



Believe. Achieve. Succeed Together.

Iver Village Junior School
Implementing the Science Curriculum

Article 28, 29

Education must develop every child's personality, talents and abilities to the full

Intent Statement

In our science curriculum we support pupils in developing their own scientific knowledge and conceptual understanding. Through hands on investigations and experiments, they will understand the nature, processes and methods of science. Pupils will also learn about great scientists of the past, today's new inventions and question what science in the future may look like.

Throughout KS2 pupils will acquire new knowledge and understanding of specific topics and get the chance to take part in experiments and investigations in order to develop their scientific mind. Pupils will learn and adopt scientific skills such as: collecting data, sorting, classifying, measuring, researching and testing. Pupils will also be expected to pronounce and use key vocabulary and scientific language at an age-related expectation level.

Implementation

Curriculum Design

National Curriculum:

The national curriculum for science aims to ensure that all pupils:

- develop **scientific knowledge and conceptual understanding** through the specific disciplines of biology, chemistry and physics
- develop understanding of the **nature, processes and methods of science** through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the **uses and implications** of science, today and for the future.

The science curriculum and Iver Village Junior School

At Iver Village Junior School we believe Science is an exceptionally important subject. Our aim is that science will inspire our children to be inquisitive about the world and enable them to develop a range of skills that can be used across their learning. As well as learning about the theories of scientific concepts, children have the opportunity to take part in a variety of investigations to test these theories and to try to answer questions. At the end of their primary education, our children should have the ability to make informed decisions about new technologies, their health and the scientific opportunities around them. We believe that not only shall we be teaching the children their scientific knowledge, but also developing their scientific skills.

Throughout the school, the three concepts (Biology, Chemistry, Physics) are addressed regularly during the academic year. The spiral structure of our curriculum means that children are given the chance to re-visit scientific topics to further their knowledge and depth of understanding. Within these concepts, there are regular opportunities for the children to experience working scientifically, building on these skills as they progress through the school.

Cyclical curriculum and repetition:

The science curriculum cycle involves a sequence of knowledge and skills. When working scientifically, the cycle is as follows:

- Question
- Research
- Hypothesis
- Experiment
- Data Analysis
- Conclusion
- Evaluation

Key concepts:

The key concepts in science are Biology, Chemistry and Physics. We follow the structure of the National Curriculum to ensure a wide coverage of the concepts. The children have a knowledge organiser for each topic which makes it clear which concept they are studying.

Key Knowledge:

Biology

- Plants
- Animals including humans
- Living things and their habitats
- Evolution and inheritance

Chemistry

- Materials (including rocks and fossils and states of matter)

Physics

- Forces
- Earth and space
- Light
- Sound
- Electricity

Key skills:

- Asking scientific questions
- Setting up practical enquiries – comparative and fair tests
- Making systematic observations
- Gather, record and present data
- Draw conclusions from results

- Report findings from investigations
- Use results to answer scientific questions

Key vocabulary:

- Technical vocabulary relating to scientific skills
- Topic specific vocabulary in each year group
- Knowledge organisers

Medium term planning:

Year 3 Example

| Y3 | Topic | Science Skills | Concepts | Skills Used | Vocab |
|----|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Autumn 1: Plants | 1. Ask scientific questions 2. Set up practical enquiries (comparative and fair tests) 3. Make observations systematically 4. Gather and record data 5. Present data 6. Draw conclusions from results 7. Report findings from investigations 8. Use results to answer scientific | Biology 1. Plants 2. Animals Including Humans 3. Evolution and Inheritance Chemistry 4. Rocks and Fossils 5. Materials 6. States of Matter Physics 7. Forces and Magnets 8. Earth and Space 9. Light 10. Sound 11. Electricity | | Petal Flower Leaf Soil Sunlight Water Glucose Photosynthesis Roots Stem Ovary Sepal Stamen Anther Carpel Style Filament Stigma Ovules Pollen Pollination Fertilisation |
| | Lesson 1 | What are the different parts of a flowering plant and their function? | Biology - plants | 1, 8 | |
| | Lesson 2 and 3 | What do plants need to grow? (Investigation) How do I make careful observations and record my findings? | Biology - plants | 1, 8 2, 3, 4, 5 | |
| | Lesson 4 and 5 | How is water transported through plants? How do I plan a test fairly? | Biology - plants | 1,8, 2, | |
| | Lesson 6 | What are the stages in a flowering plants lifestyle? | Biology - plants | 1, 8 | |
| | Lesson 7 | How and why are plants pollinated? | Biology - plants | 1, 8 | |
| | Lesson 8 | How are seeds formed and dispersed? | Biology - plants | 3, 6, 8 | |
| | Lesson 9 and 10 | How can I write a diary entry of a seed? | Biology - plants | 1, 8 | |

Year 4 example

| Y4 | Topic | Science Skills | Concepts | Skills Used | Vocab |
|----|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Autumn 1: States of Matter | 1. Ask scientific questions 2. Set up practical enquiries (comparative and fair tests) 3. Make observations systematically 4. Gather and record data 5. Present data 6. Draw conclusions from results 7. Report findings from investigations 8. Use results to answer scientific | Biology 1. Plants 2. Animals Including Humans 3. Evolution and Inheritance Chemistry 4. Rocks and Fossils 5. Materials 6. States of Matter Physics 7. Forces and Magnets 8. Earth and Space 9. Light 10. Sound 11. Electricity | | Solid Liquid Gas State Matter Freeze Heat Particles Hypothesis Melt Evaporation Vapour Condensation Water Cycle Precipitation Transpiration Electrons Protons Neutrons Water Vapour Solidify |
| | Lesson 1 | How can I sort and describe materials? | Chemistry – States of Matter | 1, 8 | |
| | Lesson 2 | How can I recognise what a solid, liquid and gas is? | Chemistry – States of Matter | 1, 8 | |
| | Lesson 3 & 4 | How can I investigate gases and explain their properties? | Chemistry – States of Matter | 2, 3, 4, | |
| | Lesson 5 & 6 | How can I investigate materials as they change state? | Chemistry – States of Matter | 3, 4, 6 | |
| | Lesson 7 & 8 | How can I explore how water changes state? | Chemistry – States of Matter | 3, 6, 8 | |
| | Lesson 9 & 10 | How can I explore how water evaporates? | Chemistry – States of Matter | 3, 8 | |
| | Lesson 11 | How can I identify and describe the different stages in the water cycle? | Chemistry – States of Matter | 1, 8 | |

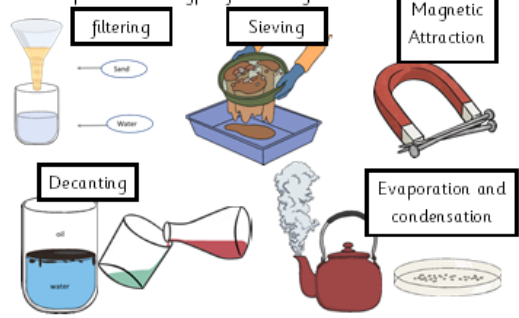

Year 5 example

| Y5 | Topic | Science Skills | Concepts | Skills Used | Vocab |
|----|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Autumn 1: Materials | <ol style="list-style-type: none"> 1. Ask scientific questions 2. Set up practical enquiries (comparative and fair tests) 3. Make observations systematically 4. Gather and record data 5. Present data 6. Draw conclusions from results 7. Report findings from investigations 8. Use results to answer scientific | <u>Biology</u> 1. Plants 2. Animals Including Humans 3. Evolution and Inheritance <u>Chemistry</u> 4. Rocks and Fossils 5. Materials 6. States of Matter <u>Physics</u> 7. Forces and Magnets 8. Earth and Space 9. Light 10. Sound 11. Electricity | | Material Property Magnetic Permeable Transparent Flexible Brittle Conductor Insulator Variable Dissolve Soluble Insoluble Liquid Solid Gas Separate Mixture Product Substance Suspension Dissolve Evaporate Attract Particles Reversible Irreversible Physical Chemical Reaction |
| | Lesson 1 | How can I compare materials according to their properties? | Chemistry – Materials | 3 | |
| | Lesson 2 and 3 | How can I investigate thermal conductors and insulators? | Chemistry – Materials | 1, 2,3,4,5 | |
| | Lesson 4 | How can I investigate which electrical conductors make a bulb shine brightest? | Physics – Electricity | 1,2,3,4,5 | |
| | Lesson 5 and 6 | How can I explain the changes that occur when materials are heated and cooled? | Chemistry – States of matter | 6,7,8 | |
| | Lesson 7 and 8 | How do I explain the changes that occur when materials are burned? | Chemistry – states of matter | 6,7,8 | |
| | Lesson 9 and 10 | How can I write a poem about materials linking to heating, cooling and burning materials? | Chemistry – states of matter | | |

Year 6 example

| Y6 | Topic | Science Skills | Concepts | Skills Used | Vocab |
|----|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Autumn 1: Evolution and Inheritance | <ol style="list-style-type: none"> 1. Ask scientific questions 2. Set up practical enquiries (comparative and fair tests) 3. Make observations systematically 4. Gather and record data 5. Present data 6. Draw conclusions from results 7. Report findings from investigations 8. Use results to answer scientific | <u>Biology</u> 1. Plants 2. Animals Including Humans 3. Evolution and Inheritance <u>Chemistry</u> 4. Rocks and Fossils 5. Materials 6. States of Matter <u>Physics</u> 7. Forces and Magnets 8. Earth and Space 9. Light 10. Sound 11. Electricity | | Inheritance Variation Parents Genes Survival Evolution Adaption Mutation Fossil Record Characteristic Trait Reproduce Advantageous Disadvantageous Physical Generation Classification Dominant Environmental Organism Species |
| | Lesson 1 | How can I explain the scientific concept of inheritance? | Biology – Evolution and Inheritance | 1, 8 | |
| | Lesson 2 | How can I demonstrate understanding of the scientific meaning of adaptation? | Biology – Evolution and Inheritance | 1, 8 | |
| | Lesson 3 | How can I identify the key ideas of the theory of evolution? | Biology – Evolution and Inheritance | 1, 8 | |
| | Lesson 4 | How can I find out about the work of scientists including Charles Darwin? | Biology – Evolution and Inheritance | 1, 8 | |
| | Lesson 5 | How can I identify evidence for evolution from fossil records? | Biology – Evolution and Inheritance | 1, 8 | |
| | Lesson 6 | How can I understand how human beings have evolved? | Biology – Evolution and Inheritance | 1, 8 | |

Knowledge Organiser example

| Year 5 Autumn 2 – Materials (Chemistry) | |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Key knowledge | |
| Dissolving | When a solid and liquid are mixed together forming either a solution or a suspension. • Solution: Clear and will never settle out • Suspension: Cloudy will settle out after a while |
| Soluble vs insoluble | If materials are soluble they <u>will dissolve</u> If materials are insoluble they <u>won't dissolve</u> . |
| Separating | There are different ways to separate materials that are combined, which depends on the type of mixture you have.  |
| Reversible changes | A reversible change is a change that <u>can be undone</u> or reversed and is called a physical change . E.g. mixing sand and water, melting ice |
| Irreversible changes | An irreversible change is a change that <u>cannot be undone</u> and is called a chemical change . E.g. burning, mixing vinegar and bicarbonate of soda |
| What happens during a chemical change? | During a chemical change new substances (such as gas) are produced, which makes it impossible for the materials to go back to their original state. |
| What have you learnt this term? | |
| I can investigate what happens to different materials when they are mixed with water. | |
| I know that some materials will dissolve in water to form a solution and are soluble. | |
| I know that some materials will not dissolve in water and form a suspension and are insoluble. | |
| I know different methods for separating mixtures of material. | |
| I can use the appropriate method to separate mixtures of materials. | |
| I know the difference between reversible and irreversible reactions. | |
| I can explain that some reactions form new materials. | |
| Working scientifically | |
| Make predictions about outcomes of investigations by drawing on prior knowledge. | |
| Make systematic observations. | |
| Draw conclusions based on data and observations. | |
| Raise questions for further investigation. | |
| With increasing independence, report and present conclusions to others in oral and written form. | |
|  | |

Lesson Design

All science lessons follow a similar structure to support pupils in developing a depth of understanding and gives them opportunities to practise key skills.

| Aspect of lesson | Details |
|-----------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Review of previous learning and retrieval practice | - Starter question/questions relating to previous learning. |
| Introduction of learning question | - Learning question introduced |
| Concepts, knowledge, skills, vocabulary | - Success criteria for lesson - Key topic vocabulary |
| Modelling | - Teacher modelling aspects of scientific writing - Modelling of working scientifically skills |
| Guided practice | - Shared scientific writing |




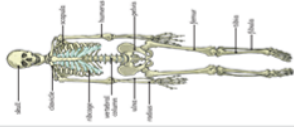
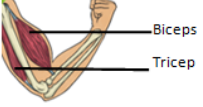






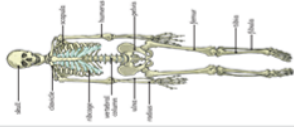
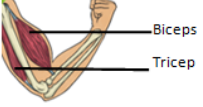









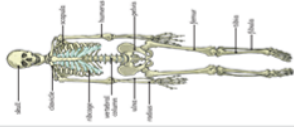
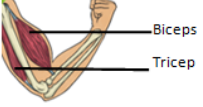
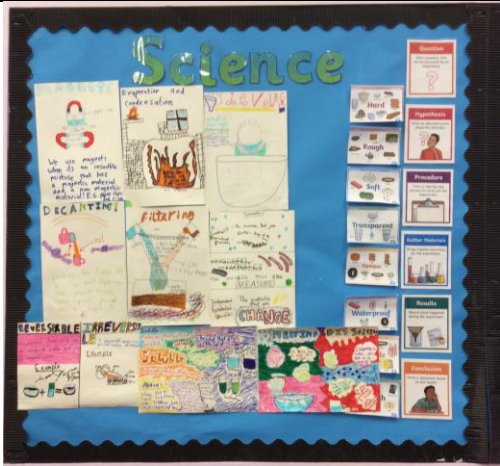
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|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Independent practice (learning tasks) | - A range of tasks dependent on topic being studied. |
| Plans for scaffolding | - Pre-teaching of vocabulary - Support in class from class teacher and LSA to targeted groups - Use of stem sentences - Images to aid understanding - Task organisers - Knowledge organisers |
| | |

Classroom Practice

| | |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Retrieval practice | Review of previous learning during lesson starter Use of mini whiteboards to check understanding |
| Modelling: | Teacher modelling of key scientific skills, where necessary |
| Questioning | Open questions Think, pair, share Opportunity for using key scientific vocabulary |
| Scaffolding: | Prepared by class teacher where necessary |
| Practise | Frequent retrieval of previous key knowledge Continued modelling of how to apply knowledge and working scientifically skills |
| Oracy | Reminder of discussion guidelines Discussion of oracy skills being used in tasks Think, pair, share Use of stem sentences Topic vocabulary |

Adaptive teaching:

The main aim for adaptive teaching within science is providing appropriate and timely scaffolding to allow for all pupils to access the lesson. The table below identifies some of the ways scaffolding is provided during science lessons.

| Year 3 Autumn 2 – Animals including humans—skeletons and nutrition (Biology) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Knowledge organisers and worked examples | <table border="1"> <tr> <th colspan="2">Key knowledge</th> </tr> <tr> <td>Animal diets</td> <td> Carnivore— Meat eating animal Omnivore— Eats both plants and meat Herbivore— Plant eating animal </td> </tr> <tr> <td>Why do animals and humans have skeletons?</td> <td>Skeletons protect the organs inside the body. They allow movement and support the body to stop it from falling on the floor.</td> </tr> <tr> <td>Different types of animal skeletons</td> <td> <table border="1"> <tr> <td>vertebrate endoskeleton</td> <td>invertebrate exoskeleton</td> <td>invertebrate hydrostatic skeleton</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table> </td> </tr> <tr> <td>Names of bones in the human body</td> <td></td> </tr> <tr> <td>Why do humans and animals have muscles?</td> <td></td> </tr> </table> | Key knowledge | | Animal diets | Carnivore— Meat eating animal Omnivore— Eats both plants and meat Herbivore— Plant eating animal | Why do animals and humans have skeletons? | Skeletons protect the organs inside the body. They allow movement and support the body to stop it from falling on the floor. | Different types of animal skeletons | <table border="1"> <tr> <td>vertebrate endoskeleton</td> <td>invertebrate exoskeleton</td> <td>invertebrate hydrostatic skeleton</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table> | vertebrate endoskeleton | invertebrate exoskeleton | invertebrate hydrostatic skeleton |  |  |  | Names of bones in the human body |  | Why do humans and animals have muscles? |  | <table border="1"> <tr> <th>What have you learnt this term?</th> </tr> <tr> <td>I can explain how living things obtain food.</td> </tr> <tr> <td>I can compare and group animals by their diet.</td> </tr> <tr> <td>I can name the different bones in a human skeleton.</td> </tr> <tr> <td>I know why animals and humans have skeletons.</td> </tr> <tr> <td>I can explain why animals have different types of skeletons.</td> </tr> <tr> <td>I can explore how my muscles work.</td> </tr> <tr> <td>I know why humans and animals have muscles and the structure of them.</td> </tr> <tr> <td>I can explain how skeletons and muscles support, protect and enable movement for animals.</td> </tr> <tr> <th>Working scientifically</th> </tr> <tr> <td>1. Ask scientific questions</td> </tr> <tr> <td>3. Make observations systematically</td> </tr> <tr> <td>6. Draw conclusions from results</td> </tr> <tr> <td>8. Use results to answer scientific questions</td> </tr> </table> | What have you learnt this term? | I can explain how living things obtain food. | I can compare and group animals by their diet. | I can name the different bones in a human skeleton. | I know why animals and humans have skeletons. | I can explain why animals have different types of skeletons. | I can explore how my muscles work. | I know why humans and animals have muscles and the structure of them. | I can explain how skeletons and muscles support, protect and enable movement for animals. | Working scientifically | 1. Ask scientific questions | 3. Make observations systematically | 6. Draw conclusions from results | 8. Use results to answer scientific questions |
| | Key knowledge | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Animal diets | Carnivore— Meat eating animal Omnivore— Eats both plants and meat Herbivore— Plant eating animal | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Why do animals and humans have skeletons? | Skeletons protect the organs inside the body. They allow movement and support the body to stop it from falling on the floor. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Different types of animal skeletons | <table border="1"> <tr> <td>vertebrate endoskeleton</td> <td>invertebrate exoskeleton</td> <td>invertebrate hydrostatic skeleton</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table> | vertebrate endoskeleton | invertebrate exoskeleton | invertebrate hydrostatic skeleton |  |  |  | | | | | | | | | | | | | | | | | | | | | | | | | | |
| vertebrate endoskeleton | invertebrate exoskeleton | invertebrate hydrostatic skeleton | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  |  |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Names of bones in the human body |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Why do humans and animals have muscles? |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| What have you learnt this term? | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I can explain how living things obtain food. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I can compare and group animals by their diet. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I can name the different bones in a human skeleton. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I know why animals and humans have skeletons. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I can explain why animals have different types of skeletons. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I can explore how my muscles work. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I know why humans and animals have muscles and the structure of them. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| I can explain how skeletons and muscles support, protect and enable movement for animals. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Working scientifically | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1. Ask scientific questions | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3. Make observations systematically | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6. Draw conclusions from results | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8. Use results to answer scientific questions | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Task organisers | <p>Now:</p> <p><i>Write prediction using stem sentences</i></p> <p>Next:</p> <p><i>Collect equipment ready for experiment.</i></p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Physical Resources | <p>Mini whiteboards, writing equipment, word banks.</p> <p>Range of scientific equipment from resource cupboard which is organised into topic areas.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Visual supports |  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adult support | <p>Class teacher</p> <p>LSA supporting targeted group/individuals</p> <p>Pre-teaching of key vocabulary</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Additional intervention

For some pupils, additional support is required to support the development of pupils science understanding. The below table identifies the types of additional intervention that may be provided. This provision is planned with support from the SENCo.

| | |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-teaching of vocabulary | Scaffolding and increased vocabulary knowledge for different contexts Intervention group run by LSA Topic related scientific vocabulary |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|

Support for teachers:

| | |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Subject knowledge | https://www.reachoutcpd.com/ https://edu.rsc.org/primary-science/boost-your-knowledge#develop https://educationendowmentfoundation.org.uk/education-evidence/evidence-reviews/primary-science https://explorify.uk/ |
| Pedagogy | https://edu.rsc.org/primary-science/boost-your-knowledge#content https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study/national-curriculum-in-england-science-programmes-of-study |