to another

In discussing a particular event, for example dissolving sugar in tea, consider whether the explanation proposed applies in another context, such as salt dissolving on a wet road. You or the children might suggest other contexts where the idea might be tried. This might be done by discussing the evidence for and against the explanation, or by gathering more evidence and testing the idea in the other context, depending on children's familiarity with the events being examined.

Discussing the words children use to describe their ideas

Children can be asked to be quite specific about the meaning of words they use, whether scientific or not. They can be prompted to think of alternative words which have almost the same meaning. They can be asked to think of examples of a word they are using, such as 'melt', so that you can decide when to introduce alternative or more precise words if necessary.

Extending the range of evidence

Some of the children's ideas may be consistent with their experience up to that time, but they could be challenged by extending the range of this experience. This applies particularly to things which are not easily observed, such as slow changes; or those which are normally hidden, such as the insides of objects. Books are useful in some cases.

Getting children to communicate their ideas

Expressing ideas in any way – through writing, drawing, modelling or, particularly, through discussion – involves thinking them through, and often rethinking and revising them. Discussion has a further advantage in that it is two-way and children can set others' ideas against their own. Just realizing that there are different ideas helps them to reconsider their own.

1.3 Charts to help children to develop their ideas

The charts on pages 20, 30 and 44 show how you can help children to develop their ideas from starting points which have given rise to different ideas.

The centre rectangles contain starter questions.

The surrounding 'thought bubbles' contain the sort of ideas expressed by children. The further ring of rectangles contains questions posed by teachers in response to the ideas expressed by the children. These questions are meant to prompt children to think about their ideas.

The outer rounded boxes indicate ways in which the children might respond to the teacher's questions.

Some of the shapes have been left blank, as a sign that other ideas may be encountered and other ways of helping children to develop their ideas may be tried.

This teachers' guide is divided into themes; in each one there is a section on finding out children's ideas, examples of ideas children have, and a section on helping children to develop their ideas.

1.4 Living processes and the curriculum

Nuffield Primary Science Themes

How do we know if it's alive?

This theme helps children to develop their ideas about what is living and non-living.

Some young children have little idea about the differences between living and non-living things; others think that anything that moves is alive, or associate human characteristics with all living things.

The activities in this theme give children greater experience of living things and encourage them to consider what processes are common to all living things. Children can explore a wild area or local park, find out and discuss how house plants, pets and other animals are cared for, and compare their own needs with those of other living things.

National Curriculum Programme of Study

Life Processes and Living Things

1 Life processes

a the differences between things that are living and things that have never been alive;

b that animals, including humans, move, feed, grow, use their senses and reproduce.

Environmental Studies 5-14 (Scotland): Science

Understanding Living Things and the Processes of Life (Stages P1 to P3)

Variety and characteristic features

- sorting things into broad groups according to easily observable characteristics;
- recognising and naming common plants and animals in the classroom and local environment.

The human body and keeping healthy

This theme helps children develop their ideas about some of the internal and external parts and major organs of the body, the basic life processes, and healthy living.

Young children may know some internal organs of the human body; however, many are uncertain of the position of these organs or their function. Many children do not associate muscles with movement or know that the body has a bone structure.

This theme includes investigations in which children explore the effect of exercise on their breathing and pulse, observe how their movements are controlled by muscles, and find out about their senses.

In this theme there are suggestions for helping children to find out about healthy eating, exercise, harmful substances, and keeping safe. Children can devise healthy meals, interview people concerned with health and keeping safe, and design posters.

Plant and animal growth

This theme helps children develop their ideas about animals and plants and their growth.

Children may be uncertain of how they themselves change as they grow; some describe changes by simply referring to particular parts of the body, for example, their feet and hair.

Many children think of flowering plants and pot plants as 'plants', and are unaware of the wide range of living things that the term 'plants' describes. Young children suggest that plants need the Sun, water and soil to grow. However, individual children seldom suggest all three of these needs.

In this theme children find out about the external parts of a plant, the conditions for plant growth, how light can affect plants, and the life cycle of plants. Children can grow plants from seeds, bulbs and cuttings, and devise investigations to find out about conditions necessary for plant growth.

Life Processes and Living Things

1 Life processes

b that animals, including humans, move, feed, grow, use their senses and reproduce.

2 Humans as organisms

a to name the main parts of the human body;
b that humans need food and water to stay alive;
c that taking exercise and eating the right types of food help humans to keep healthy;
f that humans have senses which enable them to be aware of the world around them.

Life Processes and Living Things

1 Life processes

b that animals, including humans, move, feed, grow, use their senses and reproduce.

3 Green plants as organisms

a that plants need light and water to grow;
b to recognise and name the leaf, flower, stem and root of flowering plants;
c that flowering plants grow and produce seeds which, in turn, produce new plants.

Understanding Living Things and the Processes of Life (Stages P1 to P3)

Variety and characteristic features

- similarities and differences between themselves and other pupils.

The processes of life

- use of all the senses to detect information and to keep the body safe.

Understanding Living Things and the Processes of Life (Stages P1 to P3)

Variety and characteristic features

- recognising and naming common plants and animals in the classroom and local environment

The processes of life

- changes which occur in plants and animals which are indicative of growth and maturation.

1.5 Experimental and Investigative Science

Two important aspects of children's learning in science are:

- ◆ learning how to investigate the world around them;
- ◆ learning to make sense of the world around them using scientific ideas.

These are reflected in the National Curriculum. 'Experimental and Investigative Science' covers the first aspect. The second aspect is covered by the rest of the Programme of Study. Although these two aspects of science learning are separated in the National Curriculum they cannot be separated in practice and it is not useful to try to do so. Through investigation children explore their ideas and/or test out the ideas which arise from discussion. As a result, ideas may be advanced, but this will depend on the children's investigation skills. Thus it is important to develop these skills in the context of activities which extend ideas. So there is no separate Nuffield Primary Science teachers' guide on scientific investigations, because opportunities to make these occur throughout all the guides and they form an essential part of the SPACE approach.



Thus in this guide you will find investigations which provide opportunities to develop and assess the skills and understanding set out in Experimental and Investigative Science. These are marked in the text by the symbol shown here. In this teachers' guide, the investigations which cover the most skills are 'Senses' (page 33) and 'Growing plants from seed' (page 47).

It is important that teachers give active guidance to pupils during investigations to help them work out how to improve the way in which they plan and carry out their investigations.

Experimental and Investigative Science is about the ways scientific evidence can be obtained, about the ways observations and measurements are made, and about the way in which the evidence is analysed. It therefore sets out three main ways in which pupils can develop their ability to do experimental and investigative science, as follows:-

- 1 'Planning experimental work'. Here, children should be helped to make progress from asking general and vague questions, to suggesting ideas which could be tested. Teachers' discussion with pupils should aim to help them to make predictions, using their existing understanding, on the basis of which they can decide what evidence should be collected. This should lead them to think about what apparatus and equipment they should use.



When children describe plans for their work, they should be helped to think about what features they are going to change, what effects of these changes they are going to observe or measure, and what features they must keep the same. In this way they can come to understand what is meant by 'a fair test'.

- 2 'Obtaining evidence'. Children should make observations in the light of their ideas about what they are looking for and why. When they describe their observations, teachers may have to help them to improve, for example by reminding them of their original aims and plan for the work. Such help should also encourage progress from qualitative comparisons and judgements to appreciating the value of making quantitative measurements (for example 'cold water' is qualitative, 'water at 12°C' is quantitative). This should lead to the development of skills with a variety of instruments and to increasing care and accuracy in measurement, involving, for example, repeating measurements to check.
- 3 'Considering evidence'. Here, children should first learn to record their evidence in systematic and clear ways, starting with simple drawings and then learning to use tables, bar charts and line graphs to display the patterns in numerical data. Then they should be asked to think about and discuss their results, considering what might be learnt from any trends or patterns. As ideas develop, they should be careful in checking their evidence against the original idea underlying the investigation and should become increasingly critical in discussing alternative explanations which might fit their evidence. In such discussions, they should be helped to relate their arguments to their developing scientific understanding. They should also be guided to see possibilities for conducting their investigation more carefully, or in quite different ways.

Whilst these three may seem to form a natural sequence of stages, children's work might not follow this particular sequence. For example, some might start with evidence from their observations and proceed on this basis to propose a hypothesis and a plan to test it. For others, the results of one task may be the starting point for a new inquiry involving new measurements. Useful learning about how to investigate might arise when only one or two of the above aspects of an investigation are involved, or when the teacher tells children about some aspects so that they can concentrate on others. However, there should be some occasions for all pupils when they carry out the whole process of investigation by themselves.

The assessment examples given in chapter 3 are analysed in relation to the level descriptions, which describe children's progress in relation to these three aspects: *planning experimental work*, *obtaining evidence* and *considering evidence*. Thus, these three provide a framework both for guiding children and for assessing their progress in experimental and investigative work.

1.6 Planning your science programme in school

The following pages give examples of how two schools have planned their science programme for the whole of Key Stage 1. Planning of this kind helps to provide continuity and progression in children's learning in science. The development of such whole school programmes is discussed more fully in the *Science Co-ordinators' Handbook*.

Each plan covers the requirements for the National Curriculum at Key Stage 1 and shows which themes in the Nuffield Primary Science Teachers' Guides have been used for planning the topic in detail by the classteacher.

Example 1

This primary school has recently grown from 1.5 form entry to 2 form entry and so have had to take account of varying class sizes and vertical grouping. Their programme is based on fixed year topics which provide progression through the programme of study but by using the SPACE approach staff feel they are able to cater for individual children.

Each topic is planned out, by year group, in terms of the concept to be explored and the key ideas to be focused on using the Teachers' Guides. Some topics run for one term whilst others are restricted to half a term. A minimum of five lessons are allowed for each half term. Individual teachers use the topic plan to develop their own short term planning responding to the ideas of the children in their class.

| | AUTUMN TERM | SPRING TERM | | SUMMER TERM | |
|--|--|---------------------------------|------------------------------------|---|--------------------------|
| RECEPTION | Individual variation | Sources and uses of electricity | Light and dark | Changing materials | |
| Nuffield Primary Science Teachers' Guide | The variety of life 2.2 | Electricity and magnetism 2.1 | Light 2.1, 2.2 | Materials 2.2 | |
| Programme of Study † | Sc2:4a | Sc4:1a | Sc4:3a, b | Sc3:2a, b; Sc4:2d | |
| YEAR 1 | Pushes and pulls | Making and hearing sounds | The human body and keeping healthy | Local habitats | Plants and animal growth |
| Nuffield Primary Science Teachers' Guide | Forces and movement 2.1 Using energy 2.2 | Sound and music 2 | Living processes 2.2 | Living things in their environment 2.1 Rocks, soil and weather 2.1 Earth in space 2.3 | Living processes 2.3 |
| Programme of Study † | Sc4:2a, b, c, d | Sc4:3c, d, e | Sc2:2a, b, c, d, e, f | Sc2:5a, b | Sc2:2e; 3a, b, c |
| YEAR 2 | Properties of materials | Magnets | Electricity - simple circuits | Naming and grouping living things | |
| Nuffield Primary Science Teachers' Guide | Materials 2.1 Rocks, soil and weather 2.1 | Electricity and magnetism 2.3 | Electricity and magnetism 2.2 | The variety of life 2.1 | |
| Programme of Study † | Sc3:1a, b, c, d, e | Sc3:1b, c | Sc4:1a, b, c | Sc2:1a, b; 4b | |



Example 2

Situated in a large conurbation this primary school is 2.5 form entry but the number of children entering fluctuates from year to year causing difficulties with class size. The Nursery is an integral part of the school and work is shared with the Reception classes. Therefore this pre-YR1 time is planned as a whole providing a wide range of experiences for the children so that they are 'working towards' the requirements of the programme of study.

The plan is set out by year group and the different elements of the Programme of Study, covering five topics per year with each one to be covered in approximately half a term. Each year group decides the order of their topics during the year. The provision of a 'spare' half term allows teachers some flexibility in their planning and, if they wish, to introduce other aspects of science not prescribed by the National Curriculum.

| | AUTUMN TERM | | SPRING TERM | | SUMMER TERM | |
|--|---|--|--|--|---|--|
| RECEPTION | This is me | Our school | Plants and animals | Homes - using electricity | Toys | |
| Nuffield Primary Science Teachers' Guide | The variety of life 2.2 | Living things in their environment 2.3 | Living things in their environment 2.1; Living processes 2.3 | Electricity and magnetism 2.1 | Forces and movement 2.1 | |
| Programme of Study (working toward) † | Sc2:2a, b, f; 4a | Sc2:1a, 3b, 5a; Sc3:2a | Sc2:1b, 3a, b, c, 4b, 5a, b | Sc4:1a, 3a, b | Sc4:2a, b, c | |
| YEAR 1 | Ourselves | Growing things | Materials - clothes | Sounds/Night and day | Floating and sinking | |
| Nuffield Primary Science Teachers' Guide | Living processes 2.2; Variety of life 2.2 | Living processes 2.3 | Materials 2.1 | Sound and music 2; The earth in space 2.1 | Forces and movement 2.2 | |
| Programme of Study † | Sc2:1b; 2a, b, e, f, 4a, b | Sc2:3a, b, c | Sc3:1a, b, c, d, e; 2a | Sc4:3c, d, e | Sc3:1a, c, e; Sc4:2a | |
| YEAR 2 | Keeping healthy | Habitats | Materials - homes | Light and electricity | Moving things | |
| Nuffield Primary Science Teachers' Guide | Living processes 2.2 | The variety of life 2.1; Living things in their environment 2.1; Rocks, soil and weather 2.1 | Materials 2.1; 2.2 | Electricity and magnetism 2.1, 2.2; Light 2.1; 2.2 | Forces and movement 2.1; Using energy 2.2 | |
| Programme of Study † | Sc2:1b; 2b, c, d | Sc2:4b; 5a, b | Sc3:1a, b, c, d, e; 2b | Sc4:1a, b, c; 3a, b | Sc4:2a, b, c, d | |

† For the purposes of these charts the references to sections of the Programme of Study have been abbreviated as follows:

Sc2 = Life Processes and Living Things

Sc3 = Materials and their Properties

Sc4 = Physical Processes

1.7 Planning a topic

Here is a case study which may help you in planning a topic.

Case study: Growth and change

The teacher planned to address aspects of Sc2 in this topic, focusing in particular on the processes of life but also considering living things in their habitats. During the topic, the classroom became filled with plants and the school pets. The teacher considered this direct experience necessary to improve the children's skills of observation and to sustain their interest. The teacher had planned a science-based topic, but was able to identify some links with other curriculum areas.

SCIENCE

Plant and animal growth



The starting point for this topic was an incubator containing a number of hens' eggs.

- ◆ Children were asked to draw what they thought was happening inside the eggs.
- ◆ They were asked to think about what might be happening inside a variety of seeds and beans.
- ◆ In a class discussion, they exchanged ideas about when they themselves grow and what might make them grow.
- ◆ Children's ideas were developed by monitoring the growth and changes that took place in both the plants and the hens' eggs.
- ◆ Children investigated the growth of plants in different conditions.
- ◆ They made collages of how people changed during their life and talked about how they knew when parts of their body had grown.



Habitats

The topic provided an opportunity for children to consider the longer term changes which occurred in a nearby habitat.

- ◆ On their first visit, pupils took photographs of the animals and plants.
- ◆ Later they observed and recorded how the plants within the habitat had changed.
- ◆ They recorded the different animals in the habitat at different times of the year.



OTHER CURRICULUM AREAS

Mathematics

- ◆ The topic provided an opportunity for pupils to measure the growth of different animals and plants.
- ◆ At the class shop, number skills were developed by encouraging children to check their change.

English

- ◆ Children sequenced pictures and wrote about how they change as they grow.
- ◆ They talked about the different things they do as they grow.
- ◆ They listened to and read stories of how different animals change as they grow.
- ◆ They discussed the many different occasions when the word 'change' is used.

History

- ◆ Using photographs and accounts from grandparents, children found out how schools had changed.



1.8 Pupils' books

The pupils' book accompanying this guide is called *A first look at living things*. The pupils' books are intended to be used spread by spread. The spreads are not sequential, and they are covered in these notes in thematic order.

Features of the pupils' books include:

- ◆ Stimulus spreads, often visual, designed to raise questions, arouse curiosity, and to promote discussion.
- ◆ Information spreads, which give secondary source material in a clear and attractive way.
- ◆ Activity ideas, to form the basis of investigations to be carried out by the children.
- ◆ Cross-curricular spreads and stories which can act as a basis for creative writing, or spreads with a historical or creative focus.
- ◆ Real life examples of applications of science in the everyday world.

Keeping clean pages 12-13

Purpose: Providing ideas for discussion about cleanliness and hygiene and looking after the body.

Notes: Encourage good practice in important areas such as using one's own comb, to prevent nits spreading. Explain that eyes are partially cleaned by blinking.

Teachers' guide cross-references: *Living processes*, page 35-6.

What's wrong with Scott? pages 14-15

Purpose: To help familiarize children with what doctors do or may do and allay their fears about them. To inform about how they detect what is wrong with your body.

Extension activity: Invite the school nurse to come and answer questions.

Teachers' guide cross-reference: *Living processes*, page 36.

Eating and drinking pages 4-5

Purpose: To prompt an open-ended discussion about diet and to stress the importance of variety in a balanced diet.

Extension activities: Ask children to draw a meal they consider healthy, then draw their favourite meal and compare the two. They could model these with clay or other materials.

Teachers' guide cross-references: *Living processes*, page 37; *Using energy*, page 39.

Keeping healthy pages 6-7

Purpose: A spread to prompt an open-ended discussion about keeping healthy. It introduces the idea that keeping healthy is to do with a range of things and involves a combination of mental and physical health.

Note: SPACE research revealed that most children only regarded eating as essential to their health and well-being.

Teachers' guide cross-references: *Living processes*, pages 36-7.



What do you eat? pages 16–17

Purpose: A poem to be read aloud for links with language.

Teachers' guide cross-reference: *Living processes*, page 37.

Growing pages 8–9

Purpose: To prompt an open-ended discussion about the care of young living things.

Extension activities: Discuss what children can now do on their own, and what they do with the help of their parents or other carers. Some children could ask parents about moments when they first did things on their own, e.g. walking.

Teachers' guide cross-references: *Living processes*, pages 10–11, 45.

Getting older pages 10–11

Purpose: A discussion spread to help children think about the idea that people change as they grow older.

Question for discussion: How old are the people shown here? (Only the top row are meant to be identified.)

Extension activities: Find out ages of eldest and the youngest in the class. Children could ask their parents or other carers about milestones in their lives, e.g. first day at school. Draw a time line using these dates and make a cross-curricular link with history.

Teachers' guide cross-reference: *Living processes*, page 45.

Are you my mother? pages 2–3

Purpose: To introduce the idea of life-cycles.

Notes: The correct matches are:

eggs in bird's nest – hungry chicks – robin;

yellow eggs on nettle leaf – crawling larva on nettle leaf – ladybird;

white eggs – white larva – fly;

eggs in ground – baby tortoise – tortoise fully-grown.

Teachers' guide cross-references: *Living processes*, pages 10, 46.

Taking care of animals pages 18–19

Purpose: To introduce children to importance of care of living things, especially animals.

Questions for discussion: What do pets need? How do you look after your own pets at home? How do pets care for themselves?

Teachers' guide cross-reference: *Living processes*, page 46.

Plants we eat pages 20-21

Purpose: A matching game to enable children to think about which food comes from plants, and what whole plant each food is taken from.

Notes: The pictures match as follows: tomato – tomato plant (top left); sugar – sugar cane (top middle); peas – pea plant (bottom right); potato – potato plants (centre); carrot – carrot plants (bottom middle); apple – apple tree (top right); gooseberry – gooseberry bush (bottom left). Much of the food we eat comes from plants. Sugar comes from sugar beet, which can be grown in Britain and in north-western Europe, or from sugar cane, which needs a warmer climate (such as Africa or the Caribbean).

Extension activity: Bring in other unusual fruits/vegetables, such as yams. Children from different backgrounds may know a variety of names for these and other plants.

Pupils' book cross-reference: *A first look at what things are made of*, pages 2-3.

Teachers' guide cross-reference: *Living processes*, page 47.

Plants pages 22–23

Purpose: To introduce children to the huge variety of living things that scientists call plants.

Notes: Pictured here are flowers, vegetables, mosses, bushes and trees. Ask children what they think a plant is.

Pupils' book cross-reference: *A first look at different plants and animals*, pages 16-17.

Teachers' guide cross-reference: *Living processes*, page 47.



1.9 Resources



This is what you may need to carry out the activities shown in this book.

School pets such as a rabbit or a hamster, suitably housed

Pot plants

Collection of manufactured and natural objects including pictures of plants and animals for children to classify into three groups: 'living', 'never-lived' and 'once-living': rock, spoon, apple, magnet, teddy, pencil, rubber, woodlouse, pot plant, hamster in cage, picture of dog

Art straws or pipe cleaners

Samples of food such as crisps, bread, cheese, apple, pear, banana, onion and carrot

Fragranced items such as pot-pourri, vinegar, soap

Samples of colourless drinks such as mineral water, tap water, sugar water and lemonade

Modelling clay or Plasticine

Suitable containers for hatching eggs of a cabbage white butterfly, mealworms, stick insects or similar

Seeds such as mung or broad beans or radishes plus something to grow them in

Plant bulbs



1.10 Warnings

Activities which need particular care are indicated by this symbol in the margin. Everything possible should be done to ensure the safety of the children during their investigations. You should consult any guidelines produced by your school or Local Education Authority and, if your school or LEA is a member, by CLEAPSS. See also the Association for Science Education publication *Be safe! some aspects of safety in school science and technology for Key Stages 1 and 2* (2nd edition, 1990). This contains more detailed advice than can be included here.

Some animals can be kept in the classroom. See the DES Administrative Memorandum 3/90 'Animals and plants in schools: legal aspects' and the RSPCA booklets 'Animals in schools' and 'Small mammals in schools'. Children should not bring their pets into school.

Fieldwork and visits must be carefully organized and supervised. Beware of dog mess and poisonous plants. Check your school's policy on visits.

Ideas about hygiene will vary considerably between groups of people and may depend on the facilities they have available to them.

Take care that children do not pick wild flowers. Many are protected.

2.1 How do we know if it's alive?



AREAS FOR INVESTIGATION

- ◆ Identifying living things in the environment.

KEY IDEAS

- ◆ Living things are distinguished from non-living things by their ability to carry out certain processes.
- ◆ There is a wide variety of living things, which includes plants and animals.
- ◆ * All living things have the potential to carry out all of the following processes at some stage in their life: respiration, reproduction, feeding, excretion, movement, reaction to stimuli, growth and development.

(*Asterisks indicate ideas which will be developed more fully in later key stages.)

A LOOK AT 'How do we know if it's alive?'

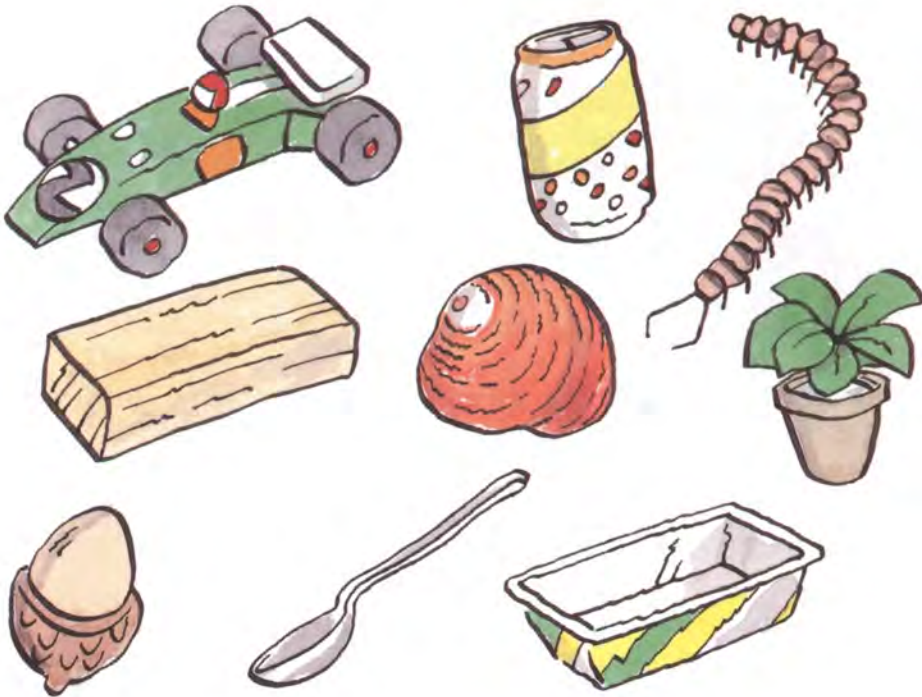
All living things can at some time feed, breathe, grow and move. In addition they will reproduce, get rid of waste, and respond to changes in their environment. Non-living things do not carry out these processes.

Finding out children's ideas

STARTER ACTIVITIES

Deciding if objects are 'living', 'once-living', or 'never-lived'

Give children a collection of manufactured and natural objects including pictures of plants and animals to classify into three groups: 'living', 'once-living', and 'never-lived'.



Let the children consider each object in turn.

Q Which group will you put this [rock] in? Why?

Get the children to draw their three groups. Children should discuss and compare their ideas. Ask them to give as many reasons as possible for deciding that something is living.

e

Children's ideas

Some young children have difficulty in classifying a group of familiar objects into 'living', 'once-living', and 'never-lived'. Other children, who appear to be quite confident in their approach to the task, may classify the objects according to criteria quite different from those of adults. Sometimes, from an adult's point of view, children may appear to classify things correctly, but a child's reasons for a classification may be entirely their own; for example, a child who classified an animal as 'living' justified this by stating:

I have seen it on TV.

Some young children appear to have little understanding of what is alive, and tend to remark on the physical appearance, or particular features, of an object; for example:

It is made of metal.

It is broken.

Other children consider that things are alive because people own or use them; for example, spoons are alive:

Because we use them.

Many children consider that things which move are alive. This belief may lead children to consider that things which share some of the features of humans are alive:

They have eyes and legs like me.

Children may consider that only animals, or plants and animals, are alive. The following examples may help to illustrate the extent to which children disagree about classifying familiar objects, and also indicates some of the reasons they may offer for their classification.

Things are 'living' because:

We have them in our houses.

They live somewhere. (For example, a spoon 'lives' in a drawer in a kitchen.)

They have homes.

They move and can be heard.

They can hide.

They have faces.

Things are 'once-living' because:

We used to have them.

It was made, it wasn't rusty, now it's become rusty and it's not alive.

You can kill them.

Things are 'never-lived' because:

They sometimes break.

I've never seen one before.

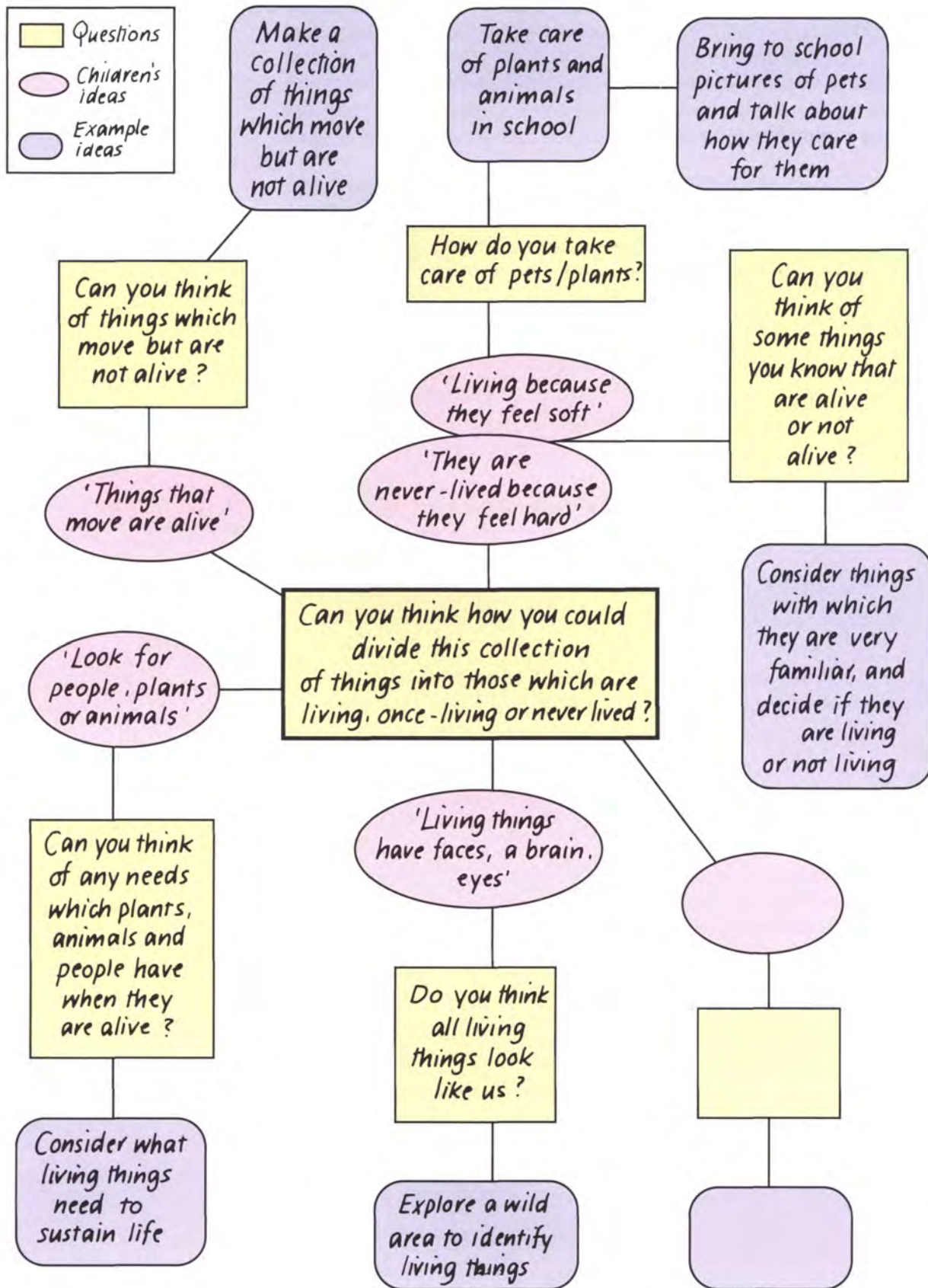
You can throw them.

We keep them in the house, it was made.

It has no brain, it never goes to school.

It has no teeth or eyes.

Helping children to develop their ideas about how do we know if it's alive?



Helping children to develop their ideas

The chart opposite shows how you can help children to develop their ideas from starting points which have given rise to different ideas.

1 Caring for animals and plants

Children can become more aware of the processes that distinguish living things from non-living things if they have an opportunity to observe and care for plants and animals at school or at home.



Children could discuss how to take care of the pets shown in *A first look at living things* or bring some pictures of their pets or plants into school.

Q *What do you need to do for your pet/plant each day?
What does your pet/plant need each day to stay alive?*

Get the children to show in a series of pictures how to take care of a pet and/or a plant.

Encourage the children to think about their own needs and how these compare with plants and animals. They could draw pictures.

Q *How do you take care of yourself each day?
What do you need to stay alive?
Does a pet (and/or a plant) also need this?*



Follow DES and RSPCA guidance - see page 15 of this book.
Children should not bring their pets into school

pb

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All living things breathe, feed and move

**AT
1**

Communicating

2 Alive or not?

Ask the children to draw sets of things that they think are living, once-living and never-lived. They may find this exercise easier than the starter activity in which they are given a set of objects to classify.

When they have drawn their sets, get them to discuss their results.

Q *Do you agree with your friend's suggestions?
What are your reasons for deciding whether something is living, once-living or never-lived?*

The children could find things to add to their sets of living and never-lived things from inside the classroom or school, the playground or school pond (care!), or a patch of grass or soil.



Children could reconsider their classification of the group of objects from the starter activity.

Q *Do you wish to swap any of the 'living', 'never-lived' and 'once-living' things into other groups?
Why have you decided to make any changes?
Do you have any new reasons for making your choices?*

AT
1

Interpreting results and findings

2.2 The human body and keeping healthy

2.2



A LOOK AT the human body and keeping healthy

When we feed, food and drink pass into the stomach. Food begins to break down in the mouth, and continues in the stomach. Food passes into the intestines, where the nutrients from the food and drink enter the blood. Waste and undigested food pass out of the body as faeces.

A diet too rich in foods such as fats and sugars may be harmful. To lead a healthy life we need to take regular exercise and avoid certain substances. Many people help us to keep safe and healthy; for example, doctors give us advice and, if necessary, medicine.

Our bodies have a bone structure. Muscles are connected to bones, and all body movements are controlled by muscles. Some of the largest muscles are in the arms, legs and back.

The senses, touch, smell, taste, sight and hearing, inform the body of its surroundings. We have limits to our senses; the limits vary from individual to individual.

AREAS FOR INVESTIGATION

- ◆ Finding out about breathing, circulation and digestion.
- ◆ Finding out about muscles and bones.
- ◆ Exploring how we use our senses, and the limitations of our senses.

KEY IDEAS

- ◆ The senses: touch, smell, taste, sight and hearing inform us of our surroundings.
- ◆ *The human body is made up of organs and organ systems which have specific functions and interact with each other.
- ◆ *Some things, such as drugs, alcohol and tobacco, can harm our health.
- ◆ * All living things have the potential to carry out all of the following processes at some stage in their life: respiration, reproduction, feeding, excretion, movement, reaction to stimuli, growth and development.
- ◆ * Human beings are mammals.

(*Asterisks indicate ideas which will be developed more fully in later key stages.)

Finding out children's ideas

STARTER ACTIVITIES

1 The human body

- Q** *What parts of the body do you know?
Can you point to some parts of the body and name them?
Can you think of any parts inside your body?
What do you think these parts are for?*

As the discussions develop, questions about particular processes and parts of the body could be asked. Children could discuss their ideas, or present them in a picture – either their own or on an outline drawing (see opposite).

- Q** *What parts of the body are needed for eating?
What do you think happens to food in your body?*

- Q** *Can you feel any bones in your body? Where are they?
What do you think your bones are for?
Where are your muscles?
How do you think your muscles help you?*

2 Health

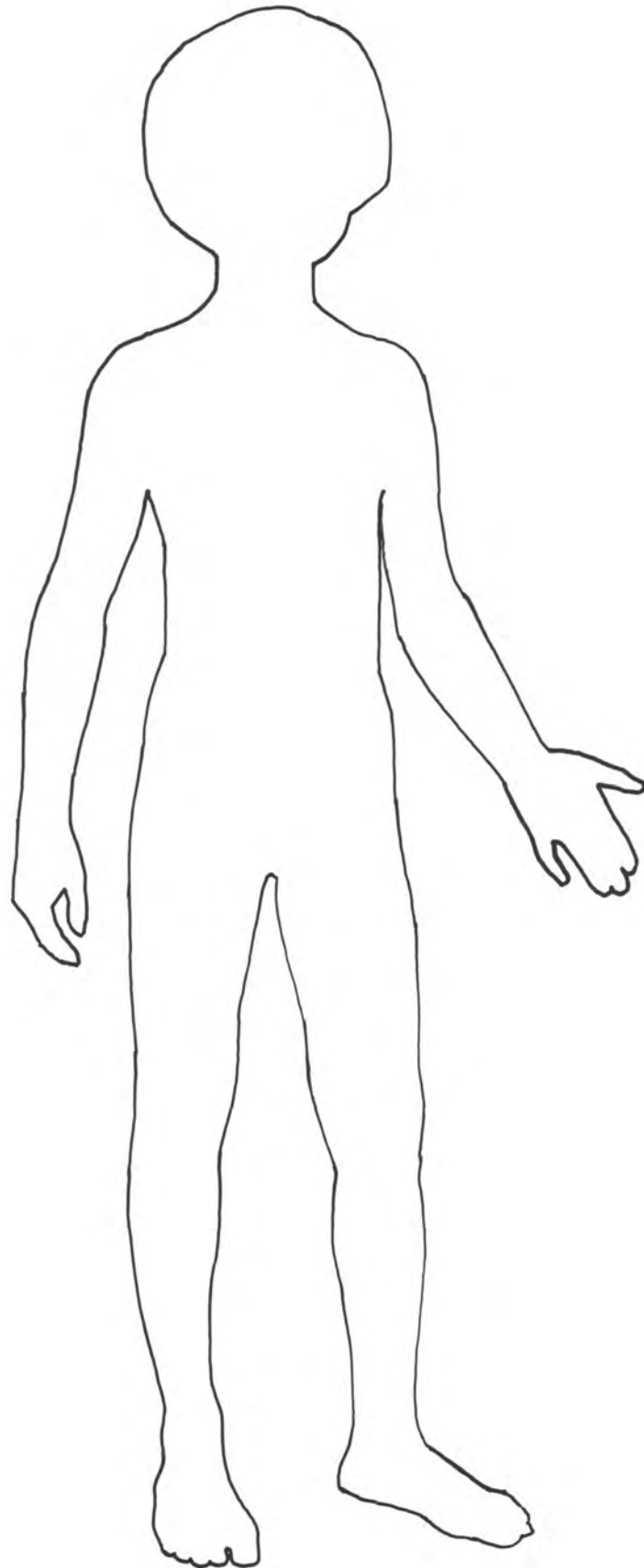
Get children to draw a picture showing ways they keep themselves healthy. Ask them about their ideas and add their comments to the drawings.

- Q** *What makes you think these are ways of keeping healthy?
How do you feel when you are healthy?*

Help children to consider the food they eat, and why people eat food.

- Q** *Why do we eat?
What kinds of food do you like?
What foods are good for us?
Is eating ever unhealthy?
Can you draw some foods which are healthy and others which are unhealthy?*





Children's ideas

The human body



Children tend to mention those parts of the body they can see, feel or hear.

People in the picture have arms and legs to move about.

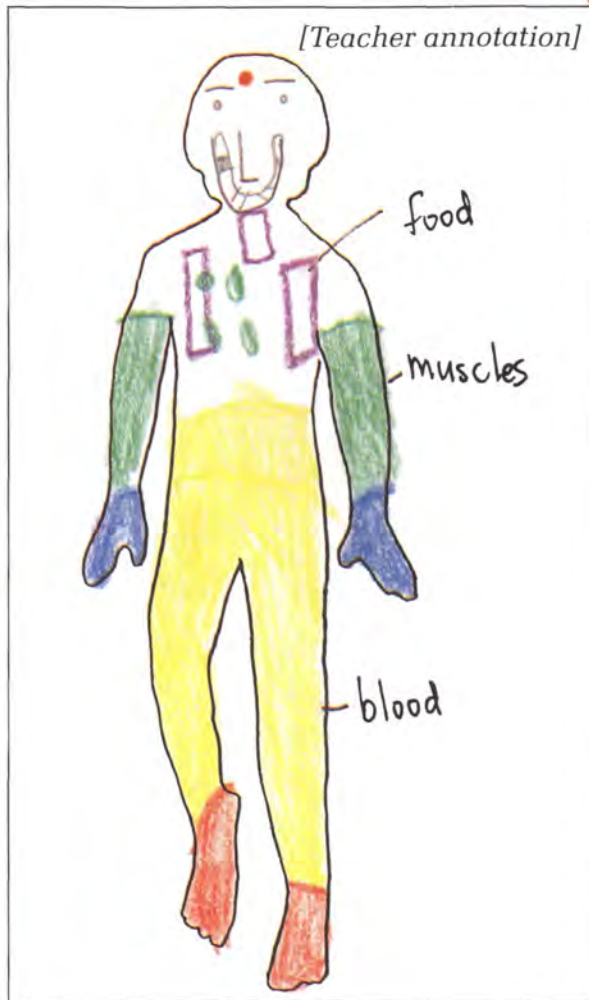
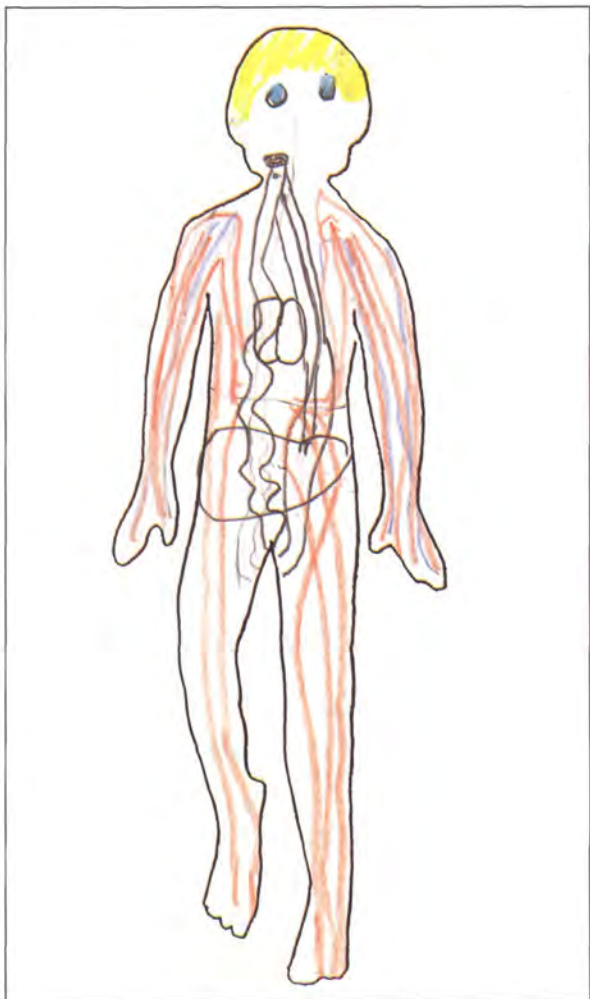
Some children will be aware of parts inside the body. They will mention blood and include bones. However, these are often positioned randomly. A few children will reveal an understanding that bones provide a structure for the body.



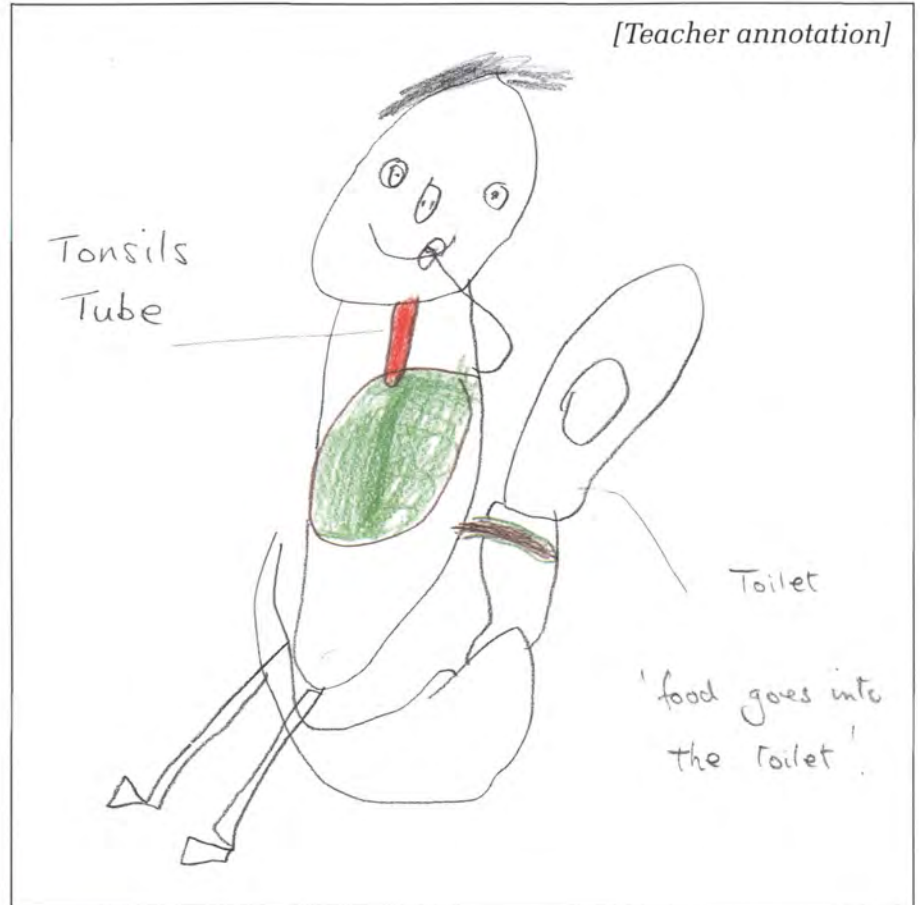
Children's understanding of muscles is often restricted to the arms and legs. They rarely mention muscles in other parts of the body.

Digestion

Young children tend to believe that food goes into the stomach and stops there. Often the food is depicted whole, showing little understanding that food is broken down in the body. Some children will explain that there are separate tubes for food and drink.

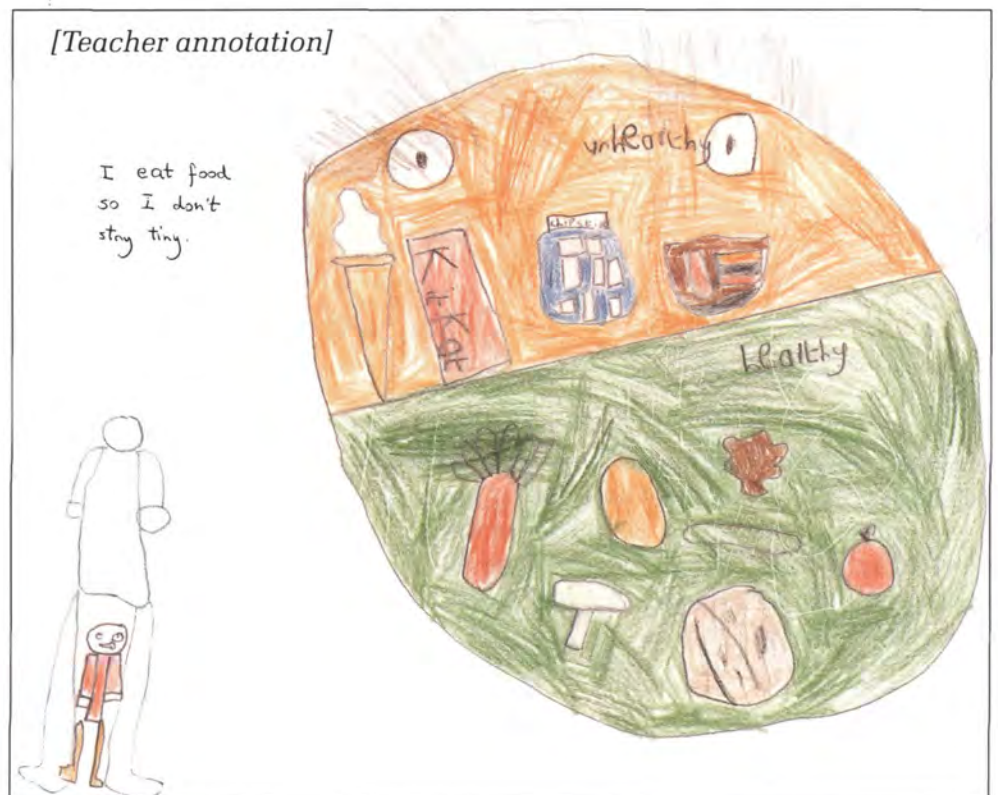


Children may be aware of some relationship between going to the toilet and eating food. Although children might explain that food goes into the toilet, they will often not be aware that it is waste food that has passed through the body.

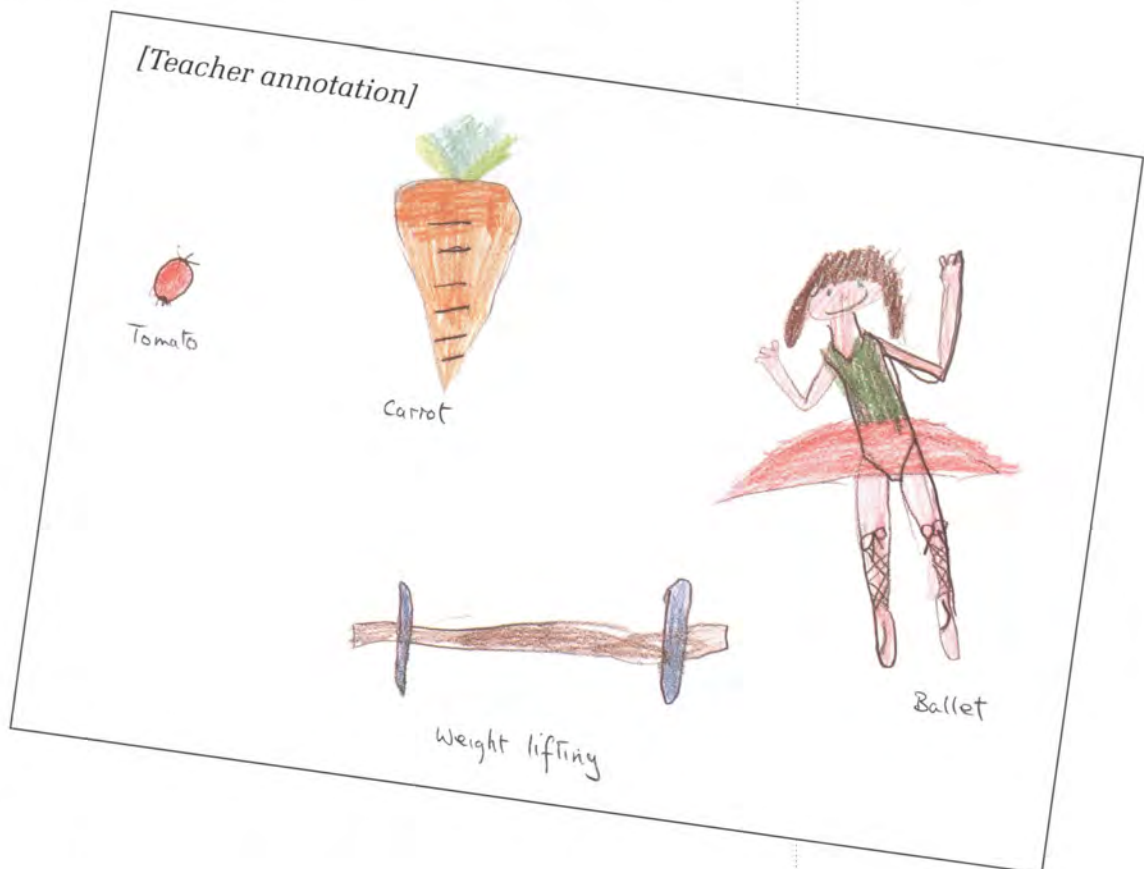


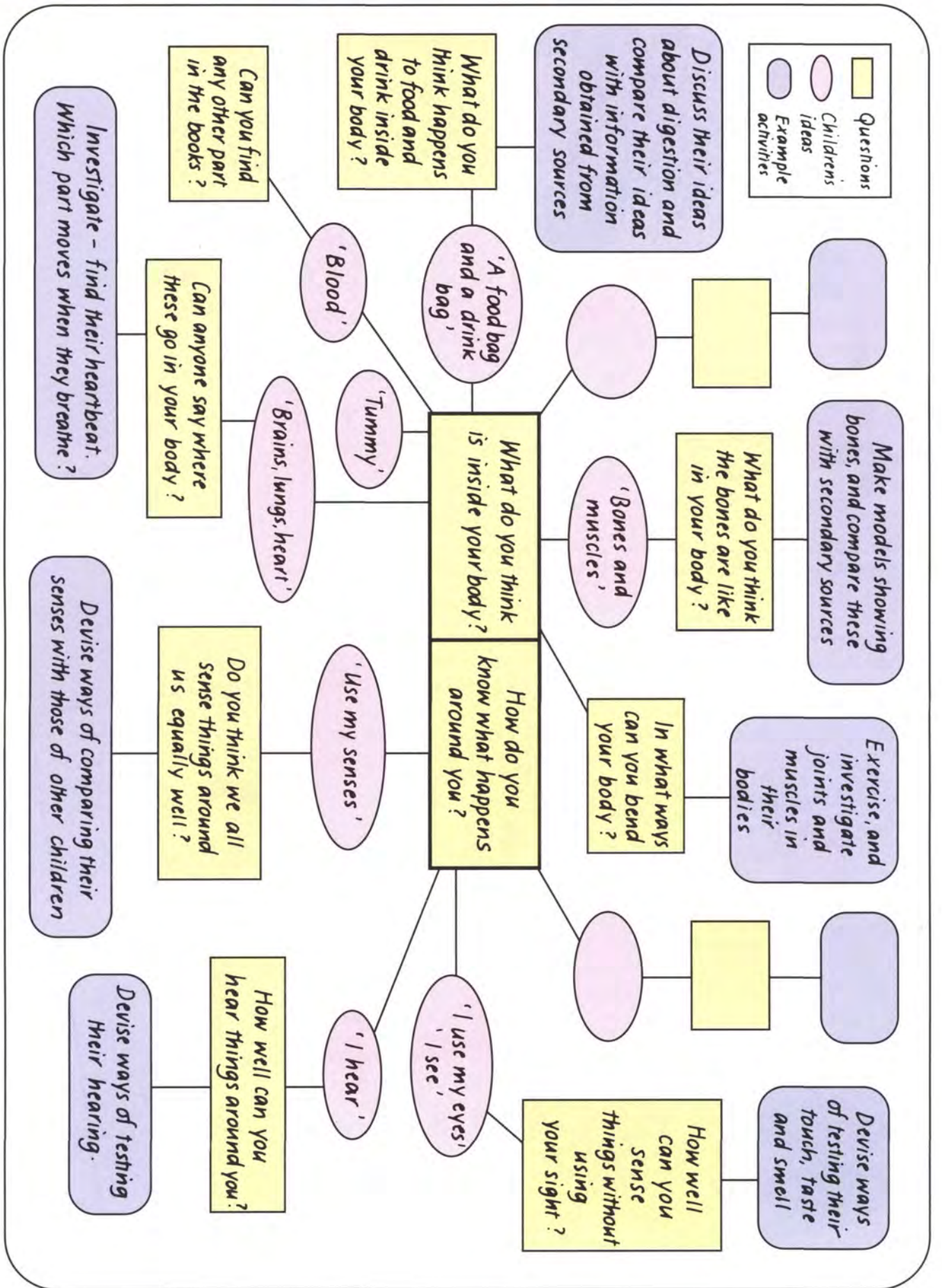
Health

Many children explain that eating food is an important part of keeping healthy. For some children it is important to eat all their food in order to keep healthy.



Some children describe a variety of things that are concerned with keeping healthy; many will say that exercise, as well as food, keeps people healthy.





Helping children to develop their ideas

The chart opposite shows how you can help children to develop their ideas from starting points which have given rise to different ideas.

1 Parts of the body

The children could make collages of pictures of different body parts.

Life size drawings of a child's body could be made, so that children can put pictures of different parts of the body in place.



A game such as 'Simon says' can help children identify body parts.

- Q** *Can you touch your ankles?
Can you bend your wrist?
Can you wiggle your fingers?
Can you feel your eyebrows?*



Encourage children to discuss what they think might be inside their bodies, and to reflect on their ideas.

- Q** *Can you feel your heart beat? Where is it?
Can you hear your tummy rumble sometimes?
Can you see veins in your wrists?
Where do you think your brain might be?*

2 Digestion

Encourage children to share their ideas about what happens to food as it is digested.

- Q** *What happens to the food in your mouth?
What happens to the food as you chew it?
Why do you sometimes choke on large pieces of food?
What do you think happens to the food when you swallow it?
Does all the food and drink you take stay in your body?*



Children should take care not to overstretch

AT
1

Observing



t

Body movements are controlled by muscles

t

Our bodies have a bone structure

AT
1

Communicating

pb

3 Bones and muscles

Children's awareness of their bones and muscles could be developed in PE lessons. As children bend their bodies into different shapes, they could think about how this is possible.

Q *What shapes can you bend your body into? What parts of your body can you bend? How many bendy places can you find?*

Children can compare their range of movements with that of other children in the class.

Q *Who can move only one finger at a time?*

Q *How far can you move your neck?*

Encourage children to exercise each muscle group separately so that they become aware of the different muscles in their body.

Q *Can you make the muscles in your arm first hard and then soft? Can you do the same with any muscles in your leg? Can you find any muscles in your shoulders or back? What do you think muscles are for? What happens to the muscles in your arm as you bend your arm?*

4 Feeling bones

Ask the children to feel and name the bones in their body. Get them to share their ideas with a friend.

The children could use art straws or pipe cleaners to make a model of their bones.

After they have made their models, direct them to suitable secondary sources to see how their ideas match the actual human skeleton. There is a picture of one in *A first look at moving things*. Children could also compare the human skeleton with the other animal skeletons shown there.

Encourage children to discuss why bones are important.



Q *What would we look like without bones? Would we be able to stand up without bones?*

5 Senses

Encourage the children to think of how they sense what is around them.

- Q** *In how many ways can you tell I am in the classroom with you?*
When you are watching TV, how do you know someone is cooking?
When you wake up in the morning, how do you know what the weather is like outside?

They could discuss with a friend what senses are used when they:

- ◆ cross the road;
- ◆ cook a meal;
- ◆ have a bath.
- ◆ ride a bicycle;
- ◆ buy a toy;



Sight

Children who have had their eyes tested may be willing to describe the test.

Children could be asked to devise their own ways of testing their eyesight. They could be asked to find whether:

- ◆ they can see better with one eye than the other eye;
- ◆ some colours show up better at a distance than others.

Get the children to find out how much they rely on their sight. When blindfolded they could:

- ◆ try to recognize friends by touching their faces and clothes;
- ◆ try to walk in a straight line;
- ◆ try to find their way across the classroom.



Encourage children to talk about the difficulties they had when wearing a blindfold.

t

Our senses inform us of our surroundings

AT
1

Communicating

AT
1

General

!

Supervise activities in which children are blindfolded

2.2



Supervise children during this activity

e

AT 1

Predicting

AT 1

Communicating

e



Supervise this activity. Some children may have special dietary needs

AT 1

Predicting



Warn children about tasting unknown liquids

AT 1

Observing
Communicating

it

Touch

Blindfold children and ask them to identify different materials and objects as they are touched against different parts of the body.



*Which part of your body do you think will feel things best?
Can you identify different materials with your bare feet?*



Children could use a 'feely bag' to try to identify common objects and materials.

Taste

Blindfolded children could try to identify samples of food which could include crisps, bread, cheese, apple, pear, banana, onion and carrot.



*Can you guess the foods by tasting them?
Did you just use taste to guess?
Can you guess just as easily if you hold your nose?
Does it help you guess if you wash your mouth out between tastes?*

Let some children set up a colourless drinks test (use plastic cups). Drinks could include mineral water, tap water, sugar water and lemonade.

Can the children find out which drink is most easily identified by the class/group?

Children could record their results by using a computer.

Smell

Help children to consider how our sense of smell helps us.

- Q** *When do we know that something is burning?
How do we know that our tea is ready?*

Set up a display of items which have a distinct smell. Samples could be placed in small containers which could be covered with perforated lids, or children could be blindfolded.



- Q** *What do these things smell like?
Where would you smell these smells?*

Children might develop their own smell test, using some of the samples.

- Q** *Which is most easy to guess?
How far away can you smell each one?
Are you all able to smell them at the same distance?*

Children might also consider which of the items they liked to smell, and which they did not like.

Hearing

Encourage children to describe the kinds of sounds they hear, and to sort them into groups.

- Q** *Can you put together the ones you like?
Can you put together the ones you hear in the same place?*

Get the children to explore their ideas about hearing. They could listen to sounds in the playground.

- Q** *Can you hear sounds that you think are far away?
Will you hear the sound better if you are nearer or further away?
If you move further away, can you still hear it?
How far away can you still hear it?*

6 Keeping healthy

Use the children's original ideas as the basis for a class discussion.

- Q** *What is it about these activities that makes them healthy?
Does everyone think these are healthy?
Can you think of any other ways we can keep healthy?*

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Children should only smell things under supervision

AT
1

Measuring

!

Some children may have hearing difficulties.
Warn children never to poke things in their ears

AT
1

General



pb

Give the children a series of pictures which show activities such as swimming, walking upstairs, eating breakfast, playing, taking medicines, and keeping clean. There is a suitable set in *A first look at living things*.

Q *Do these things help to keep you healthy? How? Can you think of any other things you do each day that help to keep you healthy?*

Get the children to discuss why some activities are healthy and others are unhealthy.



7 Taking exercise

Encourage the children to think of as many means of exercise as they can and of the types of exercise they take. They could collect pictures of these activities, which could be the focus of a discussion about why people take exercise. Some children could write to the local leisure centre to find various ways in which children can exercise there.

8 People who help us keep healthy

Children could draw pictures and write about some of the people who help to keep them healthy and safe. These might include:

- ◆ the school nurse; ◆ a doctor; ◆ a childminder;
- ◆ the school caretaker; ◆ a dentist; ◆ the lollipop person.

If possible, ask one or more into the classroom so that they can talk to the children about their jobs.

A first look at living things tells the story of a visit to the doctor.



pb

AT
1

Communicating

9 Healthy eating

Let children compile a class list of foods and drinks they have seen advertised in books and on television or which they eat themselves.

Q *Are all the foods healthy?
Which do you think are
unhealthy?*

Children could also consider the range of foods shown in *A first look at living things*.

Get the children to devise their favourite meal and model it in Plasticine or card and other scrap materials which could be painted.

Q *Why do you like this meal?
Do you think it is a healthy meal?*

Children could collect pictures of foods from magazines, and make collages of healthy and unhealthy foods. Encourage them to give their reasons for deciding whether the foods are healthy or unhealthy.

The poem about the effects of eating unwisely in *A first look at living things* could be used as a starting point for this activity.



2.2

pb

e

pb

10 Keeping safe

Children could discuss how the things around them might harm them and how they can try to keep safe.

Q *What kinds of things might not be safe?
How can we keep safe?*

Ideas might include:

| | |
|---------------------------|---------------------|
| playgrounds | building sites |
| streams, ponds and canals | busy roads |
| medicines | household chemicals |
| crowds of people | old refrigerators |
| strangers | matches and fires |

Encourage groups of children to make collages or posters of their ideas. They could use their own pictures of dangerous and safe situations as well as pictures from newspapers, comics and magazines.

Q *How did you decide which are safe and which are
dangerous?
Why are building sites/busy roads dangerous?
How can you keep safe on a busy road?*

Through role play children could think about situations involving safety, such as playing near water, crossing busy roads and being tempted to play on a building site.



2.3 Plant and animal growth



A LOOK AT plant and animal growth

Growth takes place continuously, although the process takes place so slowly that changes are often imperceptible. Children are aware that they have grown when clothes no longer fit, or when their hair or fingernails need cutting. As people grow their bodies undergo physical changes. Early in life these changes help them to become increasingly independent of others and better able to care for themselves.

All living things need air, water and nutrients to grow; green plants also need sunlight. The soil is the source of nutrients for many plants, which take these up through the root system along with water. The course of development in plants and animals follows a cycle. In animals the young develop into adults and produce offspring; at the end of the life cycle the animals die. Plants grow, mature and produce seeds, and die.

AREAS FOR INVESTIGATION

- ◆ Investigate the conditions for growth.
- ◆ Find out about the life cycles of animals and plants.
- ◆ Find out about the parts of a flowering plant.

KEY IDEAS

- ◆ All living things grow but this takes place gradually.
- ◆ *All living things need oxygen, water and nutrients to grow; green plants also need sunlight and carbon dioxide.

(*Asterisks indicate ideas which will be developed more fully in later key stages.)

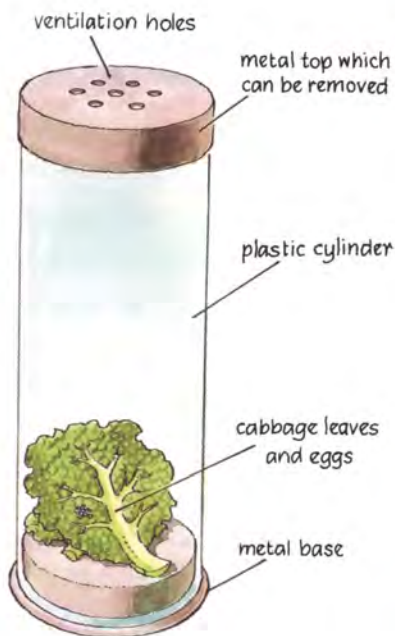
Finding out children's ideas

STARTER ACTIVITIES

1 People growing

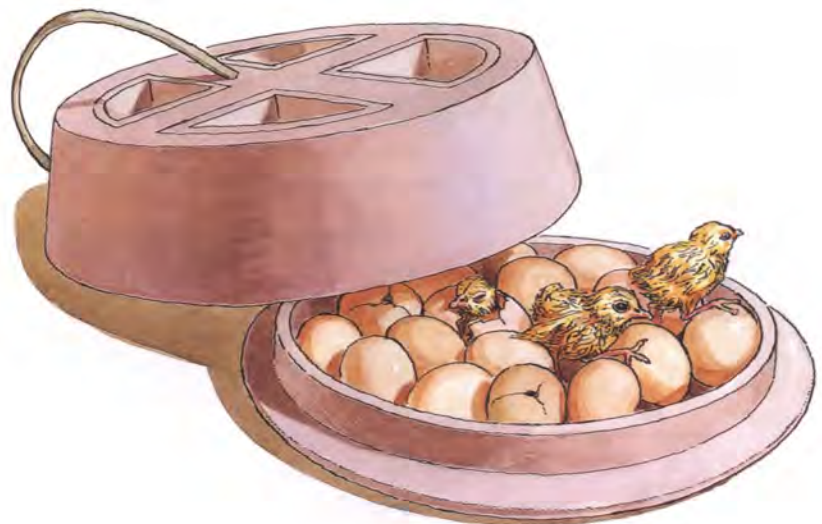
Children could draw themselves as a baby, as they are now and as they think they might be as an adult.

- Q** *What makes you grow?
How do you know you have grown?
How have you changed since you were born?
How do you think you will change as you get older?
When do you grow?*



2 Hatching eggs

The care of an incubator full of hens' eggs places extra demands on the teacher but does stimulate children's interest.



The eggs of a cabbage white butterfly can be hatched in the classroom on cabbage leaves kept in a ventilated, transparent, plastic container.

- Q** *Draw a picture to show what you think is happening inside the egg.*

Children might keep a record of development in a logbook.

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Make sure there is someone willing to take the chicks (possibly the place where the fertile eggs came from). There needs to be a proper incubator and these are quite expensive. Only attempt this if you are confident and have it all planned. What if they hatch during the weekend, or holidays? (CLEAPSS produce guidance on incubating and hatching eggs)

e

AT
1

Observing
Recording



Do not use red kidney beans – the coat is very toxic until cooked. Some seeds will be coated with pesticide. Make sure that children do not swallow seeds or poke them in their ears

3 Plant growth

Provide a display of different plants to stimulate children's ideas about the conditions necessary for plant growth.

Q *Can you draw a plant in the place where it will grow best, showing all the things it needs to grow?*

4 Germinating seeds

soak mung beans
for a day or two



rinse thoroughly,
leave wet, lay jar
on side in a dark
warm place



rinse daily until
sprouts are well
developed, about
12 days

soak broad beans
overnight



put on cotton wool on tray



cover with a damp cloth and leave in warm
dark place



keep cloth and cotton wool damp

remove cloth when
seed leaves appear
but keep cotton wool
damp



e

Choose seeds which sprout quickly, so as to sustain children's interest. Radishes and beans of various kinds have often been grown successfully in the classroom. If beans are used, mung beans are quickest, but broad beans are also suitable.

Talk to the children as they watch the changes to the seeds.

Q *What do you think is happening inside the seed?
What do you think the seeds need to make them grow?
Do you think they will stop growing?*

AT
1

Predicting
Observing
Recording

Children's ideas

1 Human growth

Some children may have difficulty in describing the ways in which their growth changes them. When they show themselves in pictures at an early age, as they are now and as an adult, their drawings may vary in size but show little change of detail.

Children's description of the ways in which they change may focus on particular parts of their body, for example, the hair, teeth, legs and feet.

I'm bigger and at school now. I might be a big junior. I would change to big clothes.



[Teacher annotation]

longer hair, bigger clothes, bigger shoes.

I had no hair, little feet, and a little hand, and a little body



Adult



Now



I'm bigger because I have hair

When it's my birthday I grow

Other children may describe how their behaviour changes, or how they become increasingly independent.

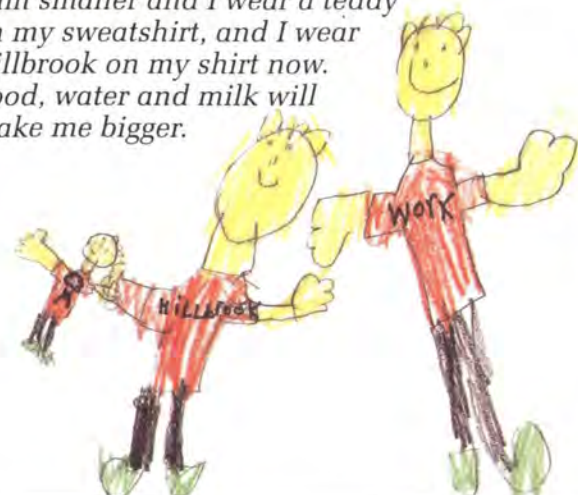
I used to say 'coo-coo mama'. I used to stand up, and when I stood up I fell down.

... I will be able to cook my own food, and I will be able to tidy up my own bed and go to work.

When describing the conditions for human growth, children often state that food and water are essential for growth.

During discussion about when growth occurs, children might explain that it happens at night or while they are asleep. These ideas are encountered in discussions about the growth of other animals and plants, as well as of humans.

I am smaller and I wear a teddy on my sweatshirt, and I wear Hillbrook on my shirt now. Food, water and milk will make me bigger.



2 Growth of other animals

Children observing eggs often suggested that the animal is completely formed, fully grown from the outset, and simply waiting to be hatched.

I think the caterpillar is scrunched up in that little egg waiting for her egg to hatch, but while she is waiting she is planning her life.

Other children might describe a miniature animal which is structurally complete.

The caterpillar is very small, it grows bigger and bigger until it is ready to come out.

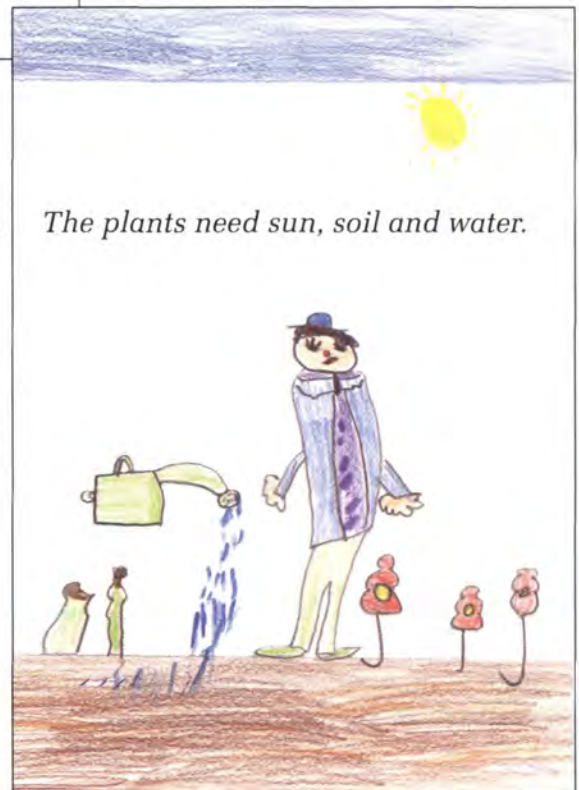


3 Plant growth

Most children are aware that plants grow, but because this process is slow and imperceptible they tend not to understand the idea of continuous growth.

Children might suggest that plants grow when they are not being watched, or at night. The idea that plants grow at night reveals that children are not yet aware of the role of sunlight in the growth of green plants.

Young children are equally likely to draw a plant inside or outside a building. At Key Stage 1, they tend not to appreciate that the conditions are affected by whether the plant is in or out of doors. Some children mention that Sun, soil and water are necessary for plants to grow, as in this example.



Many young children will indicate only one or two conditions, such as water or sunlight.

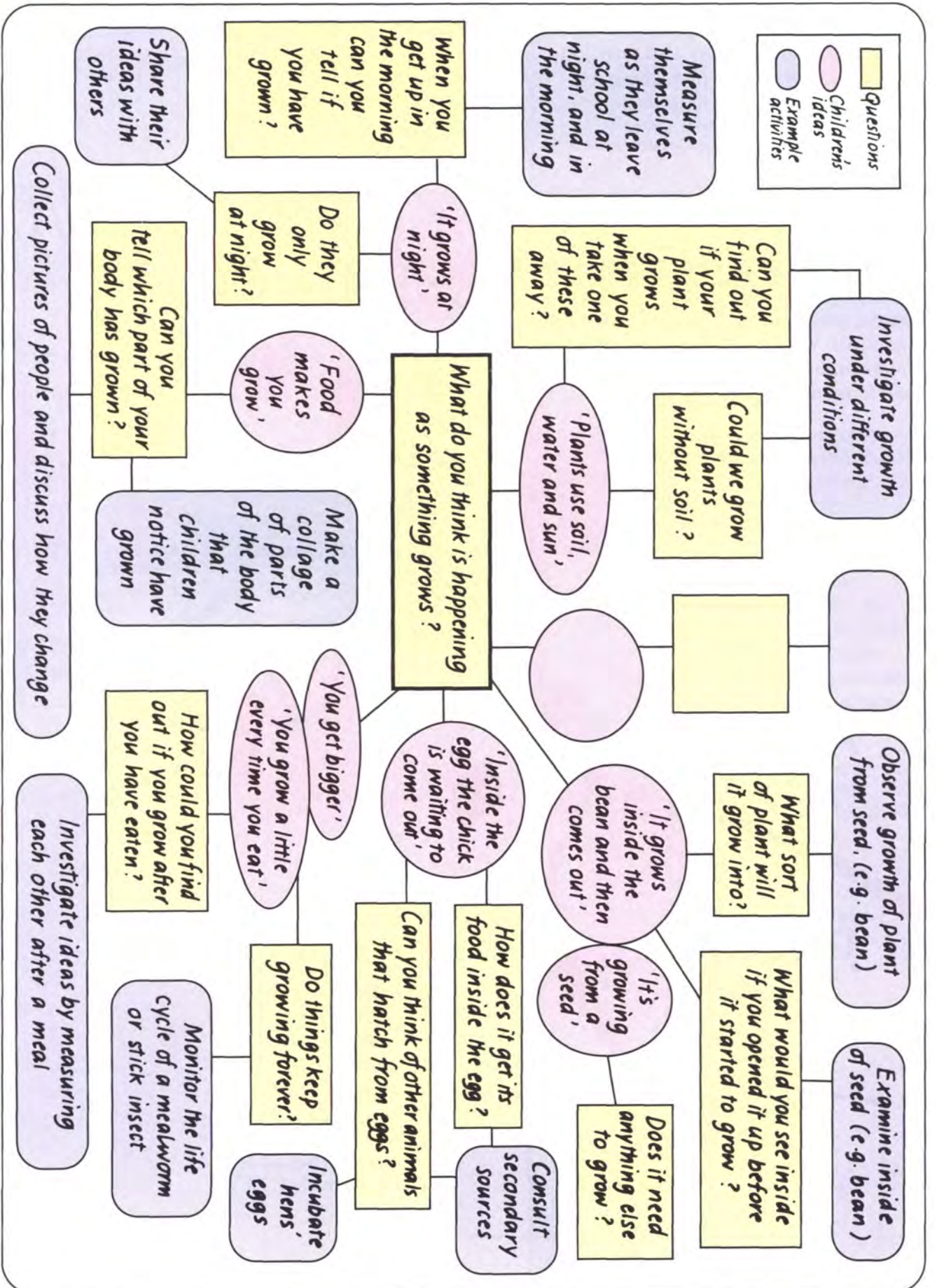
A few children may discriminate between the light and the heat provided by the Sun, and they may also mention nutrients necessary for plants to grow, such as plant food. Possibly these children have some experience of caring for indoor plants.

Children who grow beans or seeds usually realize that leaves and other parts of the plant have developed from the seed, but they may be unsure how that happens. Many children consider that the growing plant unfolds from the seed itself. Young children show little understanding that new material has been formed.

From inside, small little seeds that make stems would be there ... very tiny. You can't see them.



Helping children to develop their ideas about plant and animal growth



Helping children to develop their ideas

The chart opposite shows how you can help children to develop their ideas from starting points which have given rise to different ideas.



1 The human life cycle

Encourage the children to collect evidence to show that they have grown such as their birth weight and length, clothes which they have grown out of, and photographs taken at various stages of their lives. Ask:

Q *How do we change as we get older?*

In class discussion children could think about what they were able to do at different stages of their life. They could think about the things older brothers and sisters can do, or things they can do which their younger brothers and sisters cannot.

Q *Which things did your mum/dad have to do for you when you were little which you can do by yourself now?
How do grown-ups help you?*

There are pictures of children and adults at different stages of life in *A first look at living things*. Encourage the children to put these in a sequence.

Q *How do we change as we get older?
How did you decide who was older and who was younger?*

2 Growth

A class discussion could develop children's understanding.

Q *Do you think you will stay this height/weight?
How tall/heavy do you think you will grow to be?
What do you think makes you grow taller/heavier?
Will you grow taller/heavier for ever?
Do people ever get shorter/lighter?*

pb

AT
1

Measuring

pb

AT
1

Observing

e

e

To investigate whether they grow overnight or after they have eaten children could measure their height or weight before and after a meal or on different days.

- Q** *Have you grown enough to notice in one day?
How do you know when you have grown?
How do you know when your fingernails/hair need cutting?
Why do you think you didn't notice you were growing?*

Growth of other animals

Give the children a collection of pictures of young and adult animals and ask them to match the young to the adult animal. There is a suitable set in *A first look at living things*.

- Q** *Which young animals look very like their parents?
Which young animals look quite different from their parents?
How are the young animals different from their parents?*

Children could watch the life cycle of a small animal from the egg stage. Suitable classroom animals include mealworms, which complete their life cycle within a few weeks and are easy to keep. Stick insects are more attractive but have a longer life cycle. In some classrooms children may be able to monitor the incubating hens' eggs (see the starter activity 'Hatching eggs').

- Q** *How will the egg/animal change?
What do you think it needs to make it grow?
What will it look like in a few weeks/months?
When do you think it grows?*

3 Looking after plants

Set up a classroom display of different kinds of plants which children can help care for. Encourage children to observe the parts of the plants closely.

- Q** *What parts of the plants can you name?*



Ivy

Spider plant

Geranium

Busy Lizzie

Tradescantia

4 Looking at plants in the environment



Investigative work with living things has ethical and legal obligations, so choose practical investigations with care. The collection of plants and animals from the wild is severely restricted – see *Animals and plants in schools: legal aspects* (DES Administrative memorandum 3/90)



Follow school or LEA rules about supervision. Check your school's policy on visits. Warn children about poisonous plants – especially attractive fruits and berries

On a class walk children can observe many kinds of plants.



*Can you put them into groups?
Why do you think the plant has leaves, seeds, a flower?
How do you think the plant came to grow in that place?*

Encourage the children to use secondary sources to identify some of the parts of plants.

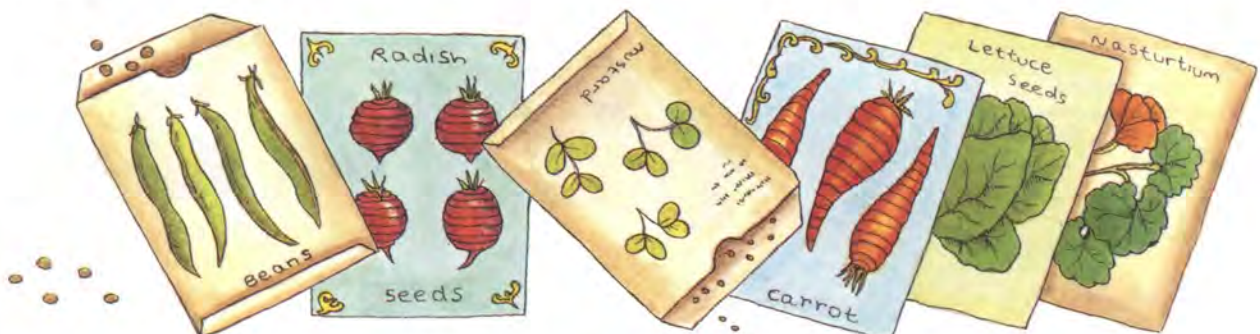
A first look at living things encourages children to think about some of the things we get from plants, and could be used as a basis for further discussions about the parts of a plant. Children could also talk about the range of plants shown and consider what conditions might be necessary for successful growth.



Predicting
Observing
Interpreting results and findings

5 Growing plants from seed

The children could plant seeds they have found. However, you may find that few grow because most seeds need to pass through some natural cycle of conditions before they will germinate. Sometimes you can trick them by putting them in a freezer for a few days to simulate winter.



2.3



Check that the seeds are not coated with an insecticide or fungicide, which might be poisonous; those bought from a health food shop should be safe. Avoid red kidney beans

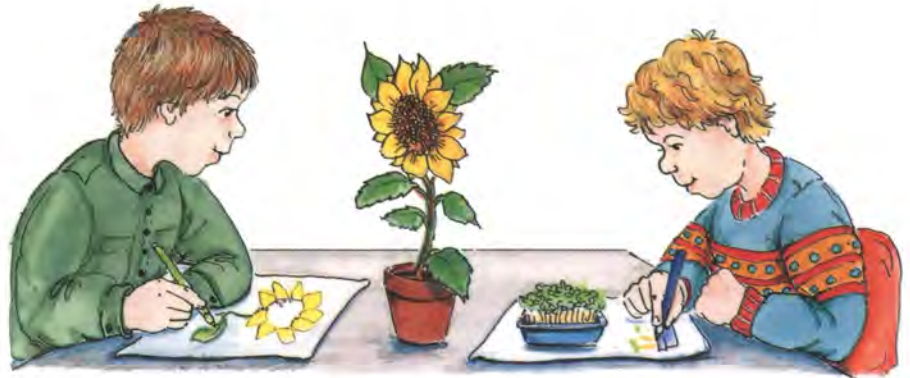
AT
1

General

Bought seeds are much more predicible. Choose quick growing plants, such as mung beans, cress, radishes, grass or wheat (see page 40). If the children are going to grow plants to full size, to record their growth rate, it may be better to choose radishes, wheat, grass, sunflowers or tomato seeds. The best time for this activity is spring or early summer. Before starting, ask the children:



- What do you think is inside the seed(s)?*
- What will happen to the seed if it is planted?*
- How do you think the seed grows into a new plant?*
- Will the plant grow for ever?*
- What will they need to help them grow?*
- Where will you put the seeds so that they will grow?*



Children could record their predictions as drawings which could be annotated to explain their ideas further.

The children could keep a group diary with their own pictures and explanations to show the changes they observe.

When children have successfully grown some seeds, ask them again to think about what is needed for growth.

6 Growing plants from bulbs

Provide children with a selection of bulbs to look at.



- What do the bulbs need to help them grow?*
- What do you think the bulb might grow into?*
- Where should we put the bulbs to help them grow?*



e

Avoid hyacinths, especially white hyacinths which give some children a rash

t

Plants need sun, water, air and nutrients to grow. A bulb is a food store for the plant that grows from it

Help the children to plant the bulbs. They might keep a group logbook in which they could record their observations and ideas as the plant grows. As the plant grows, encourage them to share their ideas.

- Q** *What do you think is happening to the bulb?*
What does it need to help it grow?
Where has the plant come from?
Can you see any leaves?
Has the plant got a stem?

AT
1

General

7 The life cycle of a plant

Encourage the children to think about and observe the main stages in the life cycle of a plant. This could be done both indoors and outdoors. Choose plants which go through their life cycle fairly quickly, such as common weeds like dandelions or thistles. During the investigation, ask:

- Q** *What does your weed look like now?*
What will it look like in a few weeks?
Why does the gardener get rid of weeds?

8 Discussing growth

Children will use different words to explain what is happening as growth occurs, such as 'growing bigger' or 'stretching'. Explore these words with them.

- Q** *What do you think 'growth' means?*
Can you describe what happens when something grows?
What does it need to grow?
How do we get bigger?
Can you think of other things that get bigger, or stretch?
Is that the same as growing?

v

t

During growth of a plant or animal, material is transformed and incorporated into it

3.1 Introduction

You will have been assessing your children's ideas and skills by using the activities in this teachers' guide. This on-going, formative assessment is essentially part of teaching since what you find is immediately used in suggesting the next steps to help the children's progress. But this information can also be brought together and summarized for purposes of recording and reporting progress. This summary of performance has to be in terms of National Curriculum level descriptions at the end of the key stages, and some schools keep records in terms of levels at other times.

This chapter helps you summarize the information you have from children's work in terms of level descriptions. Examples of work relating to the theme of this guide are discussed and features which indicate activity at a certain level are pointed out to show what to look for in your pupils' work as evidence of achievement at one level or another. It is necessary, however, to look across the full range of work, and not judge from any single event or piece of work.

There are two sets of examples provided. The first is the assessment of skills in the context of the activities related to the concepts covered in this guide. The second deals with the development of these concepts.

3.2 Assessment of skills (AT1)

Things to look out for when pupils are investigating living processes as indicating progress from level 1 to level 3:

Level 1: Making observations of simple features of the human body and of familiar plants, such as colour, shape, size and external parts; talking about and drawing them.

Level 2: Making suggestions as well as responding to others' suggestions about how to find things out about living things. Using equipment and living things suitably housed and cared for, to make observations. Recording what they find and comparing it with what they expected.

Level 3: Saying what they expect to happen when something is changed and suggesting ways of collecting information to test their predictions. Carrying out fair tests, knowing why they are fair, and making measurements. Recording what they find in a variety of ways; noticing any patterns in it.

Within the topic 'Taking care' the teacher included work on the senses. She planned to use some of the activities to help children to develop their practical skills.

The children had been introduced to ideas about the senses and they were discussing ways in which they relied on particular senses. Roxanne, Thomas, James and Katie were talking about their hearing and the teacher asked them what was meant by the expression: 'You could hear a pin drop'.

She also provided them with some pins.

The children discussed the expression and tried dropping a pin on the desk top. As they worked the teacher encouraged them to find out whether they could hear the sound from further and further away, and to predict where they would be unable to hear the sound in the classroom. The children worked in pairs, testing each other, and were surprised to find that the sound could be heard across the room. The teacher asked them:

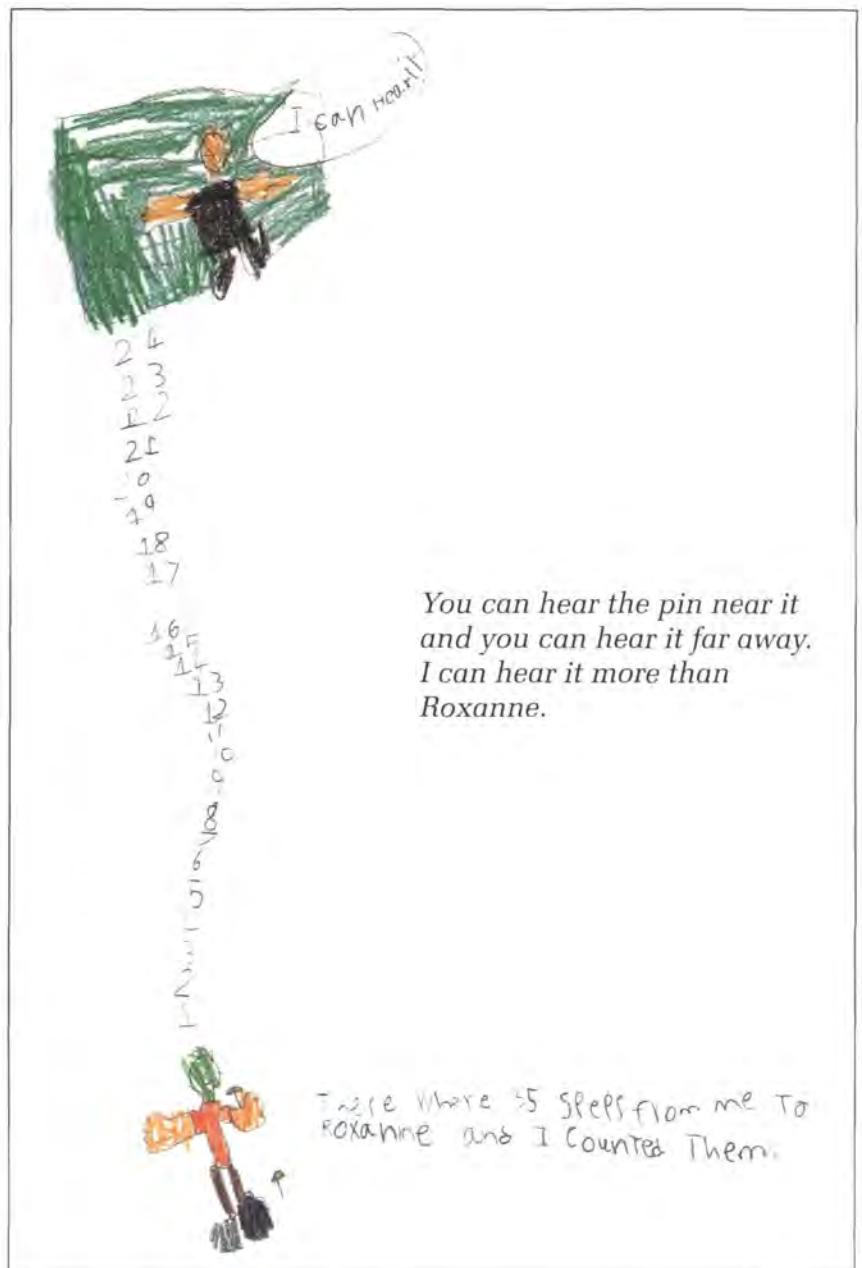
Do you think you could find out how far away you could hear a pin drop?

The children explained that they could keep testing in the same way as in the classroom but they would need to use a larger room. Following a brief discussion they suggested using the school hall. After the teacher had stressed that each group would have to show her exactly what they had found out when they returned to the classroom, the children continued their investigations in the school hall. The work and explanations of two of the children are shown below and overleaf.

Roxanne and Thomas worked together and their drawings show what they did and found. Although they did not use a measuring instrument they quantified their investigation by counting steps as a measure of the distance from the pin to the person listening.

Meanwhile another pair, James and Katie, did not measure distances or count steps, but noted that James could hear 'to the ladder', whilst Katie could hear 'all the way'. James concluded that 'she has got more good hearing than me.'

All the children made relevant observations of the sound of the pin dropping and from their initial observations made predictions about how far away they would need to be before they would not be able to hear it. They suggested ways of testing their predictions and carried out their investigation involving listening from various distances. They all went further than describing their observations, by making some interpretation of them. These are all indications of work at level 2.



Thomas



Roxanne

In their conclusions both pairs of children compared their hearing with that of their partner, basing their conclusions on the evidence. They also reported hearing the sound of the pin over comparatively large distances. It appears that they can use their observations to support these conclusions. These are further indications of work at level 2.

There is no indication of the children having considered any of the factors which might have affected the fairness of their tests, for example, the height from which the pin was dropped or the nature of the surface on which it fell. The teacher could raise questions about these and other factors, and suggest the children might investigate their effects on the sound to help progress towards level 3.

Whilst Roxanne and Thomas quantified their results, though not using a measuring instrument, it does not appear that Katie and James considered quantification. The teacher could help these children to improve their practical skills by getting them to think about the advantages of quantifying observations. For example, the children could be asked to compare their results within a group more carefully, as follows:

How much further away can Katie hear than James?

How much further away can Thomas hear than Roxanne?

Can James hear further away than Roxanne?

How much further away?

3.3 Assessment of children's understanding (Part of AT2)

In terms of work relating to living processes, progression from level 1 to level 3 is indicated by:

Level 1: Naming external parts of the human body and of familiar plants

Level 2: Awareness of the need of living things for food, air and water. Recognising that living things grow and reproduce.

Level 3: Showing knowledge of the basic life processes and using it to distinguish between living and non-living things.

As part of their work within the topic 'Taking care', children in Year 2 discussed their ideas of how they care for themselves, their pets and plants. They talked about their ideas with other children and the teacher, and showed some of their ideas in pictures.

Amee, Jennifer and Josh drew pictures of themselves and a plant, and named some of the parts. Some of the drawings are shown here.

Josh

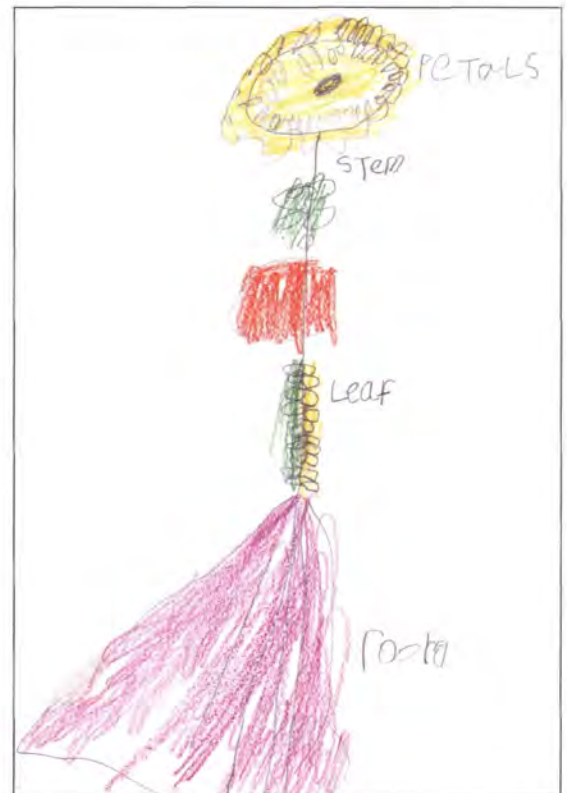


Jennifer



Amee and Josh produced drawings of both a body and a plant in which main external parts were identified. Their work appears to satisfy all aspects of the description of level 1, even though they have not labelled some of the parts of the body accurately. Showing the roots in the drawing of a plant gives greater detail than many children offer at this stage.

Jennifer's drawing of the body is also at level 1, because she has named some of the parts. She did not name any of the parts on her drawing of a plant. However, she told the teacher that her plant has a flower and a leaf. It would appear that Jennifer needed to develop her ideas about plants. Her teacher could give her the opportunity to examine an uprooted plant, or care for some classroom plants, to help her in this respect.



Amee

Simi showed how he takes care of his dog, and what a plant needs to stay alive. Jon described in detail how to take care of a plant. Ricky (shown opposite) showed what care he, his pets and a plant need.

Jon

I've got lots of flows

if you put to much water it will drawnd.
 my dad waters the flows and he Prowns them and
 he putts on New sole. if the rowts are cut the plant
 would die quit quit. the stem sucks the
 water from the sole. the stem sucks the
 water from the sole to the flower



Simi



I give my dog some food and drink.
 You give a plant some rain and some
 sun and soil.

I give my dog a drink



Simi is aware of some of the needs of an animal and a plant but, in common with many other children at Key Stage 1, he has not mentioned the need for air. However, it is possible that Simi is aware that living things need air to sustain life, and has not made this clear in his description. Through discussion the teacher could further investigate Simi's ideas about what living things need and do, to judge whether his work has reached level 2.

Jon has given detailed descriptions of the care of a plant, in which, like Simi, he has not mentioned air. Perhaps he has taken it for granted and this could be probed. He has some knowledge of the function of roots and stem, indicating progress beyond level 2 in some respects.

The teacher could help Jon to find out more about living processes by giving opportunities to develop ideas about feeding, growing and breathing in humans and other animals.

Although Ricky's work does not indicate that plants and animals need air to sustain life, it does show that humans and other animals have common life processes, and this aspect of the work indicates level 3. The teacher would have to find out from other sources the extent of Ricky's knowledge about the need for air and, as with Jon, provide him with opportunities to develop his ideas about living processes in humans and other animals.



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