# North Petherwin and Werrington Knowledge and Skills Organiser
## Science

**Purpose of Study**
A high-quality science education provides the foundations for understanding the world. Science has changed our lives and is vital to the world's future prosperity, our pupils are taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, our pupils will be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They are also encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.
Children have weekly lessons in science throughout Key Stage 1 and Key Stage 2, using various programmes of study and resources.

**Capabilities Curriculum**
The Capabilities Curriculum is a creative curriculum which measures social and emotional capabilities which improve children's learning, valuing the development of the whole child and preparing them for the future.
An Daras Trust have chosen to adopt a curriculum framework informed by pupil's social and emotional well-being. The class capability scores are used to inform a teachers approach to the lesson, which will help growth in these valuable characteristics.
These capabilities are evidenced as being necessary for future success, and by measuring them we are placing real value on them.
There are 7 capability strands: Managing feelings, Confidence, Communication, Relationships and Leadership, Planning and Problem-Solving Creativity, Resilience and Determination

**Visible Learning (metacognition)**
Metacognition describes the processes involved when learners plan, monitor, evaluate and make changes to their own learning – the thinking about their thinking. Pupils are given opportunity to understand their own cognitive abilities, knowledge of tasks and strategies that could be used to support their learning. Pupils are also encouraged to self-reflect. The following questions will be used to deepen pupils understanding of their learning:

| Visible Learning | Surface Learning Strategies | Deep Learning Strategies | Transfer Learning Strategies |
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| | *Do I know what I need to do to complete my task?*<br>*Can I plan and organise my learning before I start?*<br>*Where am I with my learning?*<br>*How well have I achieved my success criteria?* | *Can I explain my learning to someone else?*<br>*I know and can explain what strategies I have used in my learning.*<br>*I can make links between new content and ideas and learning I already know.* | *Can I organise my knowledge to support new learning?*<br>*I can look for and recognise similarities and differences in my tasks.*<br>*I can organise my knowledge to support new learning.* |

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| | *What is my next step?*<br>*I can seek feedback from others to help me in my next steps.* | *I can share my ideas and questions to deepen my understanding.*<br>*I know how I did at the end of my learning.*<br>*I can explain how things link together.* | *When have I applied my learning to another area?*<br>*I know where I am heading in my learning.*<br>*I understand what I am learning, where I am going and how to get there.*<br>*I know what success looks like.* |

**EYFS**

In Early Years, science is taught by the children learning about the world around them through play. Activities in EYFS are both adult led and child initiated. The statements within Development Matters provide a robust introduction to the Science National Curriculum.

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| Working scientifically | Comments and asks questions about aspects of their familiar world such as the place where they live, the natural world, technology and people and communities.<br>With adult support, use a variety of apparatus to explore, test and learn about similarities and differences in relation to objects, materials and living things.<br>*Gathers and records data by:*<br>*Recording using tallying.<br>*Pictorial recording.<br>*Photographic evidence.<br>*Completing simple pre prepared table/charts.<br>Can talk about some of the things they have observed such as plants, animals, natural and found objects.<br>Talks about why things happen and how things work. |
| Plants | Developing an understanding of growth, decay and changes over time.<br>Shows care and concern for living things and the environment.<br>They make observations of animals and plants and explain why some things occur, and talk about changes.<br>They talk about the features of their own immediate environments and how might vary from one another. |
| Animals including humans | Developing an understanding of growth, decay and changes over time.<br>Shows care and concern for living things and the environment.<br>They make observations of animals and plants and explain why some things occur, and talk about changes.<br>Children talk about past and present events in their lives and in the lives of family members. |
| Human body | Know the importance for good health of physical exercise and a healthy diet. |
| Space/ seasonal change | Developing an understanding of growth, decay and changes over time. |

| Metacognition | **Planning** | **Monitoring** | **Evaluation** |
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| | *What resources do I need to carry out my task?*<br>*Can I describe what I am going to do?* | *Am I doing well?* | *How did I do?* |

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| | *How can I link my learning with my own experiences to help me?* | | *Am I able to re-tell stories and link them to other areas of learning?* |
| | Autumn | Spring | Summer |
| Year A 1,2,3 Knowledge | **Materials**<br><br>Distinguish between an object and the material from which it is made.<br>Identify and name a variety of everyday materials, including wood, plastic, glass, metal, water, and rock.<br>Describe the simple physical properties<br><br>Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for different uses. *(Investigating materials in order to make our toy cars out of the most suitable material).*<br>Compare how things move on different surfaces.<br><br>**Seasons**<br>Observe changes across the four seasons<br>Observe and describe weather associated with the seasons and how day length varies | **Light**<br><br>Recognise that they need light in order to see things and that dark is the absence of light<br><br>Recognise that shadows are formed when the light from a light source is blocked by a solid object<br><br>Find patterns in the way that the size of shadows change<br><br>Notice that light is reflected from surfaces<br><br>Recognise that light from the sun can be dangerous and that there are ways to protect their eyes<br><br>**Seasons**<br>Observe changes across the four seasons<br>Observe and describe weather associated with the seasons and how day length varies | **Animals including Humans**<br><br>Identify and name a variety of common animals including, fish, amphibians, reptiles, birds and mammals. Identify and name a variety of common animals that are carnivores, herbivores and omnivores. Describe and compare the structure of a variety of common animals (fish, amphibians, reptiles, birds and mammals including pets).<br><br>Notice that animals, including humans, have offspring which grow into adults.<br>Understand the basic needs of animals, including humans for survival (water, food and air)<br>Understand the importance for humans to exercise, to eat the right amounts of different types of food and personal hygiene.<br><br>**Seasons**<br>Observe changes across the four seasons<br>Observe and describe weather associated with the seasons and how day length varies |
| Skills | **Core skill 1- Questioning**<br>Ask simple questions about the world around us.<br>Begin to recognise that they can be answered in different ways. | | **Core skill 2 - Setting up and performing different types of enquiry**<br>Perform simple tests with support.<br>To begin to discuss my ideas about how to find things out.<br>To begin to say what happened in my investigation. |
| | **Core skill 3 - Observing and measuring/ Using equipment** | | **Core skill 4 - Gathering and recording data** |

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| | Begin to observe closely using simple equipment.<br>To be able to say what I am looking for and what I am measuring.<br>To know how to use simple equipment safely.<br>Use simple measurements and equipment with support.<br>Begin to progress from non-standard units, reading cm, l etc. | Gather and record data with some adult support to help in answering questions.<br>Begin to record simple data.<br>Begin to record and communicate findings in a range of ways.<br>Can show my results in a table that my teacher has provided. |
| | Core skill 5 - Using data<br>I can talk about what I see and do. | Core skill 6 - Using secondary sources<br>To begin to find information to help me form books and computers with support.<br>To begin to ask my peers for help when appropriate. |
| | Core skill 7- Scientific language<br>Begin to use simple scientific language related to the topic. | Vocabulary<br>*Question*<br>*Observe*<br>*Group*<br>*Sort*<br>*Predict*<br>*Table*<br>*Use comparative language with support.* |

| | Autumn | Spring | Summer |
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| Year B 1,2,3 Knowledge | Plants<br><br>Identify and name a variety of common wild and garden plants, including deciduous and evergreen trees.<br><br>Identify and describe the basic structure of a variety of common flowering plants, including trees<br><br>Know that seeds and bulbs grow into mature plants<br>Know that plants need water, light and a suitable temperature to grow. | Rocks<br><br>Describe in simple terms how fossils are formed when things that have lived are trapped within rock<br><br>Understand that there are different types of rock<br><br>Recognise that soils are made from rocks and organic matter. | Living things and their habitats<br><br>Explain the differences between living, dead, and things that have never been alive.<br><br>Identify that most living things live in habitats to which they are suited and describe how different habitats provide the basic needs of different animals and plants.<br><br>Describe how animals obtain their food from plants and other animals using understanding of a simple food chain.<br><br>Identify and name different sources of food. |

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| | **Seasons**<br>Observe changes across the four seasons<br>Observe and describe weather associated with the seasons and how day length varies | **Seasons**<br>Observe changes across the four seasons<br>Observe and describe weather associated with the seasons and how day length varies | **Seasons**<br>Observe changes across the four seasons<br>Observe and describe weather associated with the seasons and how day length varies |
| Skills | **Core skill 1- Questioning**<br>Ask some relevant questions about the world around us.<br>Recognise that they can be answered in different ways. | **Core skill 2- Setting up and performing different types of enquiry**<br>Perform simple tests.<br>To discuss my ideas about how to find things out.<br>To say what happened in my investigation. | |
| | **Core skill 3- Observing and measuring/ Using equipment**<br>Observe closely using simple equipment.<br>To be able to say what I am looking for and what I am measuring and why.<br>Use simple measurements and equipment.<br>Begin to progress from non-standard units, reading cm, m, ml, l etc. | **Core skill 4- Gathering and recording data**<br>Gather and record data to help in answering questions.<br>Record simple data.<br>Record and communicate their findings in a range of ways.<br>Can show my results in a table while suggesting what the table should include. | |
| | **Core skill 5- Using data**<br>With help, I begin to notice simple patterns and relationships.<br>I can talk about what I found out and how I found it out. | **Core skill 6- Using secondary sources**<br>To find information to help me from books and computers, sometimes with support when needed.<br>To ask my peers for help when appropriate. | |
| | **Core skill 7- Scientific language**<br>Use simple scientific language related to the topic and some science words. | **Vocabulary**<br>As previous plus…<br><br>*Questioning*<br>*Plan*<br>*Record*<br>*Identify*<br>*Block graph*<br>*Data*<br>*Use comparative language – bigger, faster etc...* | |
| Metacognition | **Planning** | **Monitoring** | **Evaluation** |
| | *What resources do I need to carry out my task?*<br>*Where do I start and what strategies will I use?*<br>*Have I done anything like this before?* | *Am I doing well?*<br>*Am I finding this challenging?*<br>*Do I need any different techniques to improve my learning/task?* | *Am I able to re-tell stories and link them to other areas of learning?*<br>*How did I do in my task?*<br>*How did the feedback I received help me?* |

| | *How can I link my learning with my own experiences to help me?* | | |
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| | Autumn | Spring | Summer |
| Year A 5+6 Knowledge | **Sound**<br><br>Identify how sounds are made, associating some of them with something vibrating<br><br>recognise that vibrations from sounds travel through a medium to the ear<br><br>recognise that sounds get fainter as the distance from the sound source increases.<br><br>find patterns between the volume of a sound and the strength of the vibrations that produced it.<br><br>find patterns between the pitch of a sound and features of the object that produced it<br><br>**Light**<br><br>Recognise that light appears to travel in straight lines<br><br>Use the idea that light travels in straight lines to explain that objects are seen because they give<br><br>explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes | **Animals including Humans**<br><br>Identify and name the main parts of the human circulatory system.<br>Describe the functions of the heart, blood vessels and blood.<br><br>Understand the impact of diet, exercise, drugs and lifestyle on their bodies and how they function.<br><br>Describe the way in which nutrients and water are transported within animals including humans. | **Electricity**<br><br>Identify common appliances that run on electricity.<br><br>Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.<br><br>Identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.<br><br>Recognise that a switch opens and closes a circuit and associate this with whether or not a lamp lights in a simple series circuit.<br><br>Recognise some common conductors and insulators, and associate metals with being good conductors.<br><br>**Evolution and Inheritance**<br><br>Understand that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago.<br>Explain that living things produce offspring of the same kind, but normally offspring vary and and not identical to their parents. |

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| | | | Understand how animals and plants have adapted to suit their environment in different ways and that adaptation may lead to evolution. |
| Skills | Core skill 1- Questioning<br>Begin to plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.<br>Begin to explore and talk about ideas, ask their own questions about scientific phenomena, analyse functions, relationships and interactions more systematically.<br><br>Begin to select the most appropriate ways to answer science questions using different types of scientific enquiry. | Core skill 2- Setting up and performing different types of enquiry<br>Begin to use test results to make predictions to set up further comparative and fair tests.<br>Begin to recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why.<br>Begin to suggest improvements to my method and give reasons.<br>Begin to decide when it is appropriate to do a fair test. | |
| | Core skill 3- Observing and measuring/ Using equipment<br>Begin to take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings where appropriate.<br>Begin to identify patterns that might be found in the natural environment.<br>Begin to make their own decisions about what observations to make, what measurements to use and how long to make them for and whether to repeat them.<br>Choose the most appropriate equipment and explain how to use it accurately.<br>Begin to interpret data and find patterns.<br>Select equipment on my own. Can make a set of observations and say what the interval and range are.<br>Begin to take accurate and precise measurements – N, g, kg, mm, cm, mins, seconds, $cm^2V$, km/h, m per sec, m/ sec Graphs – pie, line | Core skill 4- Gathering and recording data<br>Begin to record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables and bar and line graphs.<br>Begin to report and present findings from enquiries.<br>Begin to decide how to record data from a choice of familiar approaches.<br>Begin to choose how best to present data. | |
| | Core skill 5- Using data<br>I can use my results to make predictions.<br>I can discuss and justify my scientific ideas, with some support.<br>I am beginning to explain how one thing causes another.<br>I can use spoken and written forms such as displays and other presentations to report my conclusions, with guidance. | Core skill 6- Using secondary sources<br>Use a range of secondary sources to research.<br>Begin to separate opinion from fact. | |

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| | Core skill 7- Scientific language<br>Am beginning to read, spell and pronounce scientific vocabulary correctly.<br>Am beginning to use relevant scientific language and illustrations to discuss, communicate and justify scientific ideas.<br>Am beginning to confidently use a range of scientific vocabulary.<br>Am beginning to use conventions such as trend, rogue result, support prediction and –er word generalisation.<br>Am beginning to use scientific ideas when describing simple processes. | Vocabulary<br>As previous plus…<br><br>*Variables*<br>*Cause*<br>*Effect*<br>*Repeat*<br>*Precise*<br>*Systematic*<br>*Scatter graph*<br>*Line graph*<br>*Bar graph*<br>*Pattern*<br>*Relationship*<br>*Evidence* |

| | Autumn | Spring | Summer 2 |
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| Year B 5+6 Knowledge | **States of Matter**<br><br>Compare and group materials together, according to whether they are solids, liquids or gases<br><br>Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)<br><br>Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. | **Living things and their habitats**<br><br>Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment<br><br>Recognise that living things can be grouped in a variety of ways<br><br>Recognise that environments can change and that this can sometimes pose dangers to living things.<br><br>Can describe the difference in the life cycle of a mammal, an amphibian, an insect and a bird.<br><br>Can describe the process of reproduction in some plants and animals. | **Animals including Humans**<br><br>Describe the simple functions of the basic parts of the digestive system in humans<br><br>Identify the different types of teeth in humans and their simple functions.<br><br>Identify the predator, producer and prey in food chains. |

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| | **Animals including Humans**<br><br>To understand the changes that happen to humans as the develop to old age | | |
| Skills | Core skill 1- Questioning<br>Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary.<br>Explore and talk about ideas, ask their own questions about scientific phenomena, analyse functions, relationships and interactions more systematically<br>Recognise scientific ideas change and develop over time. Select the most appropriate ways to answer science questions using different types of scientific enquiry. | Core skill 2- Setting up and performing different types of enquiry<br>Use test results to make predictions to set up further comparative and fair tests.<br>Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why.<br>Suggest improvements to my method and give reasons.<br>Decide when it is appropriate to do a fair test. | |
| | Core skill 3- Observing and measuring/ Using equipment<br>Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings where appropriate.<br>Identify patterns that might be found in the natural environment.<br>Make their own decisions about what observations to make, what measurements to use and how long to make them for and whether to repeat them.<br>Choose the most appropriate equipment and explain how to use it accurately.<br>Can interpret data and find patterns.<br>Select equipment on my own.<br>Can make a set of observations and say what the interval and range are.<br>Accurate and precise measurements – N, g, kg, mm, cm, mins, seconds, $cm^2V$, km/h, m per sec, m/ sec Graphs – pie, line, bar (Year 6) | Core skill 4- Gathering and recording data<br>Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables and bar and line graphs.<br>Report and present findings from enquiries.<br>Decide how to record data from a choice of familiar approaches.<br>Can choose how best to present data. | |
| | Core skill 5- Using data<br>I can confidently use my results to make predictions.<br>I can identify when further tests might be needed.<br>I can discuss and justify my scientific ideas.<br>I can explain whether or not I trust my results.<br>I can explain how one thing causes another.<br>I can use spoken and written forms such as displays and other presentations to report my conclusions. | Core skill 6- Using secondary sources<br>Talk about how scientific ideas have developed over time.<br>Recognise which secondary sources will be most useful to research my ideas.<br>Begin to separate opinion from fact.<br>Identify scientific evidence that has been used to support ideas or prove them wrong. | |
| | Core skill 7- Scientific language | Vocabulary | |

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| | Read, spell and pronounce scientific vocabulary correctly.<br><br>Use relevant scientific language and illustrations to discuss, communicate and justify scientific ideas.<br>Can confidently use a range of scientific vocabulary.<br>Can use conventions such as trend, rogue result, support prediction and –er word generalisation.<br>Can use scientific ideas when describing simple processes. | As previous plus…<br><br>*Interpret*<br>*Refute*<br>*Opinion/ fact*<br>*Present (your findings)*<br>*Justify* |

| Metacognition | **Planning** | **Monitoring** | **Evaluation** |
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| | *What resources do I need to carry out my task?*<br>*Where do I start and what strategies will I use?*<br>*What type of resources and materials will I need to complete my learning?*<br>*How can I break down the task into smaller steps?* | *Am I finding this challenging?*<br>*Is there anything I need to stop and change to improve the understanding of my learning?*<br>*Do I need to re-read information to make it clearer?*<br>*Do I need to change my strategies?* | *Did I use the right strategy?*<br>*How did the feedback I received help me?*<br>*For future tasks, would I use another strategy?*<br>*Did I pace myself appropriately to get the task done?* |

**Working Scientifically**

Working Scientifically plays a key role in the teaching and learning of Science, and so is incorporated into learning throughout the rest of the Science curriculum. These key skills are instrumental in developing our young scientists' understanding and investigative abilities.

| **EYFS** | **Year 1** | **Year 2** | **Year 3** | **Year 4** | **Year 5** | **Year 6** |
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| Comments and asks questions about aspects of their familiar world such as the place where they live, the natural world, technology | Ask simple questions and recognise that they can be answered in | Ask simple questions and recognise that they can be answered in different ways | Ask relevant questions and use different types of scientific enquiries to answer them<br><br>Set up simple practical enquiries, comparative and fair tests | With support, they should identify new questions arising from the data, making predictions for | Plan different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary | Plan different types of scientific enquiries to answer their own or others' questions, including recognising and controlling variables where necessary |

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| and people and communities.<br><br>With adult support, use a variety of apparatus to explore, test and learn about similarities and differences in relation to objects, materials and living things.<br><br>*Gathers and records data by:*<br>*Recording by the use of tallying.<br>*Pictorial recording.<br>*Photographic evidence.<br>*Completing simple pre prepared table/charts.<br><br>Can talk about some of the things they have observed such as plants, animals, natural and found objects.<br><br>Talks about why things happen and how things work. | different ways<br><br>Use simple equipment to observe closely<br><br>Perform simple tests<br><br>Identify and classify<br><br>Use his/her observations and ideas to suggest answers to questions<br><br>Gather and record data to help in answering questions | Use simple equipment to observe closely including changes over time<br><br>Perform simple comparative tests<br><br>Identify, group and classify<br><br>Use his/her observations and ideas to suggest answers to questions noticing similarities, differences and patterns<br><br>Gather and record data to help in answering questions including from secondary sources of information | Make systematic and careful observations and, where appropriate, take accurate measurements using standard units, using a range of equipment, including thermometers and data loggers<br><br>Gather, record, classify and present data in a variety of ways to help in answering questions<br><br>Record findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables<br><br>Report on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions<br><br>Use results to draw simple conclusions, make predictions for new values, suggest improvements and raise further questions<br><br>Identify differences, similarities or changes related to simple scientific ideas and processes<br><br>Use straightforward scientific evidence to answer questions or to support his/her findings | new values within or beyond the data they have collected and finding ways of improving what they have already done.<br><br>Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences, including oral and written explanations, displays or presentations of results and conclusion<br><br>With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer question | Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate<br><br>Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs<br><br>Use test results to make predictions to set up further comparative and fair tests<br><br>Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations<br><br>Identify scientific evidence that has been used to support or refute ideas or argument | Take measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate<br><br>Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs<br><br>Use test results to make predictions to set up further comparative and fair tests<br><br>Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations<br><br>Report and present findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations<br><br>Describe and evaluate their own and other people's scientific ideas related to topics in the national curriculum (including ideas that have changed over time), using evidence from a range of sources |

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