

Barrow CEVC Primary School

Inspire, Create, Discover, Together

SCIENCE IMPLEMENTATION



Science - Implementation

Modular Approach – Knowledge

At Barrow Primary School, Science is taught across each year group in modules that enable pupils to study in depth key scientific understanding, skills and vocabulary. Each module aims to activate and build upon prior learning, including EYFS, to ensure better cognition and retention. Each module is carefully sequenced to enable pupils to purposefully layer learning from previous sessions to facilitate the acquisition and retention of key scientific knowledge. Each module is revisited either later in the year or in the following year as part of a spaced retrieval practice method to ensure pupils retain key knowledge and information.



Scientific Enquiry

As well as ensuring pupils are taught key knowledge, each module is designed to offer pupils the opportunity to undertake scientific enquiries and develop their skills as a Scientist in asking questions, planning and carrying out experiments, collecting and analysing information and drawing conclusions.

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Asking simple questions and and recognising recognising that that they can be be answered in in different ways ways	Observing closely, closely, using simple equipment equipment	Performing simple simple tests	ldentifying and and classifying classifying	Using their observations and and ideas to suggest answers answers to questions	Bathering and and recording data to help in in answering questions	Plan enquiries, including recognising and controlling variables where necessary	Use appropriate techniques, apparatus, and materials during fieldwork and laboratory work	Take measurements, using a range of scientific equipment, with increasing accuracy and precision	Record data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, bar and line graphs, and models	Report findings from enquiries, including oral and written explanations of results, explanations involving causal relationships, and conclusions	Present findings in written form, displays and other presentations	Use test results to make predictions to set up further comparative and fair tests	Use simple models to describe scientific ideas, identifying scientific evidence that has been used to support or refute ideas or arguments
Example of a Key Stage 1 Module							Exa	mple of	a Upp	er Key	Stage	2 Modu	ile



Science - Implementation

Cumulative Quizzing (Supporting Cognitive Load)

At the start of each module, pupils undertake a short quiz, using platforms such as Socrates, to establish prior knowledge and understanding of the module content. Throughout each module pupils continually revisit previous content to reinforce key knowledge and vocabulary. At the end of the module, pupils take another quiz to check their understanding and knowledge.

Example of Kno	wledge Organiser	and Quizzi	ng Sequen	Ce										
Cumulative quizzing Each session pupils practice retrieving and remembering previous content. This is part of the provision to help pupils remember the content, not as an add on.														
		Q1	Q1 & 2	Q1 to 3	Q1 to 4	Q1 to 5	Q1 to 6	Q1 to 7	Q1 to 8	Qí to 9	Q1 to 10			
Knowledge organiser organiser	Vital Vocabulary					Knowled	ge notes					Spaced Practice Quiz		
To communicate; bring core knowledge to the mind; make concepts and vocabulary visible using diagrams, definitions and simple explanations	To help practice and define essential vocabulary. A reference point to check back and elaborate with			Know They su Knowledge note: Knowledge note:	iledge notes are t pport vocabulary Ωuestions s elaborate and co es should be clear	he elaboration and and concept acqu can be introduced ommunicate vocab r. precise and not	d detail to help pu visition through a at the beginning vulary and concept overloaded with t	vils acquire the co well-structured se of a session ts in a sequence th ext or small, hard	intent equence hat is cumulative to read images			Revisiting vocabulary and concepts will ease the forgetting curve Try revisiting end content monthly using the original quizzes.		
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Example of module sequence and overview

Planning

All modules have a sequenced overview outlining recommended number of sessions, key concepts, knowledge and vocabulary to be taught. Teachers use this overview to plan individual sessions approximately 45-50 minutes in length. All planning is produced on using or Discovery Planning template which incorporates cooperative learning techniques, key vocabulary, core concepts and a class profile to enable all teaching staff to effectively plan and support the needs of all pupils in the classroom.



Knowledge Organisers and Knowledge Notes

Accompanying each module is a Knowledge Organiser which contains key vocabulary, information and concepts which all pupils are expected to understand and retain. Knowledge notes are the elaboration and detail to help pupils acquire the content of each module. They support vocabulary and concept acquisition through a well-structured sequence that is cumulative. Each Knowledge Note begins with questions that link back to the cumulative quizzing, focussing on key content to be learnt and understood. Knowledge Organisers and Knowledge Notes are dual coded to provide pupils with visual calls to aid understanding and recall.

Knowledge Organisers and Knowledge notes are referenced throughout each module and copies of the Knowledge Organiser are sent home to families to support with home learning. In addition, pupils can access at home key



Year 1 Knowledge note



Year 5 Knowledge Organiser



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Accompanying each learning question is a knowledge note which contains key vocabulary, information and concepts which all pupils are expected to understand and retain.

Our dual coded knowledge notes are a valuable resource in the teaching of substantive knowledge and vocabulary acquisition.

Our editable knowledge notes enable us to make reasonable adjustments, which are bespoke to the learner, to ensure that all pupils are able to access the curriculum.



Progression of Disciplinary Knowledge







Reading

In our History curriculum we encourage pupils to access high quality texts to support their learning and develop their skills in accessing information from a range of sources. Teachers model reading historical texts and pupils spend time partner reading or reading independently to acquire knowledge or deepen their understanding.

All children have access to the 'Curriculum Visions' website, which is a digital library with a range of high quality texts tailored to our curriculum. Children are provided with opportunities to extend their learning, or carry out pre-reading tasks about their current unit of learning. We believe this helps to raise the profile of our foundation curriculum, by actively involving parents in supporting their children's learning and development at home.

Vital Vocabulary – words we love and talk about Science: Y6 - Animals, including humans						
Word	What it means ?	Clue				

Vocabulary

Vocabulary forms a key part of our wider curriculum. Subject specific Tier 2 and Tier 3 words are incorporated in each module and pupils are encouraged to develop their own 'Vital Vocabulary' lists along with dual coding to expand their science vocabulary repertoire.

Oracy

When discussing their findings or presenting information, pupils are encouraged to speak using full sentences and incorporating the key subject vocabulary.

Our curriculum allows a opportunities for children to acquire skills which they may not have acquired at home: skills which we believe will help them to take up further educational opportunities.

	Aca	demic and elabor	ative vocabulary (T	ïer 2)	
 suspended	being held in a	bulk of fluid	de-	means the 'removal of the thing'	
occur	something take	es place	<mark>de</mark> oxygenated	means removal of oxygen	
 dispose	to throw away;	discard	composition	the way something is put together	
mesh	a structure or fo joined (interlace	ormation that is ed)	impedes	prevent; stop or hinder	
anatomy	the science of b	oodily structure	propelled	push something forward	





Writing

Pupils are encouraged to write across all areas of the curriculum and teachers model how to write purposefully in each subject using key structures and vocabulary. Pupils are encouraged to use their Science curriculum books as reference books, using previous work, knowledge organisers and knowledge notes.



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Resources

All Science modules are underpinned by high quality texts which support wider curriculum reading. Unity Schools Partnership are working closely with Curriculum Visions to ensure our subject content has supporting materials which can be accessed by pupils in school and at home.



Curriculum Visions - online books and interactive resources.

As well as our own school library and online resources,, we also access STEM boxes through West Suffolk College and the local library and enable children to broaden their scientific understanding and curiousity through educational visits e.g. The Cambridge Science Centre.

KS1: EVERYDAY MATERIA	ALS					
INTRODUCTION TO MATERIALS	Containing containing a broad selection of different items made from different materials, the activity is designed to introduce children to the concept of 'material' and challenges them to group materials by given criteria and criteria of their own design.					
SAME ITEM, DIFFERENT MATERIAL – GLOVES	This activity is designed to demonstrate to children that the same term, a glove, may be made of different materials, to give it different properties. They are asked to design and use tests to identify which glove is best at fulfilling a number of oriteria. In carrying out the tests, they will demonstrate to themselves that when choosing a material	Exfindout! E Subjects ·	I want to find out about.	۹.	Are you a parent or	teacher? • Books
	need it to exhibit.		d and a second s			
CHANGING SHAPE	This box contains a selection of materials that may or may not change shape. This activity allows children to find out how the shapes of solid objects may change with the actions they apply, such as squashing, bending, twisting and stretching. The children use a table to collect their	Mammals		P		0
	data.	Furry, warm-blooded mammals live all around	1 11	ALAF	A A	1 1 1 1 A
HOUSE BUILDING	The children are challenged to build a model house to resist the 'rain' (a water spray gun). They draw, label and make predictions about the materials they have chosen, create their houses and test them, recording their results and discussing their findings.	the world, from the driest deserts to the		Mammals and their		
		wettest forests. Many mammals have a hairy	Hoofed mammals	young	Types of mammal	What is a mammal?
		coat that keeps them warm in cold places.				
CLEANING COPPER	This box contains a selection of household materials that may be used to clean copper pennies, and others that will be ineffactive. The children will make predictions about which material will best clean the pennies; they may measure out the various liquids and make observations of their results and record them.	Others swim in the oceans and have hardly any				
PENNIES		fur at all. Mammals have large brains for their				
		size and are among the cleverest animals on				
JELLY & ICE CREAM This activity has been written for KEY STAGE 1 although "States of Matter" and	This activity can draw on the "CHANGING SHAPE" activity (changing the shape of various everyday materials by applying an action/force eg. bending, twisting etc). In this activity the children apply an action/force by shaking the loe cream and mixing the jelly, but these actions alone will not produce the tasty treat ware a iming for. How need to	many things from finding food to raising a				
		family. We as humans have a special hond				
the use of temperature to influence them does not come into the national curriculum for Science until KEY STACE 2. Year 4		with mammals. This is because human beings				
to opened the re rainer a, That 4,	adjust the temperature.	are mammals too				
		are mammals, too.				

West Suffolk College STEM boxes

Dorling Kindersley Online



IMPLEMENTATION

A menu of disciplinary knowledge tasks accompany each learning

question. Teachers select at least one task that will consolidate and elaborate pupil understanding relating to the teaching of the knowledge note.

These disciplinary knowledge tasks are only completed after the explicit instruction of the content in the knowledge note.

These tasks provide relevant and sophisticated CHALLENGE for pupils to think hard about the content – creating coherent long-term memory.

We refer these tasks as 'thinking scientifically tasks'.

Year 2 Living things and their habitats
Q3 Where do plants and animals live?
Listing
Review the meaning of <i>macro</i> (large scale) and <i>micro</i> (small scale). Give pupils an example of a macrohabitat (e.g. a desert) and a microhabitat (e.g. a rockpool). Work as a class to add other habitat types to each list. Organise pupils into groups. Give each group the name of one of the microhabitats and one of the macrohabitats listed. Can they identify any species of animal that live there? Share ideas. This task could then be repeated for plants. Challenge: Animals have to have special habitats but plants can grow anywhere. Ask pupils whether they agree or disagree with this statement.
Predicting C Exploring 2 IPROF
could be found in the school (or alternative) grounds, e.g. woodlice, worms etc. For each species, ask pupils to predict the habitat where it is likely to be found, giving reasons. After reminding pupils about taking care when looking for creatures (e.g. replacing large stones / logs gently), go outside and allow pupils to explore potential microhabitats. List or take photographs of the species found. Pupils then compare this information with their predictions.
Deducing 🕑 Concluding 🕬
Based on where they found various species in the previous task, can pupils deduce the preferred habitat for each? For example, if a woodlouse was found under a stone, can we deduce that they like dark, sheltered places? What if this was just one rogue woodlouse – is this sufficient evidence to reach a conclusion? Elicit from pupils that more than one case is needed to draw a conclusion. Challenge: Using woodlice as an example, how could pupils find out which conditions they prefer through scientific enquiry?
Suggesting 📌
Using a habitat familiar to pupils, such as a woodland, ask: What would happen to the animals that live there if all the plants were removed (and vice versa)? Link this to the issue of habitat loss, locally or globally, and the impact this has on the natural world.
Questioning P IPROF
If pupils could ask one question only about a species found in Task 2, what would it be? If appropriate, allow them to use

reference materials to find out the answer.



Continuous Professional Development

All staff have undergone CPD in Cognitive Load Theory, Spaced Practice Retrieval Theory and planning the wider curriculum which has supported the development of a modular wider curriculum.

In addition, staff have been trained in the Theory of Reading which emphasises the importance of teaching reading across all subjects and how to teach vocabulary – including etymology and morphology.



Teachers are encouraged to develop their subject knowledge by accessing resources in school and online including Reach Online CPD and using recommended Primary Science materials.

Further training is scheduled to support teachers to plan and facilitate effective science investigations and how to assess and monitor scientific knowledge and understanding.





