



Planning, teaching and assessing the curriculum for pupils with learning difficulties

# Science



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Qualifications and Curriculum Authority  
83 Piccadilly  
London  
W1J 8QA

[www.qca.org.uk](http://www.qca.org.uk)

## Contents

<b>Introduction</b>	<b>2</b>
What is the purpose of this guidance?	2
Who are the pupils?	2
Who is the guidance for?	2
What is in the guidance?	3
What are the subject materials?	3
 <b>Responding to pupils' needs when teaching science</b>	 <b>4</b>
The importance of science to pupils with learning difficulties	4
Modifying the science programmes of study	4
Improving access to the science curriculum	11
 <b>Opportunities and activities at key stage 1</b>	 <b>13</b>
 <b>Opportunities and activities at key stage 2</b>	 <b>20</b>
 <b>Opportunities and activities at key stage 3</b>	 <b>28</b>
 <b>Opportunities and activities at key stage 4</b>	 <b>35</b>
 <b>Performance descriptions</b>	 <b>41</b>

## Introduction

### What is the purpose of this guidance?

This guidance supports the planning, development and implementation of the curriculum for pupils with learning difficulties. It draws on effective practice across a range of schools and can be used in mainstream and special primary and secondary schools, specialised units and independent schools. It also provides support to the range of services that work with these schools.

The guidance can be used with the school's own material, the national curriculum and the frameworks for teaching literacy and mathematics to:

- confirm the statutory entitlement to learning for all pupils and build on the principles of inclusion set out in the national curriculum
- help schools develop an inclusive curriculum by:
  - setting suitable learning challenges
  - responding to pupils' diverse learning needs
  - including all learners by overcoming potential barriers to learning and assessment
- provide a stimulus to revisit and revise existing schemes of work or a basis to develop new ones.

### Who are the pupils?

The guidance relates to all pupils aged between 5 and 16 who have learning difficulties, regardless of factors such as their ethnicity, culture, religion, home language, family background or gender, or the extent of their other difficulties. This includes pupils who are unlikely to achieve above level 2 at key stage 4. (These pupils are usually described as having severe or profound and multiple learning difficulties.) This also includes pupils with learning difficulties who may be working at age-related expectations in some subjects but are well below this in others. (These pupils, along with those with other significant difficulties, are often described as having moderate learning difficulties.)

### Who is the guidance for?

The guidance supports the work of a range of adults who are concerned with meeting the needs of pupils with learning difficulties. This includes class teachers, subject coordinators, special educational needs coordinators (SENCOs), senior managers, teaching assistants, parents,

carers, governors, therapists, local authority and advisory support services, and professionals from health, social services and the voluntary sector. Throughout these materials, the term 'staff' is used to refer to all those concerned with the education of these pupils.

## What is in the guidance?

The guidance contains:

- support on developing and planning the curriculum
- support on developing skills across the curriculum
- subject materials on planning, teaching and assessing each national curriculum subject; religious education (RE); and personal, social and health education (PSHE) and citizenship. These include descriptions of pupils' attainment showing progress up to level 1 of the national curriculum, which can be used to recognise attainment and structure teaching.

## What are the subject materials?

The subject materials support staff in planning appropriate learning opportunities. The materials do not represent a separate curriculum for pupils with learning difficulties or an alternative to the national curriculum. They demonstrate a process for developing access to the national curriculum and support staff in developing their own curriculum to respond to the needs of their pupils at each key stage. The materials offer one approach to meeting this challenge. Schools may already have effective structures or may wish to adopt different approaches.

The materials identify learning opportunities relevant to each subject. They demonstrate appropriate learning across the scope of the national curriculum from the earliest levels. They are intended to increase schools' confidence in their capacity to provide appropriate access to the national curriculum.

A common framework for these materials has been used. In each subject, appropriate learning for pupils with diverse needs at each key stage has been identified. Those aspects of the programmes of study that may create particular difficulties are also discussed, as well as aspects that may be unsuitable at a particular key stage. The suggested activities can be used to develop ideas for relevant, accessible and challenging experiences in curriculum plans.

## Responding to pupils' needs when teaching science

### The importance of science to pupils with learning difficulties

Science gives all pupils the opportunity to think and learn, and develop an interest in, and curiosity about, the world around them through exploratory and investigative experiences and activities.

In particular, science offers pupils with learning difficulties opportunities to:

- develop an awareness of, and interest in, themselves and their immediate surroundings and environment
- join in practical activities that link to ideas, *for example, doing and thinking*
- use their senses to explore and investigate
- develop an understanding of cause and effect.

In response to these opportunities, pupils can make progress in science by:

- experiencing that personal actions have consequences, leading to the seeking of explanations, and an understanding of the links between causes and effects
- increasing the breadth and depth of their experience, knowledge and understanding
- linking and applying scientific knowledge and understanding to everyday life, *for example, to cooking, to their own health, in the use of materials for functional purposes*
- investigating the familiar, and later developing a broader environmental and technological perspective
- developing an understanding of the more abstract as well as the concrete and practical
- moving from description to explanation of events and phenomena.

### Modifying the science programmes of study

The statutory inclusion statement of the national curriculum requires staff to modify the programmes of study to give all pupils relevant and appropriately challenging work at each key stage. Staff should teach

knowledge, skills and understanding in ways that match and challenge their pupils' abilities.

Staff can modify the science programmes of study for pupils with learning difficulties by:

- choosing material from earlier key stages
- maintaining, reinforcing, consolidating and generalising previous learning, as well as introducing new knowledge, skills and understanding
- using the programmes of study for science as a resource, or to provide a context, in planning learning appropriate to the age and needs of pupils
- focusing on one aspect, or a limited number of aspects, in depth or in outline, of the age-related programme of study
- including experiences which allow pupils at the early stages of learning to gain knowledge, skills and understanding in science as part of their study of other subjects, or which take place as part of everyday activities, *for example, choosing materials, investigations involving food and cooking*
- enabling some pupils, at first, to access science by personal exploration using a sensory approach.

## Scientific enquiry

### Planning

Planning involves anticipation, thinking about what might happen, and deciding what action to take. It begins with the awareness that actions have consequences and that these are linked, *for example, operating a switch to play music or move a toy*. Anticipation can be encouraged by exaggerating and building-up a coming event, *for example, 'Wait for it, wait for it ...'*. Taking part in the planning process for an investigation is made easier by offering alternatives, brainstorming ideas, and encouraging pupils to think about previous experiences and knowledge. Learning about planning through scientific enquiry across the key stages can help pupils to:

- respond to, and answer, scientific questions (at first it may be necessary for staff to give pupils examples of questions and ways of answering), leading to asking scientific questions, *for example, 'What will happen if ...?' 'Why did ...?'*



- think and communicate about what might happen, try things out when deciding what to do, and choosing what equipment and materials to use
- decide what kind of evidence to collect, *for example, surveys, measurement, observation, information*
- know about the range of available sources of information, *for example, asking people, looking at pictures, photographs, CD-ROMs and the internet*
- learn about tests that are fair, and those that are not, by taking part in a variety of investigations involving fair and unfair tests.

### ***Obtaining and presenting evidence***

Obtaining evidence begins with the exploration and investigation of a range of living things, materials and phenomena, using the senses of sight, hearing, smell, touch and taste, as appropriate. Observation is indicated initially by attending, showing an interest in, and manipulating. Care needs to be taken to avoid confusion, and only a manageable amount of sensory input should be presented at any one time. Learning how to obtain and present evidence across the key stages can help pupils to:

- follow simple instructions to keep themselves and others safe, *for example, 'Stop', 'No more', and learn to take action to control risks to themselves and others*
- use a range of scientific equipment and materials, at first for play and exploration and then in a planned way
- make observations and measurements, becoming more systematic and accurate
- record what happens using a variety of means, *for example, remembering, using symbols to indicate to a member of staff, using sticky symbols on prepared graphs or tables*
- present the evidence and explain what happened, *for example, summing up using a variety of ways including concrete objects, three-dimensional models, photographs, symbols, tallies, drawings, diagrams, graphs, audio recorders, videos and other forms of ICT.*

### ***Considering and evaluating evidence***

Considering and evaluating evidence begins with the demonstration of consistent responses and using discrimination during a scientific activity, *for example, choosing certain materials and rejecting others to indicate personal preference.* Learning how to consider and evaluate evidence across the key stages can help pupils to:



- use evidence for a purpose and recognise its relevance, *for example, selecting fabrics for clothes to keep warm*
- make simple comparisons and identify simple patterns or associations, *for example, 'Which is the biggest?' 'Which is the fastest?'*
- communicate 'What happened when...?' and begin to provide an explanation and compare what happened with what pupils expected, *for example, using before/after photographs or video clips*
- use observations, measurements or other data to draw conclusions, *for example, after an investigation about freezing and melting, pupils might know and communicate where to put their ice lollipop to keep it frozen*
- review their work and communicate it to others, *for example, suggesting improvements for the next time.*

## Life processes and living things

### **Humans and other animals**

Knowledge and understanding of humans and other animals starts with pupils' awareness of themselves, *for example, body awareness and self-awareness*, and, at first, relates to personal experience, *for example, food tasting and preferences, experiencing movement, exploring their own body parts and senses*. It leads to a basic knowledge of how the human body works and how to keep healthy. Learning about humans and other animals across the key stages can help pupils to:

- recognise that animals, including humans, move, feed, grow, use their senses and reproduce
- treat animals with care and sensitivity
- recognise the variety of foods to be included in a healthy diet and the need for a balanced diet
- observe and explore movement in themselves, other humans and animals, and know about the role of skeletons and muscle
- recognise that humans and other animals can produce offspring and that these grow into adults
- know about the main stages of the human life cycle, *for example, babyhood, childhood, adolescence, adulthood, old age, death*
- be aware that we breathe in and out, into the lungs, and that blood flows through the body

- recognise the need for personal hygiene and follow simple and safe routines to reduce the spread of bacteria
- explore different factors that contribute to a healthy lifestyle, including the choices pupils can make, *for example, diet, exercise, effects of tobacco and alcohol, drugs as medicines, keeping food fresh.*

### Green plants

Knowledge and understanding of green plants starts by exploring with the senses, *for example, feeling, smelling and looking at a variety of plants.* Developing a knowledge and understanding of green plants across the key stages can help pupils to:

- explore the smell, texture and visual appearance of herbs, flowering plants and other plants
- recognise that plants grow from seeds and that they need light, water and warmth to flourish
- recognise the parts of a plant, *for example, leaf, stem, flower, root,* leading to an understanding of their role and function
- observe the life cycle of plants and recognise when they are living or dead, *for example, taking and viewing photographs at different times to show differences.*

### Variation and classification

Knowledge and understanding of variation and classification begins by pupils' awareness that others are different from them. Learning about the variation and classification of green plants across the key stages can help pupils to:

- recognise similarities and differences between themselves and others
- recognise that the variety of living things can be grouped in different ways.

### Living things in their environment

Knowledge and understanding of living things in their environment starts by exploring the local environment, *for example, the school and its grounds.* Developing knowledge and understanding of living things in their environment across the key stages can help pupils to:

- care for the environment
- recognise that different living things are suited to different environments, *for example, fish swim in water, birds fly, plants grow in the earth*

- explore how the environment provides for living things, *for example, food, shelter/protection.*

## Materials and their properties

### **Grouping and classifying materials**

Knowledge and understanding of grouping and classifying materials starts by exploring a range of materials with different sensory properties.

Grouping and classifying materials across the key stages can help pupils to:

- use all their available senses to explore and make responses to materials
- match and sort materials and recognise similarities and differences between them
- discover the properties of different materials, *for example, roughness, ability to float*
- explore the usefulness of materials with regard to properties, *for example, thermal insulators, electrical conductors.*

### **Changing materials**

Knowledge and understanding of changing materials starts by noticing a change, *for example, in shape, colour, temperature.* Learning about changing materials across the key stages can help pupils to:

- explore materials that change shape by physical means
- investigate reversible changes, *for example, freezing water, heating chocolate, dissolving sugar in water, drying clay*
- investigate non-reversible changes, *for example, heating butter and eggs, adding water to plaster, baking clay*
- recognise how reactions can be useful, *for example, baking powder in cooking*, and not useful, *for example, the rusting of iron.*

## Physical processes

### **Electricity**

Knowledge and understanding of electricity starts by using electrical equipment and items, *for example, through a range of switches.* Learning about electricity across the key stages can help pupils to:

- explore/use switches that operate electrical items with easily observable outcomes, *for example, on/off, bright/dim light*, and realise that their action causes the effect

- observe that electricity is used in a variety of ways in school and home, *for example, light, power, heating*
- use electrical appliances and everyday equipment safely in functional contexts, *for example, PlayStation, audio or video recorder*
- build simple series circuits using batteries, wires, bulbs, switches and other components, and test whether a circuit will work by using practical experiments.

### **Forces and motion**

Knowledge and understanding of forces and motion starts by experiencing a range of movements followed by feeling and anticipating their effects, *for example, being pushed on a swing or pulled on a ground sheet*. Learning about forces and motion across the key stages can help pupils to:

- make movement happen by applying a force, *for example, to doors, objects on wheels*
- recognise that when things speed up, slow down or change direction or shape, there is a cause, *for example, push or pull*
- explore resistance to movement, *for example, air resistance and parachutes, friction and different shoe surfaces, water resistance and swimming*
- investigate the properties of magnets
- explore the force of gravity, *for example, things fall, gravity pulls things down*.

### **Light and sound**

Knowledge and understanding of light and sound starts by exploring, recognising and responding to contrasting stimuli, *for example, light and darkness, sound and silence*. Learning about light and sound across the key stages can help pupils to:

- experience light
- respond to, locate and track (safe) sources of light
- explore shadows, reflections, coloured filters and lights
- experience sound
- recognise and locate sources of sound, including some that are far away
- make sounds using objects and materials, including their own bodies
- explore volume and pitch.

### *The Earth and beyond*

Knowledge and understanding of the Earth and beyond starts by appreciating that night and day are different and are associated with different activities. Learning about the Earth and beyond across the key stages can help pupils to:

- be aware of the Sun during the day and know that there is no Sun light at night
- observe how the position of the Sun appears to change in the sky and how shadows change as this happens
- realise that the Earth is only one of several planets in the solar system.

### Improving access to the science curriculum

Staff can make science more accessible by focusing on the senses. They can improve access by:

- using materials and resources that pupils can experience and understand through sight, sound, taste or smell
- giving pupils first-hand and direct scientific experiences through investigations, experiments, play and visits
- presenting materials and resources that pupils can understand through sight, touch, sound, taste or smell
- allowing pupils to observe and gain a scientific understanding where, because of visual or multi-sensory impairment or mobility difficulties, pupils cannot experience incidental learning of the wider world and the environment.

Staff can also improve access by:

- using ICT, visual and other materials to increase pupils' knowledge of their personal surroundings and the wider world
- using scientific contexts (domestic and environmental) that are of interest, and are relevant and meaningful, to pupils
- using specialist aids and equipment
- encouraging support from adults or other pupils, while giving pupils space and freedom to do things for themselves, allowing them sufficient time to respond
- adapting tasks or environments and using alternative activities where necessary, *for example, where pupils have allergies to plants or animals*

- being aware of the pace at which pupils work and of the physical effort required
- balancing consistency and challenge, according to individual needs.

Science can help pupils develop their broader communication and literacy skills through encouraging interaction with other pupils as well as staff.

With some pupils, communication and literacy skills develop as they use a range of visual, written and tactile materials, *for example, large print, symbols and symbol text*. These skills also develop as pupils use ICT and other technological aids. Other pupils' skills develop as they use alternative and augmentative communication, *for example, body movements, eye gaze, facial expressions and gestures, including pointing and signing*.

## Opportunities and activities at key stage 1

All aspects of the science programme of study at key stage 1 are appropriate for pupils with learning difficulties. With modification, it can provide stimulating and challenging learning opportunities.

The focus of teaching science at key stage 1 may be on giving pupils opportunities to:

- explore and investigate, through a range of sensory activities which give feedback and generate interest
- engage in practical activities and investigations that extend their awareness and understanding of themselves, *for example, body awareness and self-awareness.*

Given these opportunities in science at key stage 1:

<b>all</b> pupils with learning difficulties (including those with the most profound disabilities)	build on their own experiences and on the exploration and investigation opportunities given in the early years foundation stage. They take part in scientific enquiry by exploring people, materials and other living things and respond to sensory experiences.
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<b>most</b> pupils with learning difficulties (including those with severe difficulties in learning) who will develop further skills, knowledge and understanding in most aspects of the subject	become familiar with some scientific language. They are aware that their actions have consequences, for example, personal cause and effect, and that they can change materials. They collect evidence as part of scientific enquiry.
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<b>a few</b> pupils with learning difficulties who will develop further aspects of knowledge, skills and understanding in the subject	record and communicate their ideas and data, for example, using drawings, objects, symbols, and begin to evaluate evidence. They may answer scientific questions and use scientific language.
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Throughout key stage 1, staff can maintain and reinforce the knowledge, skills and understanding introduced during the foundation stage by applying these in different areas, and introduce new learning. The following activities show how this can be done and provide examples of approaches staff can take with units of work in science.

### Sorting and using materials

#### *Pupils explore and investigate a range of materials*

They may:

- use their senses to explore a range of materials and objects with strong tactile, visual, aural and/or olfactory qualities
- explore materials which are grouped by a given property, *for example, all sweet items to taste, all wet items to feel*, or have been selected for contrasting attributes, *for example, sweet and sour, wet and dry*
- indicate their preference for particular objects, materials or properties
- make a display about their favourite materials and objects with photographs of favourites
- sort materials according to particular properties, *for example, hard and soft*, or type of material, *for example, wood or metal*
- communicate about objects, *for example, shiny, bendy*
- use a feely bag to explore objects by touch and sound and try to identify the objects with staff asking appropriate questions, *for example, 'Is it hard?' 'Is it furry?' 'Does it rattle?'*
- take part in a material hunt in the classroom, school or school grounds to find objects made of the same materials, *for example, wood, metal, plastic, clay*. Pupils present and organise the objects (or photographs of them) on a labelled display
- explore different ways of grouping the same materials, *for example, by colour, by size, by texture*
- use secondary sources, *for example, videos*, to find out more about a particular material, *for example, paper or stone*

- explore properties for particular purposes and choose suitable materials, *for example, make a hat for a doll to wear in the rain and try out different materials before choosing which material is waterproof*. They may suggest ways of trying out the materials, justify their decision and communicate what they did and what they found.

## Plants

### ***Pupils explore and investigate a range of plants***

They may:

- explore the smell, texture and visual appearance of a variety of plants and indicate preferences, *for example, colours or scents*
- identify similarities and differences between them, *for example, they all have leaves, they are all green, they have different colour flowers and different shaped leaves*
- identify some of the different parts of plants, *for example, flower, leaf, roots*
- explore the school grounds and find different plants in different places (without picking them or pulling them up). They take photographs of the plants and later match them to the places where they were found, *for example, the water lily in the pond, the tub of flowers in the front of the school, the tree in the car park*
- visit a local garden centre.

### ***Pupils grow plants***

They may:

- plant quick-growing seeds, help to look after them, observe them as they grow and take photographs at different intervals, then sequence them, *for example, seed, seedling, young plant, flowering plant*
- make a tactile book about their plant

- investigate a plant's need for water. They suggest the things plants need for survival, choosing from a selection of objects, *for example, coat, watering can, breakfast cereal*. They devise an investigation to test this, *for example, to water some plants and not others*, and observe what happens and make conclusions, *for example, by matching the symbol for water to the healthy plant and the 'no water' symbol to the plant that died*.

### ***Pupils taste and group plants***

They may:

- explore the smell, texture and taste of plants (or parts of plants) that can be eaten by humans, *for example, tomato, sweetcorn, lettuce*, and compare them with ones that cannot be eaten by humans, *for example, grass, tree bark, flowers*, and sort and group them appropriately.

## **Light and dark**

### ***Pupils explore contrasts of light and darkness***

They may:

- experience contrasts of light and dark, noticing and anticipating changes
- experience darkness in a darkened or multi-sensory room and observe as the light is gradually increased
- search for objects and people in the dark
- cover and uncover their eyes, try on sunglasses and note the difference
- look at themselves and others in mirrors in settings which are light or gloomy.

### ***Pupils explore and investigate light sources***

They may:

- focus on and track light sources in a darkened room

- use switches to operate a range of lighting effects in a multi-sensory environment or on a computer, indicating preferences for particular effects
- look for different sources of light in the classroom/school, *for example, central light, computer light, warning light on switches*
- explore a range of types of light, *for example, table lamps, fairy lights, torches, bicycle lights, light wands, candle light*, observing the lighting effect and then repeat the activity in a dark room and in a light room.

***Pupils explore and investigate light with other materials***

They may:

- explore a 'black box' (box with a small peephole in one end and a larger hole covered with cardboard in the top). They look for an object inside when the hole is covered (and there is no light) and when there is light. They shine torches of different brightness into the box and decide which torch made the object easiest to see. They answer questions, *for example, 'Can you see the object now?' 'What can we do so that you can see it?'*
- shine light sources on different materials and objects to observe the effects and decide which are shiny, and sort materials according to this property
- explore materials to find out if light shines through them
- listen to stories or poems about light and dark and night and day
- go outside on a day when there is some sunshine and some clouds and, without looking at the Sun, decide when the Sun is out and when it goes behind a cloud.

## Sound

### ***Pupils listen to sounds***

They may:

- experience contrasts of silence and sound
- locate sources of sound by turning, looking, touching
- listen to (and make) sounds on a resonance board
- keep very quiet and listen for sounds in the classroom, *for example, voices in the next room, cars outside, an aeroplane, a telephone*. They repeat this in different parts of the school and school grounds and go on a 'listening' walk
- listen to a recording of familiar voices, *for example, children in the class, known staff, family members*
- listen to recordings of familiar sounds and identify what they are by pointing to a picture, photograph or symbol; play sound lotto
- explore feely bags containing auditory objects
- listen to different types of music and express likes and dislikes
- listen to sounds made behind a screen and decide what made the sound by choosing between objects/instruments
- listen to sounds at different distances away and muffled, *for example, a ticking clock under a cushion*.

### ***Pupils make sounds***

They may:

- make sounds using their own bodies, *for example, vocalising, singing, clapping, stamping, tapping their cheeks, and working together with another person, for example, moving one hand to clap against the other person's hand or offering their arm to be tapped*
- use switches to make sounds on a computer, or operate music on an audio recorder
- make different sounds, using equipment such as a sound beam

- explore the sounds made by a range of musical instruments and other objects using different methods, *for example, banging, plucking, shaking, blowing*, and indicate preferences and dislikes
- feel vibrations when instruments are played
- explore loudness
- use additional equipment to change sounds, *for example, microphones, echo units*
- make musical instruments, *for example, a simple drum, or elastic bands stretched over a box*, and play them
- make sound effects to accompany a poem, story or song and devise a story with sound effects.

## Opportunities and activities at key stage 2

Much of the science programme of study at key stage 2 is relevant to pupils with learning difficulties. With modification, it can provide stimulating and challenging learning opportunities.

The focus of teaching science at key stage 2 may be on giving pupils opportunities to:

- recognise that they are growing and changing, and to learn about how the body changes in preparation for puberty
- control aspects of their immediate surroundings, *for example, using forces and electrical circuits or changing materials for a purpose.*

Given these opportunities in science at key stage 2:

<b>all</b> pupils with learning difficulties (including those with the most profound disabilities)	continue to develop their experience and understanding of the world by using their senses, observing and exploring. With appropriate support, they take part in investigations about living things, materials and phenomena. They gain greater awareness of life processes and of themselves as growing and changing individuals.
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<b>most</b> pupils with learning difficulties (including those with severe difficulties in learning) who will develop further skills, knowledge and understanding in most aspects of the subject	learn about a wider range of living things, materials and phenomena. They carry out investigations with others and collect evidence, become familiar with some reference sources, record their results, for example, using objects, symbols or computer software, and communicate what they have done and what happened. They use some scientific language and answer scientific questions.
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a few pupils with learning difficulties who will develop further aspects of knowledge, skills and understanding in the subject attempt to answer questions through testing and investigating. They ask scientific questions, use some reference sources, drawings, charts and diagrams to communicate their findings and ideas. They recognise relevant evidence and evaluate it, draw conclusions from their data, consider if tests are fair or unfair, and link their scientific knowledge to their everyday experiences.

Some parts of the key stage 2 programme of study, such as those which need more abstract understanding, may be too demanding for some pupils. Such parts may become less demanding as pupils get older, but it may not be appropriate to teach these parts to some pupils during this key stage. It may be more appropriate to teach the more demanding parts of the programme of study for key stage 1. Throughout key stage 2, staff can maintain and reinforce the knowledge, skills and understanding introduced during key stage 1 by applying these in different areas, and introduce new learning. The following activities show how this can be done and provide examples of approaches staff can take with units of work in science.

### Forces

#### *Pupils explore and investigate movement, pushing and pulling*

They may:

- experience a variety of different movements, *for example, being pulled on a ground sheet, pushed on a swing, rocked and rolled in safe and comfortable contexts, pushed and pulled in a wheelchair, or on a go-kart*
- observe the movement of different objects, *for example, swings and roundabouts in a park*
- explore the different ways they can move their bodies and use them to push and pull possibly cooperating with a partner
- identify objects in the classroom that need a pull or a push to make them move, *for example, door, drawer, piano keys, model cars, trolley*, and in the school grounds, *for example, gates, wheelbarrow*

- cause movement with a push or pull action in different contexts, *for example, pushing floats in the pool, pushing pedals on a bike, pushing a ball in PE, pushing a ball over a precipice, pulling a sensory rope, pulling a string which rings a bell*
- consider how to move larger equipment, *for example, chairs, boxes.*

### ***Pupils explore speed and direction***

They may:

- move their bodies by being supported or pushed at different speeds and in different directions
- make objects move faster or slower, stop or change direction, *for example, model cars, soft balls in PE.*

### ***Pupils carry out an investigation***

They may:

- plan and carry out, with support, an investigation about the movement of toy cars, *for example, take it in turns to push a car and measure in lengths of tape or non-standard units (for example, straw lengths) to see how far it has rolled*
- record the investigation and tell others about it
- think about fairness, *for example, 'Chris pushed the car harder!'*

### ***Pupils explore movement outside***

They may:

- observe the wind moving objects, *for example, trees, washing, balloons, bubbles, sailing boats, or make model windmills and investigate what to do to make them move*
- observe water moving objects, *for example, twigs, water wheels; play 'Poohsticks'*
- use secondary sources about wind and water, *for example, a video about a windy day.*

## Changing materials

### ***Pupils explore and investigate changes in naturally occurring materials***

They may:

- explore a collection of materials, *for example, wood, leather, plastic*
- sort materials according to defined criteria or their own criteria
- explore some naturally-occurring materials and products made from them, *for example, wood and a wooden spoon, chair, table; sheep's wool and woollen jersey; clay and pots*
- use secondary sources, *for example, CD-ROMs, books or videos*, to observe how some naturally-occurring materials are made into objects
- make a collage from a chosen range of materials and explain their reasons for selecting the materials
- explore and sort carefully a selection of materials, some of which are found naturally and some of which are manufactured, *for example, twigs, sand, rock, plastic and cardboard.*

### ***Pupils physically change objects and materials***

They may:

- explore a variety of materials which can be changed physically, *for example, plasticine, play dough, clay*, and make shapes by twisting, stretching, bending and squashing
- explore other objects which easily revert to their original shape, *for example, foam sponges, soft rubber balls*, and some which cannot easily be changed, *for example, stones*, indicate their preferences, and tell others about their experiences.

### ***Pupils mix materials to produce new materials.***

They may:

- mix materials, *for example, flour and water, powder paint and water, powder paint and washing-up liquid*

- change materials by adding water, then explore and compare by touch, *for example, wet and dry sand, pasta (cooked and uncooked), cornflour*
- add water to a material and watch the result, *for example, to icing sugar, peat, jelly, flour.*

***Pupils explore change in materials caused by heating***

They may:

- use appropriate senses to explore materials which change when heated, *for example, toasting bread, boiling eggs*, and observe the differences before and after heating, *for example, by taking 'before' and 'after' photographs*. They discuss whether, *for example*, the toast or boiled egg can be changed back into its original form.

***Pupils explore and investigate melting and freezing***

They may:

- explore ice shapes, *for example, different shapes and sizes*, touch and feel the ice, and observe what happens when it is left out in the classroom
- suggest ways in which ice can melt more quickly, predict the outcomes, and try out their ideas, *for example, observe five pieces of ice the same size located in different places in the classroom*
- complete a table of their results, *for example, using pictures and symbols*, discuss what happened and, with help, draw conclusions, *for example, the ice cube on the windowsill melted first because it was in the Sun light*
- suggest how to turn water back into ice and try this out
- try freezing other materials and find out what happens.

### Magnets

*Pupils explore and investigate the properties of magnets*

They may:

- handle and explore a variety of magnets, putting them together and pulling them apart
- explore the classroom with magnets and search for magnetic reactions, *for example, door handles, pipes, keys, taps*
- use magnets in a range of contexts, *for example, magnetic letters and numbers, fridge magnets, a magnetic fishing game*
- explore a collection of materials with their magnets and find items that are magnetic and those which are not, then make a record of their work using pictures of the objects, and communicate their findings
- predict whether an object is magnetic or not, test it, record their predictions and the results, and compare the findings
- plan and carry out an investigation to see how strong several magnets are, *for example, how many paper clips they can hold*, record their results and communicate their findings.

### Growing up

*Pupils explore changes in humans from babyhood to old age*

They may:

- be visited by a parent with a baby and a parent with a toddler, and observe differences, *for example, in the baby's and toddler's feeding, movements and communication*
- sort and sequence pictures of babies, children, teenagers, adults and older people
- look at photographs of themselves and staff when they were babies and young children and identify differences; discuss what the children liked doing then and what they like doing now

- explore and sort clothing and objects for babies and children of various ages.

***Pupils explore the growth and development of humans and develop body awareness***

They may:

- focus on different parts of the body, *for example, hair, eyes, mouth, hands, feet*, and join in related sensory activities, *for example, massage, foot spa, action songs*
- use mirrors to compare themselves with each other
- explore similarities and differences between people, *for example, compare height, age, gender, hair and eye colour*
- discuss bodily changes at puberty for boys and girls by looking at line drawings and videos.

***Pupils explore the growth and development of other animals***

They may:

- match pictures and models of young animals to the parent animal; sequence photographs of the life-cycle of animals, *for example, frogs, birds*
- use secondary sources, *for example, videos, CD-ROMs*, to observe the life cycle of animals.

## Electricity

### *Pupils explore a range of switches*

They may:

- operate a variety of electrical items, *for example, audio recorder, fan, light source, moving and vibrating objects, computer programs*
- use a range of switches to operate items in a multi-sensory environment, *for example, bubble tube, fibre optics*
- explore the classroom and identify appliances which use electricity, and make a record, using photographs, pictures or symbols, of items which use electricity, *for example, audio recorder, television, and those which do not, for example, stapler*
- explore devices which use batteries and match the batteries to the device
- look at pictures of electrical appliances, *for example, television, lamp, audio recorder, computer, kettle*, and sort them into different categories, *for example, how they help us*
- learn basic safety rules for electricity and handling batteries
- explore a collection of batteries, insulated wires and matched bulbs or buzzers and connect them, with support if necessary, to make the bulb light or buzzer sound. They may put together pre-drawn elements of the circuit or draw a picture to illustrate the working circuit. In addition, they may explore circuits that do not work and try to make them work and communicate what they did
- design and make a simple device requiring a circuit, *for example, a house with a light in it.*



## Opportunities and activities at key stage 3

Much of the science programme of study at key stage 3 is relevant to pupils with learning difficulties. With modification, it can provide stimulating and challenging learning opportunities.

The focus of teaching science at key stage 3 may be on giving pupils opportunities to:

- extend their explorations and investigations from the familiar to a wider world
- recognise how science applies to their everyday lives, *for example, appreciating what makes a healthy lifestyle.*

Given these opportunities in science at key stage 3:

<b>all</b> pupils with learning difficulties (including those with the most profound disabilities)	extend their scientific experience and understanding through explorations, experiments and investigations appropriate for their age. They work with others to collect evidence.
<b>most</b> pupils with learning difficulties (including those with severe difficulties in learning) who will develop further skills, knowledge and understanding in most aspects of the subject	know they need to ask questions about how things work and can make suggestions about how to find answers and to solve problems. They use a range of observations and measurements and different modes of data collection. Pupils link their knowledge to their everyday lives, including their personal health and lifestyles. They use some reference sources; communicate what they have done; describe what has happened; draw conclusions from their data; and recognise when a test is largely fair or unfair.
<b>a few</b> pupils with learning difficulties who will develop further aspects of knowledge, skills and understanding in the subject	make comparisons and recognise significant differences when interpreting the results of tests and investigations. They communicate their ideas and findings. They understand some ways in which scientists work; evaluate their work; select; and use reference sources and begin to apply their knowledge and understanding of scientific ideas to familiar phenomena and everyday things.

Some parts of the key stage 3 programme of study, for example, those involving abstract understanding, precise measurement or detailed depth of study, may be too demanding for some pupils. Such parts may become less demanding as pupils get older, but it may not be appropriate to teach these parts to some pupils during this key stage. It may be more appropriate to teach the more demanding parts of the programme of study for the earlier key stages. Throughout key stage 3, staff can maintain and reinforce the knowledge, skills and understanding introduced during the earlier key stages by applying these in different areas, and introduce new learning. The following activities show how this can be done and provide examples of approaches staff can take with units of work in science.

### Habitats

*Pupils explore different habitats and organisms connected to those habitats*

They may:

- group pictures and photographs into plants, *for example, trees and flowers*, and animals, *for example, insects, mammals, including humans*
- explore habitats in the school grounds and the immediate locality, *for example, hedge, tree, flower bed, under stones*, and look for, and observe, plants and animals
- investigate a different habitat and record what the habitat is like, *for example, wet/dry, shady/sunny*, and what they find there, and collect evidence, *for example, take photographs and carefully collect animals and leaf mould as evidence*. They present their findings to other pupils and compare the findings from different habitats and discuss why different animals are found there
- group similar organisms together, *for example, pupils are each given a picture and have to find their similar partner – bee/wasp, daisy/dandelion*. They identify similarities and differences between organisms, *for example, the number of legs, wings, colours*, and use hand lenses to look carefully at the detail

- devise simple keys to distinguish between organisms, *for example, devise questions which distinguish between their collection of pictures – ‘Does it have leaves?’ ‘Does it have six legs?’ ‘Does it live in water?’* and play quiz games based on these observations
- use reference materials to identify organisms and to find information about a particular plant or animal
- plan and carry out an investigation and pose questions, *for example, ‘Do earthworms live above or below ground?’ ‘What do snails prefer to eat?’* They decide how to collect evidence, what equipment to use, carry out the investigation and make observations, then record and communicate their findings
- explore contrasting habitats, *for example, the Arctic, desert, underwater,* through stimulus material, *for example, videos, DVDs, interactive field trips*
- observe and identify different physical features of the habitats and the type of animals and plants that live there and why, and match different organisms to habitats and explain why they match.

## Physical changes

### *Pupils explore and investigate solids and liquids*

They may:

- explore a collection of solids, *for example, wood, iron*, and liquids, *for example, shampoo, cooking oil, water, syrup*, and sort them into 'solids' and 'liquids' and observe the similarities and differences between the two groups. Such work may be supported by a range of questions, *for example, 'Can you spill them?' 'What happens if you tilt the bottle?' 'Which ones are runny?'*
- explore ice and water and suggest how to freeze water to make ice, that is, change a liquid to a solid
- explore other solids, and think about, and suggest ways of, changing them into liquids by making them runny, *for example, candle wax, butter, chocolate*, and experiment by putting them in a warm place and observing what happens. Ways of stopping them from melting are suggested, *for example, putting chocolate in the fridge, or using melted butter to make biscuits*
- use secondary sources, *for example, videos, CD-ROMs*, to observe other materials which need to be heated before they melt, *for example, metals*.

### *Pupils explore and investigate dissolving and filtering*

They may:

- mix materials with water, *for example, salt, instant coffee, powder paint, sand, marbles*, observe what happens, and record their results
- try out ways of getting back the marbles or sand from the mixture with water, using a variety of apparatus, *for example, sieves, paper towels, fabrics*
- think and communicate about what has happened to the salt and sugar in a mixture with water. They taste the mixture, make a prediction, and try it out to see if the salt/sugar can be separated by filtering and sieving

- review their work by matching cards naming and illustrating processes, *for example, filtering, dissolving, melting, sieving*, with cards showing everyday processes, *for example, using a tea bag, adding salt to cooking, warming fat in a pan, putting ice cubes in a drink, getting lumps out of flour*.

### ***Pupils think and learn about air and gases***

They may:

- consider what is in a balloon and what 'fills' a parachute
- explore balloons filled with helium and compare with balloons filled with air.

### ***Pupils explore and investigate evaporation***

They may:

- observe changes in puddles in the playground, *for example, by chalking round the edge*, or changes in water left in an open dish, with the level marked, or consider clothes and hair being washed and dried and observe what happens to the water
- leave small quantities of sugar and salt mixtures with water in a warm place and observe what happens.

## **Keeping healthy**

### ***Pupils learn about food and diet***

They may:

- explore different kinds of food, by tasting and sorting, and express their preferences
- group different foods, *for example, those you can eat a lot of, those you should eat a little of*, and plan menus to include a variety of foods.

### ***Pupils learn about medicines and drugs***

They may:

- sort empty containers, *for example, beer, wine, alcopop, milk, lemonade, cigarettes, aspirin, asthma inhaler, cough medicine*, into two groups – one which contains a medicine/drug and one which does not

- decide which are medicines, and discuss the benefits of taking medicines. Staff can help by using questions such as 'Which medicines do you use?' 'Who can use medicines?' 'When do you take them?' 'Do you need permission?' 'How do you know how much to take?'
- discuss the effects on their body of drinking alcohol and smoking tobacco and use secondary sources, for example, videos, DVDs, to find out more.

***Pupils learn about the importance of exercise to maintain their muscles***

They may:

- exercise for a short period of time, for example, running, physiotherapy exercises, and observe changes in the way they feel, for example, breathing faster, feeling hotter, feeling tired. After a rest, they compare the way they feel
- take their pulse rate before and after exercise and compare
- brainstorm the different forms of exercise available to them, discuss which parts of the body and which muscles move for different forms of exercise, and use a model skeleton to visualise this. They use secondary sources to observe how muscles work
- complete an exercise diary over a week.

## Resistance

### *Pupils learn about friction as a force that slows things down*

They may:

- investigate pulling an object on different surfaces, *for example, vinyl, carpet, gravel*, and consider which is easiest and why
- investigate pulling a person wearing different types of shoes, *for example, trainers, wellington boots, ballet shoes*, on a smooth surface and consider which is easiest and why
- consider how friction can be useful, *for example, helping to grip*, and how it can be a problem, *for example, machinery needs oil*, and where low friction is useful, *for example, skating, playground slides*.

### *Pupils explore and investigate air resistance*

They may:

- try moving across the playground holding an opened umbrella or a large piece of card and communicate the result
- make model parachutes of different sizes and compare them
- fly kites.

### *Pupils explore and investigate water resistance*

They may:

- try walking through water, communicate what it feels like, and compare pushing objects through water with those pushed through air
- explore the shapes of boats, *for example, through secondary sources*, to find out which shapes reduce water resistance
- plan and carry out an investigation on the effects of shapes on water resistance by dropping differently shaped pieces of plasticine into a tall cylinder of water. They discuss how to make the test fair, *for example, by using the same amount of plasticine, the same height of water*, and predict what might happen. They find out which pieces of plasticine drop to the bottom more quickly, record their results, draw basic conclusions from their investigations, evaluate the investigation and discuss if they could improve it.



## Opportunities and activities at key stage 4

Much of the science programme of study at key stage 4 is relevant to pupils with learning difficulties. With modification, it can provide stimulating and challenging learning opportunities. The focus of teaching science at key stage 4 may be on giving pupils opportunities to:

- apply their previous knowledge, skills and experience in new situations
- consider explanations and the causation of things around them, their bodies and events.

Given these opportunities in science at key stage 4:

<b>all</b> pupils with learning difficulties (including those with the most profound disabilities)	use experience, knowledge, skills and understanding attained at earlier key stages to help them engage in new activities and investigations. Staff may need to support them in the use of a wide range of equipment and materials.
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<b>most</b> pupils with learning difficulties (including those with severe difficulties in learning) who will develop further skills, knowledge and understanding in most aspects of the subject	make links between scientific experience and their everyday lives. They use different ways of presenting their data, for example, charts, diagrams and drawings. They recognise some relevant evidence, make simple evaluations of their work, and ask some scientific questions.
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<b>a few</b> pupils with learning difficulties who will develop further aspects of knowledge, skills and understanding in the subject	understand some positive and negative effects of scientific and technological developments. They select and use appropriate reference sources. They carry out more systematic investigations, make more systematic observations and measurements, and apply their scientific knowledge to new situations.
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Some parts of the key stage 4 programme of study, for example, those involving abstract understanding, quantification, scientific decision making or detailed depth of study, may be too demanding for some pupils. Such parts may become less demanding as pupils get older, but it may not be appropriate to teach these parts to some pupils during this key stage. It may be more appropriate to teach the more demanding aspects of the programme of study for the earlier key stages. Throughout key stage 4, staff can maintain and reinforce the knowledge, skills and understanding introduced during the earlier key stages by applying these in different areas and introduce new learning. The following activities show how this can be done and provide examples of approaches staff can take with units of work in science.

### What happens inside me?

#### ***Pupils learn about circulation and breathing***

They may:

- feel changes in the chest as they breathe
- consider variations in breathing, *for example, blowing out candles, blowing up a balloon, playing a musical instrument, swimming*
- think about where they breathe in and out, *for example, nose and mouth*, and what happens when they have a cold
- use secondary sources, *for example, video clips, software simulations*, to observe how air is drawn into, and expelled from, the lungs. They may look at lungs in a model torso
- feel their heart beat and pulse rate, and use secondary sources to observe how the heart pumps blood around the body.

#### ***Pupils study food and digestion***

They may:

- go back over the importance of a balanced diet and discuss how to eat healthily
- discuss why the body needs food, *for example, growth, repair, movement*
- consider what happens to food inside the body, *for example, feeding, absorption and elimination*

- use secondary sources, *for example, videos, DVDs*, to observe basic digestive processes.

***Pupils revise and extend knowledge and understanding about the effect of drugs on the body***

They may:

- discuss and complete a chart about the good and bad effects of alcohol and tobacco
- learn the basic effects of some illegal drugs.

***Pupils revise and extend their knowledge and understanding about human reproduction***

They may:

- look at line drawings and video simulations to name parts of the reproductive system and identify the need for an egg from the female and sperm from the male for fertilisation
- observe, *for example, through video clips, ultrasound scans, photographs and diagrams*, the development of the foetus in the womb. They may invite a pregnant woman to visit the class and ask her questions and listen to the baby's heartbeat
- observe and discuss the process of birth using videos, photographs and diagrams
- observe video clips of newborn babies and explore the care needs of babies, *for example, love, warmth, milk, sleep*.

### Reactions and mixtures

#### *Pupils explore acids and alkalis*

They may:

- look at empty containers for household acids, *for example, vinegar, lemon juice, cleaning materials*, and alkalis, *for example, bicarbonate of soda, detergent*, and discuss hazard labels
- explore the effect of adding household acid and alkalis to dye solutions from plant material, *for example, red cabbage, raw beetroot, blackcurrant*, and compare the results
- establish that there are two classes of solution (called acids and alkalis) and that the dyes can indicate which is which (safety precautions are necessary)
- use a range of reference sources and advertisements to find out, with help, about the use of acids and alkalis in everyday situations, *for example, hair and skin care, treatment of stings and bites, treatment of indigestion*.

#### *Pupils explore basic chemical reactions*

They may:

- explore everyday materials which react chemically when mixed, *for example, lemon juice and bicarbonate of soda, baking powder and water, plaster of Paris and water*, by mixing them, observing what happens and communicating the changes which occur
- discuss useful chemical reactions, *for example, baking powder when baking*, and reactions which are not useful, *for example, metal corrosion and the weathering of rocks*.

## Earth, Sun and Moon

### ***Pupils learn about the Earth, Sun and Moon***

They may:

- observe how the Sun appears to move over a day and record the pattern of their own day, *for example, waking/sleeping, school time, leisure time*
- consider the importance of the Sun in providing light and heat
- use secondary sources and models, *for example, videos, CD-ROMs, a globe, photographs from space*, and observe the shapes of the Earth, Moon and Sun
- investigate where the Sun shines in the school grounds at different times of the day, *for example, observing the length and position of shadows*
- use secondary sources, *for example, videos, DVDs*, to observe the Earth spinning. They may observe a model to illustrate night and day, *for example, using a globe or person as the Earth and a strong light source to represent the Sun*
- observe a model of the solar system and act out the positions of the planets
- visit a planetarium
- let objects fall and observe that they drop to the ground. They may use secondary sources to observe how people move on the Moon, where the gravitational force is lower.

## Energy and keeping warm

### ***Pupils learn about energy resources***

They may:

- identify what they use for heating in their home and at school, *for example, electricity, gas, coal, oil*
- use secondary sources to consider where the fuels come from and how non-renewable fuel supplies might run out

- use secondary sources to consider renewable energy resources, *for example, wind, waves, running water, sunlight*, and discuss ways of saving energy, *for example, turning lights off, shutting doors*.

***Pupils learn about temperature and investigate insulation***

They may:

- feel water at different temperatures and compare and use thermometers to measure the temperature more accurately
- take the temperature of a cup of coffee/tea or bowl of water at regular intervals as it cools down. They display their results on a graph, using ICT
- predict what will happen when they repeat these measurements with a cold drink containing ice cubes. They record their results and communicate them
- carry out an investigation about keeping things cold, *for example, wrapping ice cubes in different materials such as cling film, newspaper, cotton wool, tin foil, bubble wrap*, and observe them at intervals. They predict what will happen, take photographs, and make drawings to record their evidence and communicate what happened. They draw basic conclusions about insulators and relate this to everyday life, *for example, taking frozen food home from the shops*
- repeat this investigation for keeping things warm by using warm water in several containers, wrapping them in different materials, and discuss how to make a fair test, *for example, identical containers, water same temperature at the start*. They take the temperature at regular intervals and record their results using ICT to display them on a graph. They communicate what happens, identify which materials make good insulators, evaluate their investigation, and discuss how to improve it another time
- relate their investigation to everyday life for keeping things warm, *for example, thermos flasks, loft insulation, double glazing, wearing thick coats in winter*.

## Performance descriptions

These performance descriptions outline early learning and attainment before level 1 in eight levels, from P1 to P8.

The performance descriptions can be used by teachers in the same way as the national curriculum level descriptions to:

- decide which description best fits a pupil's performance over a period of time and in different contexts
- develop or support more focused day-to-day approaches to ongoing teacher assessment by using the descriptions to refine and develop long-, medium- and short-term planning
- track linear progress towards attainment at national curriculum level 1
- identify lateral progress by looking for related skills at similar levels across subjects
- record pupils' overall development and achievement, for example, at the end of a year or a key stage.

The performance descriptions for P1 to P3 are common across all subjects. They outline the types and range of general performance that some pupils with learning difficulties might characteristically demonstrate. Subject-focused examples are included to illustrate some of the ways in which staff might identify attainment in different subject contexts.

Levels P4 to P8 describe pupils' performance in a way that indicates the emergence of skills, knowledge and understanding in each subject. The descriptions are characteristic of the types of attainment the learners are likely to demonstrate.

**P1 (i)** Pupils encounter activities and experiences. They may be passive or resistant. They may show simple reflex responses, *for example, startling at sudden noises or movements*. Any participation is fully prompted.

**P1 (ii)** Pupils show emerging awareness of activities and experiences. They may have periods when they appear alert and ready to focus their attention on certain people, events, objects or parts of objects, *for example, looking towards flashes of light or turning towards loud sounds*. They may give intermittent reactions, for example, sometimes withdrawing their hands from changes in temperature.

**P2 (i)** Pupils begin to respond consistently to familiar people, events and objects. They react to new activities and experiences, *for example, discarding objects with unfamiliar textures*. They begin to show interest in

people, events and objects, *for example, leaning forward to follow the scent of a crushed herb*. They accept and engage in coactive exploration, *for example, feeling materials in hand-over-hand partnerships with a member of staff*.

**P2 (ii)** Pupils begin to be proactive in their interactions. They communicate consistent preferences and affective responses, *for example, showing a consistent dislike for certain flavours or textures*. They recognise familiar people, events and objects, *for example, moving towards particular features of familiar environments*. They perform actions, often by trial and improvement, and they remember learned responses over short periods of time, *for example, rejecting food items after recent experience of bitter flavours*. They cooperate with shared exploration and supported participation, *for example, examining materials handed to them*.

**P3 (i)** Pupils begin to communicate intentionally. They seek attention through eye contact, gesture or action. They request events or activities, *for example, reaching out towards a sound making object*. They participate in shared activities with less support. They sustain concentration for short periods. They explore materials in increasingly complex ways, *for example, pressing hard objects into soft textures*. They observe the results of their own actions with interest, *for example, scrunching up paper and examining the product*. They remember learned responses over more extended periods, *for example, reaching out to touch a live animal with caution and sensitivity*.

**P3 (ii)** Pupils use emerging conventional communication. They greet known people and may initiate interactions and activities, *for example, switching on a favourite piece of equipment in the light and sound room*. They can remember learned responses over increasing periods of time and may anticipate known events, *for example, balls falling and bouncing on the floor*. They may respond to options and choices with actions or gestures, *for example, touching one substance rather than another*. They actively explore objects and events for more extended periods, *for example, feeling the textures of different parts of a plant*. They apply potential solutions systematically to problems, *for example, tipping a container in order to pour out its contents*.

**P4** Pupils explore objects and materials provided, changing some materials by physical means and observing the outcomes, *for example, when mixing flour and water*. Pupils communicate their awareness of changes in light, sound or movement. They imitate actions involving main body parts, *for example, clapping or stamping*. They make sounds using



their own bodies, *for example, tapping, singing or vocalising*, and imitate or copy sounds. They cause movement by a pushing or pulling action. 'Explore' includes access through any sensory mode. Teachers should ensure they are assessing intended, not accidental, actions.

**P5** Pupils take part in activities focused on the anticipation of and enquiry into specific environments, *for example, finding a hamster under straw, or a CD or video in a pile*. They match objects and materials in terms of single features or properties, *for example, temperature or colour*. They indicate the before and after of material changes. They try out a range of equipment in familiar and relevant situations, *for example, initiating the activation of a range of light sources*. They respond to simple scientific questions, *for example, 'Show me the flower', 'Is this wet/dry?' 'Showing', 'demonstrating', 'trying out', 'responding', etc*, may be done by any means appropriate to the pupil's preferred mode of communication and physical abilities. For some pupils this may mean directing an adult undertaking the task.

**P6** Pupils recognise distinctive features of objects, *for example, the features of living things in their environment, and know where they belong, for example, feathers on a bird, leaves on a tree*. They begin to make generalisations, connections and predictions from regular experience, *for example, expecting that ice cream will melt, or making wheeled objects move faster by pushing on a smooth surface or releasing them down a slope*. Pupils sort materials according to a single criterion when the contrast is obvious. They closely observe the changes that occur, *for example, when materials are heated, cooled or mixed*. Pupils identify some appliances that use electricity. They show they know some sources of sound and light, *for example, remembering their location*.

**P7** Pupils understand the scientific use of some simple vocabulary, such as before, after, bumpy, grow, eat, move and can communicate related ideas and observations using simple phrases, *for example, which food to give which animal*. Pupils can demonstrate simple properties of light, sound and movement, *for example, bright, noisy/quiet, fast/slow*. They make simple records of their findings, *for example, by putting pictures of an activity in sequence*. They begin to make suggestions for planning and evaluating their work, *for example, responding to the question 'Was that right or wrong?' 'Showing', 'demonstrating', 'trying out', 'responding', etc*, may be done by any means appropriate to the pupil's preferred mode of communication and physical abilities. For some pupils this may mean directing an adult undertaking the task.

**P8** Pupils show they have observed patterns or regular changes in features of objects, living things and events, *for example, chrysalis/butterfly day/night*. They make some contribution to planning and evaluation and to recording their findings. They identify a range of common materials and know about some of their properties. They sort materials using simple criteria and communicate their observations of materials in terms of these properties. Pupils make their own observations of changes of light, sound or movement that result from actions, *for example, using a volume control or a dimmer switch* and can describe the changes when questioned directly.

## About this publication

### Who's it for?

This handbook is for all those who work with pupils with learning difficulties. This includes pupils who are often described as having severe, profound and multiple, or moderate learning difficulties. The guidance relates to all pupils aged 5 to 16 who are unlikely to achieve above level 2 at key stage 4.

### What's it about?

It provides support materials to schools for planning learning opportunities and activities in science for pupils in each key stage. It includes performance descriptions of early learning and attainment in the national curriculum.

### What's it for?

It will be useful in developing an inclusive curriculum. It can be used in mainstream schools, special primary and secondary schools, specialised units and independent schools. It can also support the range of services that work with pupils with learning difficulties.

### Related material

This handbook is part of a set of guidance on planning and teaching the curriculum for pupils with learning difficulties. The entire set, which includes general guidance, guidance on developing skills and subject guidance, can be found on the QCA website at [www.qca.org.uk/ld](http://www.qca.org.uk/ld).

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[www.qca.org.uk/orderline](http://www.qca.org.uk/orderline)

Tel: 08700 60 60 15; Fax: 08700 60 60 17

Email: [orderline@qca.org.uk](mailto:orderline@qca.org.uk)

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