



## Science Approach Angel Oak Academy

### A knowledge-based curriculum

Our science curriculum at Angel Oak Academy is based on knowledge. Science teaching is built on the understanding that you cannot work scientifically without knowledge: you cannot write a prediction on shadow sizes without knowledge of how light travels or the opaque properties of materials; you cannot explain the celery in food dye changing colour without prior knowledge of transpiration; or you cannot conclude an investigation on the speed of sound through solids, liquids and gasses without knowledge of particle structure.

At Angel Oak Academy, we equip our children with knowledge, which precedes opportunities for application. By explicitly teaching the children the knowledge first, we build semantic memory (memory of facts or concepts) void of misconceptions, rather than episodic memory (memory of experience) filled with misconceptions that arise from allowing children to discover science for themselves.

### Planning

With our knowledge first curriculum, our teachers break down the Key Learning Indicators (KLIs) into small steps in the learning sequence on Medium Term Plans (MTPs). The learning steps are progressive to ensure that each small chunk of knowledge gradually builds on previous learning; this strategy allows the children to build on existing schemas, making links with stored knowledge and reducing the cognitive load on working memory.

Alongside MTPs, teachers create Knowledge Organisers where the fundamental knowledge is well organised to allow children to test their knowledge. The teachers commit to ensuring their class know the facts by the end of the topic. In order to ensure this knowledge remains in their long-term memory, the facts are continually revisited through quizzing and quadrants to allow spaced retrieval and memory retention. This resource is used in school and at home.

### Assessment

The knowledge organisers form an important part of assessment in science. They hold the key facts we want our children to know, and therefore, these are the key facts that we quiz them on in every lesson, and continue to quiz them on even when a new topic is being covered. This assessment may take place through low-stakes quizzing or through quadrants where the children begin the lesson revisiting previous learning. The outcomes of these formative assessment opportunities inform planning and teaching to address unlearnt knowledge or misconceptions. Learning is not linear and takes time to embed into long-term memory. Forgetting is part of the learning process so teaching sequences are reviewed, repeated, revised and reassessed for teachers to know that the knowledge and understanding has truly been learned.

Furthermore, when the children are secure in their scientific knowledge, teachers provide pupils with the opportunity to reason. Reasoning can occur orally or through written outcomes, and these tasks are an effective assessment tool to identify the depth of understanding. Any issues that arise are addressed through feedback at the point of learning, marking or through whole class feedback in the next lesson.

### Reading

Reading is regularly incorporated into science lessons. Short extracts are prepared to pre-teach new concepts and tier 3 vocabulary in context, whilst also providing opportunities to consolidate previous learning. By engaging in whole class reading of high-quality texts in lessons, we are exposing the children to factual, concise scientific writing which is vital for improving their own writing in science. These reading extracts are then used as a resource to refer back to within the lesson.

## Writing

Science knowledge is hierarchical with many strong links between concepts. Experts of a subject have well-organised knowledge and are able to make and explain links in science. We explicitly teach children how to craft and re-draft sentences to equip them with the skills needed to explain relationships between concepts. By providing word banks (tier 3 vocabulary and conjunctions), we reduce some of the cognitive load, allowing our children to focus on writing clear and concise sentences.

Writing in science is an effective assessment tool. It provides an opportunity to explore what pupils are thinking and why they are thinking it; this allows teachers to be able to truly understand the depth of understanding of a concept. If they can explain the concept in prose, they know it.