Year 4

Paul Shanks & Peter Howard

Knowledge Curriculum Outline

Year 4



EMAT Science Knowledge Based Curriculum

**Introduction**

Current events and technology are constantly changing, but there remains a significant body of enduring knowledge and skills that form the foundation of a strong curriculum. The EMAT Knowledge Based Curriculum is based on these foundations and has its values of ***Empower***, ***Motivate***, ***Aspire*** and ***Transform*** running throughout its spine.

As Leesa Wheelahan states within her book, Why Knowledge Matters in Curriculum: A Social Realist Argument. New Studies in Critical Realism and Education, “…providing students with access to knowledge should be the *raison d'etre* of education. Its premise is that access to knowledge is an issue of social justice because society uses it to conduct its debates and controversies.”

The Core Knowledge Partnership further adds, “All children should be able to unlock the library of the world's literature; to comprehend the world around them; to understand where they stand (literally) on the globe, and to realise the heritage that the history of their country has bestowed on them. In order to achieve this, it is important for every child to learn the fundamentals of mathematics; basic principles of science; theories and structures of government; significant events and themes from history; masterpieces of art, music and literature from around the world; and stories and poems that have been passed down through the generations.”

The core material within the EMAT curriculum is based upon the materials available from the Core Knowledge Partnership.

By explicitly identifying what children should learn in each academic year, it is possible to ensure a coherent approach to developing cumulative knowledge across all school years, making the most efficient and effective use of teaching time.”

The EMAT curriculum is deliberately focused on the development of language and vocabulary. Vocabulary is essential to understanding the content taught in our academies and being able to articulate the knowledge that lies within. As Iman (2009) states, “An abundance of research supports the connections between vocabulary, particularly academic vocabulary and reading comprehension”.

Iman’s statement should come as no surprise to those working within an EMAT academy and as such an overarching aim of the Knowledge curriculum is to be able to empower and motivate children to become lifelong learners and aspire to be the very best that they can be and transform their life chances through an enriched experience every day at school.

**Information on this document**

Within the following pages you will find the knowledge overview for the Year 4 Curriculum. This document outlines the knowledge that should be taught in Science across the year. Academies are free to design their topic and themes as long as these have the EMAT knowledge embedded within it.

The document provides some core vocabulary that must be taught alongside the knowledge but academies are free to add their own to this. This is not an exhaustive list but the minimum required.

**Knowledge Organisers**

What are Knowledge Organisers? Knowledge Organisers are sets of key facts or information that pupils must know and be able to recall in order to master any given unit of work. Typically, a Knowledge Organiser will fit on a single sheet of A4 or A3 and will be provided to the pupils to support their learning but can also support home learning.

Knowledge Organisers should contain the core vocabulary and knowledge that the children are expected to learn as part of their topic or unit. Across the academy it is important that each Knowledge Organiser is laid out in the same fashion to support the visualising of the information and memory retention.

There are a multitude of Knowledge Organisers available online, as well as templates for academies to formulate their own.

|  |
| --- |
| **YEAR 4** |
| **Science** | **Vocabulary** | **Cultural Capital** |
| **INTRODUCTION TO CLASSIFICATION OF ANIMALS*** Scientists classify animals according to the characteristics they share, for example:
* Cold-blooded or warm-blooded Vertebrates (have backbones and internal skeletons) or invertebrates (do not have backbone or internal skeletons)
* Different classes of vertebrates
* Teachers: Children should become familiar with examples of animals in each class and some basic
* characteristics of each class, such as:
* Fish: aquatic animals, breath through gills, cold-blooded, most have scales, most develop from eggs
* that the female lays outside her body
* Amphibians: live part of their life cycle in water and part on land, have gills when young, later
* develop lungs, cold-blooded, usually have moist skin
* Reptiles: hatch from eggs, cold-blooded, have dry, thick, scaly skin
* Birds: warm-blooded, most can fly, have feathers and wings, most build nests, hatch from eggs,
* most baby birds must be fed by parents and cared for until they can survive on their own (though
* some, like baby chickens and quail, can search for food a few hours after hatching)
* Mammals: warm-blooded, have hair on their bodies, parents care for the young, females produce
* milk for their babies, breathe through lungs, most are terrestrial (live on land) though some are aquatic
 | ClassifyClassificationCold bloodedWarm bloodedVertebrateInvertebrateAquaticGillsEggsScalesAmphibiansReptilesMammalsTerrestrial |  |
| **II. ECOLOGY**Teachers: Some topics here, such as habitats, were introduced in Year One. In this year, these topics will be covered in more detail and new areas will be studied.* Habitats, interdependence of organisms and their environment
* The concept of a ‘balance of nature’ (constantly changing, not a static condition)
* The food chain: producers, consumers, decomposers
* Ecosystems: how they can be affected by changes in environment (for example, rainfall, food supply, etc.) and by man-made changes
* Fossils and how they can tell us about the environment long ago
* Man-made threats to the environment
* Air pollution: emissions, smog
* Water pollution: industrial waste, run-off from farming
* Measures we can take to protect the environment (for example, conservation, recycling)
 | HabitatsInterdependenceEnvironmentOrganismFood chainProducersConsumersDecomposersPreyPredatorEco SystemPollutionEmissionsRecyclingConservationSmog |  |
| **III. THE HUMAN BODY: SYSTEMS, VISION AND HEARING**1. **THE MUSCULAR SYSTEM**
* Muscles
* Involuntary and voluntary muscles
1. **THE SKELETAL SYSTEM**
* Skeleton, bones, marrow
* Musculo-skeletal connection
* Ligaments
* Tendons, Achilles tendon
* Cartilage
* Skull, cranium
* Spinal column, vertebrae
* Joints
* Ribs, rib cage, sternum
* Scapula (shoulder blades), pelvis, tibia, fibula
* Broken bones, X-rays

**C. THE NERVOUS SYSTEM*** Brain: medulla, cerebellum, cerebrum, cerebral cortex
* Spinal cord
* Nerves
* Reflexes

**D. VISION: HOW THE EYE WORKS*** Parts of the eye: cornea, iris and pupil, lens, retina
* Optic nerve
* Farsighted and near-sighted

**E. HEARING: HOW THE EAR WORKS*** Sound as vibration
* Outer ear, ear canal
* Eardrum
* Three tiny bones (hammer, anvil and stirrup) pass vibrations to the cochlea
* Auditory nerve
 | MusclesInvoluntaryVoluntarySkeletal systemSkeleton, bones, marrow, ligaments, tendons, Achilles tendon, cartilage, skull, cranium, spinal column, vertebrae, ribs, rib cage sternum, scapula, pelvis, tibia, fibula, x-rayBrainMedullaCerebellumCerebrumCerebral cortexSpinal cord, nerves, reflexesVisionCornea, Iris, Pupil, lens, retina, optic nerve, near sighted, Myopic, far sighted HypermetropiaVibrationOuter earEar canalEardrumHammer, anvil, stirrup, cochlea, auditory nerve |  |
| **IV. LIGHT AND OPTICS**Teachers: Through experimentation and observation, introduce children to some of the basic physical* phenomena of light, with associated vocabulary.
* The speed of light: light travels at an amazingly high speed.
* Light travels in straight lines (as can be demonstrated by forming shadows).
* Transparent and opaque objects
* Reflection
* Mirrors: plane, concave, convex
* Use of mirrors in telescopes and some microscopes
* The spectrum: use a prism to demonstrate that white light is made up of a spectrum of colours.
* Lenses can be used for magnifying and bending light (as in magnifying glass, microscope, camera,
* telescope, binoculars).
 | LightOpticTransparentOpaqueTranslucentReflectionPlaneConcaveConvexTelescopeMicroscopePrismSpectrumWhite lightLensMagnifyCameraBinoculars |  |
| **V. SOUND**Teachers: Through experimentation and observation, introduce children to some of the basic physical phenomena of sound, with associated vocabulary.* Sound is caused by an object vibrating rapidly.
* Sounds travel through solids, liquids and gases.
* Sound waves are much slower than light waves.
* Speed of sound: Concorde
* Qualities of sound
* Pitch: high or low, faster vibrations = higher pitch, slower vibrations = lower pitch
* Intensity: loudness and quietness
* Human voice
* Larynx (voice box)
* Vibrating vocal chords: longer, thicker vocal chords create lower, deeper voices
* Sound and how the human ear works
* Protecting your hearing
 | VibrationsSound wavePitchLoud QuietLarynx |  |
| **VI. ASTRONOMY*** The ‘Big Bang’ as one theory
* The universe: an extent almost beyond imagining
* Galaxies: Milky Way and Andromeda
* Our solar system
* Sun: source of energy (heat and light)
* The nine planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto [Note that, in 2006, Pluto was classified as a dwarf planet]
* Planetary motion: orbit and rotation
* How day and night on Earth are caused by the Earth’s rotation
* Sunrise in the east and sunset in the west
* How the seasons are caused by the Earth’s orbit around the sun, tilt of the Earth’s axis
* Gravity, gravitational pull
* Gravitational pull of the moon (and to a lesser degree, the sun) causes ocean tides on Earth
* Gravitational pull of ‘black holes’ prevents light from escaping
* Asteroids, meteors (‘shooting stars’), comets, Halley’s Comet
* How an eclipse happens
* Stars and constellations
* Orienteering (finding your way) by using North Star, Big Dipper
* Exploration of space, Observation through telescopes

Rockets and satellites: from unmanned flights* Apollo 11, first landing on the moon: ‘One small step for a man, one giant leap for mankind’
* Space shuttle
 | Big BangUniverseGalaxyMilky WayAndromedaSunPlanetsPlanet NamesOrbitRotationSeasonEarth axisGravityBlack holesAsteroidMeteorCometHalley’s CometEclipseConstellationsStarsOrienteeringNorth StarPloughTelescopeRocketSatelliteSpace ShuttleApollo 11 |  |
| **VII. SCIENCE BIOGRAPHIES*** Alexander Graham Bell (invented the telephone)
* Copernicus (had new sun-centred idea about the solar system)
* Galileo Galilei (‘Father of modern science’, provided scientific support for Copernicus’s theory)
* Caroline Herschel (German-British astronomer, discovered several comets, worked with brother William)
* Isaac Newton (English physicist, mathematician, astronomer, natural philosopher and alchemist)
 |  |  |