

UNDERSTANDING
PRIMARY SCIENCE

Science Knowledge for Teaching

Third Edition

Activities CD

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Introductory material by

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Progression in learning SCIENTIFIC ENQUIRY (Sc1) provided in detail for Levels 1 to 3

	National Curriculum levels		
	Level 1	Level 2	Level 3
Questioning		Respond to suggestions of how to find things out and, with help, make their own suggestions about how to collect data to answer questions.	Respond to suggestions and put forward their own ideas about how to find an answer to a question.
Observing	Describe or respond appropriately to simple features of objects, living things and events they observe.	Make observations related to their task. Observe and compare objects, living things and events they observe.	Make relevant observations.
Measuring	Measure using equipment provided.	Use a range of simple measuring equipment.	Select suitable measuring equipment. Measure length or mass.
Fair testing			With help, carry out a fair test, recognizing and explaining why it is fair.
Predicting		Say whether what happened was what they expected.	
Concluding			Provide explanations for observations and for simple patterns in recorded measurements.
Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.
Using equipment		Use simple equipment provided.	Use a range of simple equipment.
Evaluating			Suggest improvements for their work.
Finding and using information		Use simple texts, with help, to find information.	Recognize why it is important to collect data to answer questions. Use simple texts to find information.

Progression in learning SCIENTIFIC ENQUIRY (Sc1) provided in detail for Levels 4 to 6

	National Curriculum levels		
	Level 4	Level 5	Level 6
Questioning	Recognize that scientific ideas are based on evidence.	When trying to answer a scientific question, they identify an appropriate approach.	
Observing	Make a series of observations and measurements.	Make a series of observations appropriate to the task. Begin to repeat observations and offer simple explanations for any differences observed.	Make relevant observations. Select suitable measuring equipment to use.
Measuring	Select suitable equipment to measure. Make a series of measurements adequate for the task.	Make a series of observations, comparisons or measurements to offer simple explanations of differences they encounter.	Measure a variety of quantities with precision using instruments with fine scale divisions.
Fair testing	In own investigative work, decide an appropriate approach, using a fair test to answer a question, where appropriate, showing varying one factor at a time, while keeping the others the same.	When investigations involve a fair test, they identify key factors to be considered.	In their own investigative work, they use scientific knowledge and understanding to identify an appropriate approach.
Predicting	Where appropriate, they make a prediction. Use graphs to interpret patterns in data. Begin to relate conclusions to these patterns and scientific knowledge and understanding.	Where appropriate, make predictions based on their scientific knowledge and understanding. Draw conclusions that are consistent with the evidence and begin to relate these to scientific knowledge and understanding.	Identify measurements and observations that do not fit the main pattern shown. Draw conclusions consistent with the evidence and use scientific knowledge and understanding to explain them. Select and use

Progression in learning SCIENTIFIC ENQUIRY (Sc1) provided in detail for Levels 4 to 6 (Continued)

	National Curriculum levels		
	Level 4	Level 5	Level 6
Predicting (Cont.)			appropriate methods of communicating qualitative and quantitative data using scientific language and conventions.
Concluding	Use graphs to point out and interpret patterns in their data. Begin to relate conclusions to these patterns and to scientific knowledge and understanding.	Draw conclusions that are consistent with the evidence and begin to relate these to scientific knowledge and understanding.	Identify measurements and observations that do not fit the main pattern shown. Draw conclusions that are consistent with the evidence and use scientific knowledge and understanding to explain them. Select and use appropriate methods for communicating qualitative and quantitative data using scientific language and conventions.
Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.
Using equipment	Select suitable equipment to use.	Select apparatus for a range of tasks and plan to use it effectively. Use precision appropriate to the task. Repeat observations and measurements, explaining differences encountered.	Measure a variety of quantities with precision using instruments with fine scale divisions.
Evaluating	Suggest improvements in their work,	Make practical suggestions about	Make reasonable suggestions about

Progression in learning SCIENTIFIC ENQUIRY (Sc1) provided in detail for Levels 4 to 6 (Continued)

	National Curriculum levels		
	Level 4	Level 5	Level 6
Evaluating (<i>Cont.</i>)	giving reasons.	how their working methods could be improved.	how their working methods could be improved.
Finding and using information	Select information from sources provided for them.	Describe how experimental evidence and creative thinking have been combined to provide a scientific explanation, e.g. Jenner's work on vaccination at KS2. Select from a range of sources of information.	Describe evidence for some accepted scientific ideas and explain how the interpretations of evidence by scientists lead to the development and acceptance of new ideas. Select and use sources of information effectively.

Progression in learning SCIENTIFIC ENQUIRY (Sc1) through LIFE PROCESSES AND LIVING THINGS (Sc2) levels 1 to 3

		National Curriculum levels		
		Level 1	Level 2	Level 3
Sc1	Questioning		Respond to suggestions of how to find things out.	Put forward their own suggestions about how to find an answer to a question.
	Observing, measuring	Describe or respond appropriately to simple features of objects, living things and events they observe. Measure using equipment provided.	Make observations related to their task. Observe and compare objects, living things and events they observe. Use a range of simple measuring equipment.	Make relevant observations. Select suitable measuring equipment to use.
	Fair testing			With help, carry out a fair test, recognizing and explaining why it is fair.
	Predicting, concluding		Say whether what happened was what they expected.	Provide explanations for observations and for simple patterns in recorded measurements.
	Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.
Sc2	Life processes		Use knowledge about living things to describe basic conditions that animals and plants need in order to survive. Recognize	Use knowledge and understanding of basic life processes when describing differences between living and non-living things.

**Progression in learning SCIENTIFIC ENQUIRY (Sc1) through
LIFE PROCESSES AND LIVING THINGS (Sc2) levels 1 to 3 (Continued)**

		National Curriculum levels		
		Level 1	Level 2	Level 3
Sc2	Life processes (<i>Cont.</i>)		that living things grow and reproduce.	
	Human body	Recognize and name external parts of the body, e.g. head, arm.		Provide simple explanations for changes in living things, e.g. diet affects the health of humans or other animals.
	Plants	Recognize and name external parts of plants, e.g. leaf, flower.		Provide simple explanations for changes in living things, e.g. lack of light altering plant growth.
	Classification	Communicate observations of a range of animals and plants in terms of features. Recognize and identify a range of common animals.	Sort living things into groups using simple features. Describe the basis for groupings, e.g. number of legs or shape of leaf.	
	Habitats		Recognize that different living things are found in different places, e.g. ponds or woods.	Identify ways in which an animal is suited to its environment, e.g. a fish having fins to help it swim.

Progression in learning SCIENTIFIC ENQUIRY (Sc1) through MATERIALS AND THEIR PROPERTIES (Sc3) levels 1 to 3

		National Curriculum levels		
		Level 1	Level 2	Level 3
Sc1	Questioning		Respond to suggestions of how to find things out.	Put forward their own suggestions about how to find an answer to a question.
	Observing, measuring	Describe or respond appropriately to simple features of objects, living things and events they observe. Measure using equipment provided.	Make observations related to their task. Observe and compare objects, living things and events they observe. Use a range of simple measuring equipment.	Make relevant observations. Select suitable measuring equipment to use.
	Fair testing			With help, carry out a fair test, recognizing and explaining why it is fair.
	Predicting, concluding		Say whether what happened was what they expected.	Provide explanations for observations and for simple patterns in recorded measurements.
	Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.
	Properties of materials	Know about a range of properties (e.g. texture, appearance) of different materials.	Identify a range of common materials and know some of their properties. Describe similarities	Use their knowledge and understanding of materials when describing a variety of ways of sorting them

Progression in learning SCIENTIFIC ENQUIRY (Sc1) through MATERIALS AND THEIR PROPERTIES (Sc3) levels 1 to 3 (Continued)

		National Curriculum levels		
		Level 1	Level 2	Level 3
Sc3		Communicate observations of the properties of materials.	and differences between materials.	into groups according to their properties.
	Grouping and classifying materials		Sort materials into groups and describe the basis for their groupings in everyday terms (e.g. shininess, hardness, smoothness).	Explain simply why some materials are particularly suitable for specific purposes (e.g. glass for windows, copper for electrical cables).
	Changing materials		Describe ways in which some materials are changed by heating or cooling, or by processes such as bending or stretching.	Recognize that some changes (e.g. the freezing of water) can be reversed and some (e.g. the baking of clay) cannot, and classify changes in this way.

**Progression in learning SCIENTIFIC ENQUIRY (Sc1)
through PHYSICAL PROCESSES (Sc4) levels 1 to 3**

		National Curriculum levels		
		Level 1	Level 2	Level 3
Sc1	Questioning		Respond to suggestions of how to find things out.	Put forward their own suggestions about how to find an answer to a question.
	Observing, measuring	Describe or respond appropriately to simple features of objects, living things and events they observe. Measure using equipment provided.	Make observations related to their task. Observe and compare objects, living things and events they observe. Use a range of simple measuring equipment.	Make relevant observations. Select suitable measuring equipment to use.
	Fair testing			With help, carry out a fair test, recognizing and explaining why it is fair.
	Predicting, concluding		Say whether what happened was what they expected.	Provide explanations for observations and for simple patterns in recorded measurements.
	Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.
Sc4	Physical processes	Communicate observations of changes in light, sound or movement that result from actions (e.g. switching on a simple electrical circuit, pushing and pulling objects).	Know about a range of physical phenomena and recognize and describe similarities and differences associated with them.	Use their knowledge and understanding of physical phenomena to link cause and effect in simple explanations (e.g. a bulb failing to light because of a break in an electrical circuit, the direction or speed of movement of an object changing because of a push or a pull).
	Electricity		Compare the way in which devices (e.g. bulbs) work in different electrical circuits.	
	Forces			
	Light and sound	Recognize that sound and light come from a variety of sources and name some of them.	Compare the brightness of colour of lights and the loudness or pitch of sounds.	Begin to make simple generalizations about physical phenomena (e.g. explaining that sounds they hear become fainter the further they are from the source).
	Forces		Compare the movement of different objects in terms of speed or direction.	
	Earth and beyond			

**Progression in learning SCIENTIFIC ENQUIRY (Sc1)
through MATERIALS AND THEIR PROCESSES (Sc4) levels 4 to 6**

		National Curriculum levels		
		Level 4	Level 5	Level 6
Sc1	Questioning	Recognize that scientific ideas are based on evidence. In their own investigative work, they decide on an appropriate approach.	When trying to answer a scientific question, they identify an appropriate approach.	
	Observing	Make a series of observations and measurements.	Make a series of observations appropriate to the task. Begin to repeat observations and offer simple explanations for any differences observed.	Make relevant observations.
	Measuring	Select suitable equipment to measure. Make a series of measurements adequate for the task.	Make observations, comparisons or measurements to offer simple explanations of differences they encounter.	Select suitable measuring equipment to use. Measure a variety of quantities with precision using instruments with fine scale divisions.
	Fair testing	In their own investigative work, decide on an appropriate approach, using a fair test to answer a question, where appropriate, showing variation of one factor at a time, while keeping the others the same.	When investigations involve a fair test, they identify key factors to be considered.	In their own investigative work, they use scientific knowledge and understanding to identify an appropriate approach.
	Predicting, concluding	Where appropriate, they make a prediction. Use graphs to interpret patterns in data. Begin to relate conclusions to these patterns and scientific knowledge and understanding.	Where appropriate, make predictions based on their scientific knowledge and understanding. Draw conclusions that are consistent with the evidence and begin to relate these to scientific knowledge and understanding.	Identify measurements and observations that do not fit the main pattern shown. Draw conclusions consistent with the evidence and use scientific knowledge and understanding to explain them. Select and use appropriate methods of communicating qualitative and quantitative data using scientific language and conventions.
	Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.

**Progression in learning SCIENTIFIC ENQUIRY (Sc1)
through PHYSICAL PROCESSES (Sc4) levels 4 to 6**

		National Curriculum levels		
		Level 4	Level 5	Level 6
Sc4	Physical processes	Demonstrate knowledge and understanding of physical processes drawn from the KS2 or KS3 Programmes of Study.	Demonstrate knowledge and understanding of physical processes drawn from the KS2 or KS3 Programmes of Study.	Use and apply knowledge and understanding of physical processes drawn from the KS3 Programme of Study.
	Electricity	Describe and explain physical phenomena (e.g. how the apparent position of the Sun changes over the course of a day).	Use ideas to explain how to make a range of changes (e.g. altering the current in a circuit).	Use abstract ideas in some descriptions and explanations (e.g. electric current as a way of transferring energy). Recognise, and give examples of, the wide application of many physical concepts (e.g. the transfer of energy by electricity).
	Forces	Make generalisations about physical phenomena (e.g. motion is affected by forces, including gravitational attraction, magnetic attraction and friction).		Use abstract ideas in some descriptions and explanations (e.g. the sum of several forces determining the changes in the direction or speed of movement of an object, wind and waves as energy sources available for use).
	Sound	Use physical ideas to explain simple phenomena (e.g. the formation of shadows, sounds being heard through a variety of materials).	Use ideas to explain how to make a range of changes (e.g. altering the pitch or loudness of a sound).	Recognise, and give examples of, the wide application of many physical concepts (e.g. the transfer of energy by sound).
	Light		Use some abstract ideas in descriptions of familiar phenomena (e.g. objects are seen when light from them enters the eye).	Record observations in a variety of ways. Communicate in a scientific way what they found out. Recognise, and give examples of, the wide application of many physical concepts (e.g. the transfer of energy by light, the refraction and dispersion of light).
	Earth and beyond	Describe and explain physical phenomena (e.g. how the apparent position of the Sun changes over the course of a day).	Use simple models to explain the effects that are caused by the movement of the Earth (e.g. the length of a day or year).	Give explanations of phenomena in which a number of factors have to be considered (e.g. the relative brightness of planets and stars).

**Progression in learning SCIENTIFIC ENQUIRY (Sc1)
through MATERIALS AND THEIR PROCESSES (Sc4) levels 4 to 6**

		National Curriculum levels		
		Level 4	Level 5	Level 6
Sc1	Questioning	Recognize that scientific ideas are based on evidence. In their own investigative work, they decide on an appropriate approach.	When trying to answer a scientific question, they identify an appropriate approach.	
	Observing	Make a series of observations and measurements.	Make a series of observations appropriate to the task. Begin to repeat observations and offer simple explanations for any differences observed.	Make relevant observations.
	Measuring	Select suitable equipment to measure. Make a series of measurements adequate for the task.	Make observations, comparisons or measurements to offer simple explanations of differences they encounter.	Select suitable measuring equipment to use. Measure a variety of quantities with precision using instruments with fine scale divisions.
	Fair testing	In their own investigative work, decide an appropriate approach, using a fair test to answer a question, where appropriate, showing variation of one factor at a time, while keeping the others the same.	When investigations involve a fair test, they identify key factors to be considered.	In their own investigative work, they use scientific knowledge and understanding to identify an appropriate approach.
	Predicting, concluding	Where appropriate, they make a prediction. Use graphs to interpret patterns in data. Begin to relate conclusions to these patterns and scientific knowledge and understanding.	Where appropriate, make predictions based on their scientific knowledge and understanding. Draw conclusions that are consistent with the evidence and begin to relate these to scientific knowledge and understanding.	Identify measurements and observations that do not fit the main pattern shown. Draw conclusions consistent with the evidence and use scientific knowledge and understanding to explain them. Select and use appropriate methods of communicating qualitative and quantitative data using scientific language and conventions.
	Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.

Progression in learning SCIENTIFIC ENQUIRY (Sc1) through PHYSICAL PROCESSES (Sc4) levels 4 to 6				
		National Curriculum levels		
		Level 4	Level 5	Level 6
sc3	Properties of materials	Demonstrate knowledge and understanding of materials and their properties drawn from the KS2 or KS3 programmes of study.	Demonstrate an increasing knowledge and understanding of materials and their properties drawn from the KS2 or KS3 programmes of study.	Recognize that matter is made up of particles and describe differences between the arrangement and movement of particles in solids, liquids and gases.
	Classification of materials	Describe differences between properties of different materials and explain how these differences are used to classify substances (e.g. as solids, liquids, gases at KS2).	Describe some metallic properties (e.g. good electrical conductivity) and use these properties to distinguish metals from other solids.	Make relevant observations.
	Changing materials	Use scientific terms (e.g. evaporation, condensation) to describe changes. Use knowledge about some reversible and irreversible changes to make simple predictions about whether other changes are reversible or not.	Identify a range of contexts in which changes (e.g. evaporation, condensation) take place.	Use knowledge and understanding of the nature and behaviour of materials drawn from the KS3 Programmes of Study, to describe chemical and physical changes and how materials can be made. Identify and describe similarities between some chemical reactions (e.g. the reactions of acids with metals, the reactions of a variety of substances with oxygen). Use word equations to summarize simple reactions. Relate changes of state to energy transfers in a range of contexts (e.g. the formation of igneous rocks).
	Separating materials	Describe some methods (e.g. filtration, distillation) that are used to separate simple mixtures.	Use their knowledge about how a specific mixture (e.g. salt and water, sand and water) can be separated to suggest ways in which other similar mixtures might be separated.	

Progression in learning SCIENTIFIC ENQUIRY (Sc1) through LIFE PROCESSES AND LIVING THINGS (Sc2) levels 4 to 6			
National Curriculum levels			
	Level 4	Level 5	Level 6
Questioning	Recognise that scientific ideas are based on evidence. In their own investigative work, they decide on an appropriate approach.	When trying to answer a scientific question, they identify an appropriate approach	Recognize that matter is made up of particles and describe differences between the arrangement and movement of particles in solids, liquids and gases.
Observing	Make a series of observations and measurements.	Make a series of observations appropriate to the task. Begin to repeat observations and offer simple explanations for any differences observed.	Make relevant observations.
Measuring	Select suitable equipment to measure. Make a series of measurements adequate for the task.	Make observations, comparisons or measurements to offer simple explanations of differences they encounter.	Select suitable measuring equipment to use. Measure a variety of quantities with precision using instruments with fine scale divisions.
Fair testing	In their own investigative work, decide an appropriate approach, using a fair test to answer a question, where appropriate, showing variation of one factor at a time, while keeping the others the same.	When investigations involve a fair test, they identify key factors to be considered.	In their own investigative work, they use scientific knowledge and understanding to identify an appropriate approach.
Predicting, concluding	In their own investigative work, decide an appropriate approach, using a fair test to answer a question, where appropriate, showing variation of one factor at a time, while keeping the others the same.	When investigations involve a fair test, they identify key factors to be considered.	Identify measurements and observations that do not fit the main pattern shown. Draw conclusions consistent with the evidence and use scientific knowledge and understanding to explain them. Select and use appropriate methods of communicating qualitative and quantitative data using scientific language and conventions.

Progression in learning SCIENTIFIC ENQUIRY (Sc1) through LIFE PROCESSES AND LIVING THINGS (Sc2) levels 4 to 6			
National Curriculum levels			
	Level 4	Level 5	Level 6
Communicating	Communicate findings in simple ways: talk, drawings, charts.	Describe observations using scientific vocabulary and record using simple tables.	Record observations in a variety of ways. Communicate in a scientific way what they found out.
Life processes	Demonstrate knowledge and understanding of life processes and living things drawn from the KS2/3 programme of study.	Demonstrate an increasing knowledge and understanding of life processes and living things drawn from the KS2/3 programmes of study. Describe the main stages of the life cycles of humans and flowering plants and points out similarities.	Use knowledge an understanding drawn from the KS3 programme of study to describe and explain life processes and features of living things. Distinguishes between related processes e.g. pollination, fertilization.
Human body	Use scientific names for some major organs of body systems e.g. the heart at KS2 and identifies the position of these organs in the human body.	Describe the main functions of some organs of the human body e.g. heart at KS2. Explain how these functions are essential to the organism.	Use appropriate scientific terminology when describing life processes e.g. respiration in animals.
Plants	Identify organs of different plants observed e.g. stamen at KS2.	Describe the main functions of some organs of the plant e.g. stamen at KS2. Explains how these functions are essential to the organism.	Use appropriate scientific terminology when describing life processes e.g. photosynthesis in plants.
Classification	Use keys based on observable external features to help identify and group living things systematically.	Recognize that there is a great variety of living things and understands the importance of classification.	Describe simple cell structure and identifies differences between simple animal and plant cells. Describe some of the causes of variation between living things