THE CREATIVE LEARNING PARTNERSHIP TRUST

Purpose:

Our Trust exists to create transformational educative opportunities in a shared culture of collaboration.

Science - Conception of Quality

The study of science over thousands of years is helping us to understand our world. Building knowledge and skills in Biology, Chemistry and Physics provides unique insights to how and why all things are as they are. Scientists find things out by using conventions and agreed ways of working - they enquire in special ways and apply specific skills.

Contents

* This document sets out our shared '**conception**' of effective science teaching.
* It draws upon our collective expertise and is **evidence/research informed.**
* It references insights from Ofsted, the DfE, the EEF and other organisations invested in research and 'best bets'.
* This is not an exhaustive list of factors that can create quality!
* Our key reference points for statutory requirements are: The National Curriculum, The Ofsted handbook / research and reports /& SEND COP.

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The Curriculum - what we want children to learn

Key curriculum thoughts:

⇒ The science curriculum is a careful interplay between **substantive** and **disciplinary** knowledge - the two areas increasingly combine over time.

⇒ Children should foster an interest and curiosity in the world around them as a result of learning the curriculum. We want children to **think** and **work** like scientists.

⇒ A study of science involves learning things that children might not ordinarily encounter in daily life - it is a source of **cultural capital**.

⇒ **CONCEPTS** - science has four broad concepts that help us organise learning: Biology, chemistry, physics and working scientifically.

Substantive Knowledge

Plans should identify the **repeated encounters** that children have with different content within each of the substantive concepts. For example, in **Biology**, animals are taught through all year groups; in **chemistry**, states of matter are taught in EY, Years 4 and 5 and Key Stage 3; in **physics** , forces and magnets are taught in Years 4 and 5 and Key Stage 3. **Misconceptions** should be prevalent in all planning and carefully explored. Correcting misconceptions is complex and children may quickly revert back to earlier held beliefs - for this reason - retrieval and interleaving are key.

Biology - the study of living things - how they work and interact with their environment.

⇒ Children learn about plants, animals, habitats, evolution and a wider range of content at key stage 3 e.g. cellular respiration.

Example misconception…
'The blood in our veins is blue' - the colour of veins as seen through paler skin and some diagrams in text books reinforce this.

Chemistry - materials, their properties and how they change.

⇒ Children learn about rocks, materials, and states of matter. Study expands into atoms, compounds, energetics and the periodic table in key stage 3.

Example misconception…
'Particles in a liquid are further apart than particles in a solid' - in fact the arrangement of particles is just less ordered - particles remain touching.

Physics - how the world works - the relationship of objects, forces and energy.

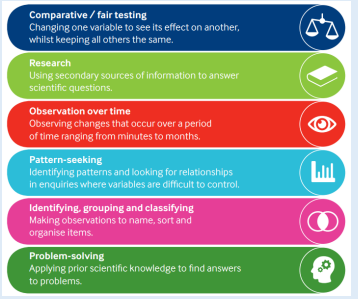
⇒ Children learn about forces, seasonal changes, electricity, light, earth and space and sound. Study expands into energy, matter and space physics in key stage 3.

Example misconception…
'The moon is a source of light' - the moon is instead a good reflector of the sun's rays.

Disciplinary Knowledge

Working scientifically:

There are 6 **types of enquiry**:



… and a range of **enquiry skills** that help us when we are learning about science.

Asking questions., making predictions, setting up tests, observing and measuring, recording data, interpreting and communicating results, and evaluating.

Pedagogy - how we help children to learn

We use Rosenshine's principles of instruction to help guide our approach to teaching (image reproduced here from Tom Sherrington).

Review - 'the most important single factor influencing learning is what the learner already knows' (Ausubel) - this should be the overriding thought as teachers plan for Science. Activating relevant prior learning is crucial.

Questioning - we need to ask lots of questions in depth and encourage children to structure their own thinking and questioning around the enquiry types and skills. Emphasis on working scientifically will be more prominent in key stage 2 and 3.

Sequencing concepts and modelling - 'memory is the residue of thought' (Willingham) - thinking carefully about what children 'attend to' is the secret to remembering. Well designed activities, that are appropriately sequenced and chunked are important. There should be ample practice at every stage. Clear worked examples (modelling) and structures and supports to manage cognitive load (scaffolds) help children journey from novice to expert. 'Practical' experiments are not the curriuclum or a proxy for ensuring engagements - they are an integrated part of each programme of study.

Proficiency requires **Practise** - practice through different stages from guided to independent as children build automaticity.

Adaptive teaching - teachers are alert to the '**demands that learning places on memory**' and they make changes to their approach accordingly.

Assessment - checking what children have learnt

Effective assessment is based upon a strong knowledge of its purpose and the intended curriculum

Assessment is understood in three ways: '**for**', '**of**' and '**as**'. There is considerable overlap between each approach…

Assessment for learning (formative) involves providing feedback for practitioners and children that is used to improve teaching and learning. It is used in an 'live' way to adapt the curriculum e.g. checking that misconceptions are not prevalent in a child's thinking as they are introduced to new content.

Assessment of learning (summative) identifies when specific curriculum goals/end points have been achieved - it is less frequent than AfL and has limitations as it often provides more limited information about children's security with smaller steps e.g. end of key stage tests such as SATs.

Assessment as learning (the testing effect) draws on the cognitive principle that children are likely to remember knowledge that they re-encounter and retrieve from their long term memory e.g. providing planned opportunities for children to re-encounter scientific words and use them in their speech and writing.

Assessment discussions should particularly focus on the needs of the **lowest attaining pupils** - are they building a sound knowledge of science basics?

Monitoring and Governance

Monitoring:

⇒ This COQ is used to evaluate the impact of the teaching of science.

⇒ There should be a clear focus to monitoring which utilises the **pupil book study** approach we are learning as a Trust.

⇒ Ideally, a whole school monitoring schedule, aligned to training, should set out the priorities for the year ahead.

Link Governor visits prioritise 3 themes:

1. Discussing the effectiveness of science with leaders (with reference to this COQ, the local action plan and outcomes).
2. A focus on the security of **substantive and disciplinary knowledge with a focus on misconceptions.**
3. The quality of staff training - what is the impact on teaching? What do children know? What can they do?

SEND and Inclusion

Every teacher is a teacher of SEND.

⇒ Where appropriate and possible, staff should provide pre-teaching and extra practice as children encounter new and/or more complex knowledge

⇒ As much as is possible pupils access the whole science curriculum with appropriate adaptions. Refer to our Trust wide **COQ for SEND.**

Principles for excelling in science:

⇒ The principles within this COQ result in children acquiring increasing fluency in recall of both substantive and disciplinary content.

Resources, Environment & Culture

The environment services the Science curriculum.

⇒ There are dedicated displays that reference and serve to remind children of the substantive and disciplinary content that they are learning.

⇒ The acquisition of vocabulary is carefully thought through - the whole curriculum is discussed and understood by staff.

⇒ Apparatus and resources are readily available for exploring biology, chemistry and physics (& replenished as required).

⇒ Pupils are supported to select ambitious texts that relate to their studies in science and support their growing background knowledge.

Subject Myth Busting

Some common myths about science:

⇒ **You have to be good at mathematics to be good at science.** While there are some important connections between the two subjects, they have their own domain specific knowledge. Being good at any subject simply requires high quality teaching and practice.

⇒ **Learning by doing is more effective than being told.** Science lessons are not just about fancy experiments! Children must gain sufficient substantive knowledge in the first instance - working scientifically isn't the exciting part - **gaining knowledge is the exciting part.**

⇒ Science is an important part of the foundation curriculum. It isn't - **it is core**. It's core because the knowledge and skills are SO important to our development as humans.

Early Years - Firm Foundations

The science curriculum begins in the early years - this is where firm foundations are established:

⇒ Quality interactions lead to effective communication and language which is at the heart of provision.

⇒ The 'understanding the world' curriculum provides the starting point for the whole progression model.

⇒ Planning details the vocabulary (especially tier 2/3 words) that children will be introduced to. There are opportunities for children to practice and use the words they learn. This creates readiness for Key stage 1 and beyond.

Research, reading and Staff CPD

This document, and practice within provision, are informed by:

Ofsted research review and subject report
Rosenshine's principles of instruction
researchED series
Association for Science Education
National Curriculum
Primary Science Teaching Trust

You can find out more about our curriculum for leaders and teachers of English at:

Creative Learning Hub.

Our Trust Vision:

Our vision for pupils:	Our vision for people:	Our vision for communities:
Strong attendance and outcomes for all. Freedom and Justice. A knowledge rich curriculum. Research/evidence informed teaching.	Collaboration and kindness. Opportunities to develop and learn. A focus on wellbeing and workload.	Schools at the heart of the community they serve. A range of benefits to support families and vulnerable groups. Ongoing support as pupils transition to their next school and beyond.

Our Trust Values:

Integrity: Courage to do the right thing for the child.	**Collaboration**: Working together, enabling each other.	**Dedication**: Committed to supporting and improving.
Kindness: Acting with compassion	**Understanding (Openness)**: Listening and valuing one another	**Innovation & Creation**: Using expertise and research to transform.