Year 6

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Knowledge Curriculum Outline

Year 6



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 6 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.

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| **YEAR 6** |
| **Science** | **Vocabulary** | **Cultural Capital** |
| **PLANT STRUCTURES AND PROCESSES**1. **STRUCTURE: NON-VASCULAR AND VASCULAR PLANTS**
* Non-vascular plants (for example: algae)
* Vascular plants
* Vascular plants have tube-like structures that allow water and dissolved nutrients to move
* through the plant
* Parts and functions of vascular plants: roots, stems and buds, leaves
1. **PHOTOSYNTHESIS**
* Photosynthesis is an important life process that occurs in plant cells, but not animal cells (photo =
* light; synthesis = putting together). Unlike animals, plants make their own food, through the process
* of photosynthesis.
* Role in photosynthesis of: energy from sunlight, chlorophyll, carbon dioxide and water, xylem and
* phloem, stomata, oxygen, sugar (glucose)

**C. REPRODUCTION IN PLANTS*** Asexual reproduction
* Example of algae
* Vegetative reproduction: runners (for example: strawberries) and bulbs (for example: onions), growing plants from eyes, buds, leaves, roots, and stems
* Sexual reproduction by spore bearing plants (for example: mosses and ferns)
* Sexual reproduction of non-flowering seed plants: conifers (for example: pines), male and female cones, wind pollination
* Sexual reproduction of flowering plants (for example: peas)
* Functions of sepals and petals, stamen (male), anther, pistil (female), ovary (or ovule)
* Process of seed and fruit production: pollen, wind, insect and bird pollination, fertilisation, growth of ovary, mature fruit
* Seed germination and plant growth: seed coat, embryo and endosperm, germination (sprouting of new plant), monocots (for example: corn) and dicots (for example: beans)
 | Non-VascularVascularPlantsRootsStemsBudsLeavesPhotosynthesisEnergySunlightChlorophyllCarbon DioxideWaterXylemPhloemStomataOxygenSugarAsexualAlgaeVegetativeSporesConiferSepalsPetalsStamenAntherPistilOvaryPollenPollinationFertilisationGerminationMonocotsDicots |  |
| **THE HUMAN BODY: HORMONES AND REPRODUCTION****A. HUMAN GROWTH STAGES*** Puberty
* Glands and hormones (see below, Endocrine System), growth spurt, hair growth, breasts, voice change
1. **THE REPRODUCTIVE SYSTEM**
* Females: ovaries, fallopian tubes, uterus, vagina, menstruation
* Males: testes, scrotum, penis, urethra, semen
* Sexual reproduction: intercourse, fertilisation, zygote, implantation of zygote in the uterus, pregnancy, embryo, foetus, newborn

**C THE ENDOCRINE SYSTEM**The human body has two types of glands: duct glands (such as the salivary glands), and ductless glands, also known as the endocrine glands.* Endocrine glands secrete (give off) chemicals called hormones. Different hormones control different body processes.
* Pituitary gland: located at the bottom of the brain; secretes hormones that control other glands, and hormones that regulate growth
* Thyroid gland: located below the voice box; secretes a hormone that controls the rate at which the body burns and uses food
* Pancreas: both a duct and a ductless gland; secretes a hormone called insulin that regulates how the body uses and stores sugar; when the pancreas does not produce enough insulin, a person has a sickness called diabetes (which can be controlled).
* Adrenal glands: secrete a hormone called adrenaline, especially when a person is frightened or angry, causing rapid heartbeat and breathing.
 | HormonesReproductionPubertyGlandsGrowth spurtHairBreastsOvariesFallopian tubes, Uterus, VaginaMenstruation, Testes, Scrotum, Penis, Urethra, Semen, Sexual Reproduction, Intercourse, Fertilisation, Zygote,Pregnancy, Embryo, Foetus, NewbornEndocrineDuct glandsDuctless glandsSecrete, hormones, pituitary gland, thyroid gland, pancreas (insulin), diabetes, adrenal |  |
| **LIFE CYCLES AND REPRODUCTION**1. **THE LIFE CYCLE AND REPRODUCTION**
* Life cycle: development of an organism from birth to growth, reproduction, death
* Example: Growth stages of a human: embryo, foetus, newborn, infancy, childhood, adolescence, adulthood, old age
* All living things reproduce themselves. Reproduction may be asexual or sexual.
* Examples of asexual reproduction: fission (splitting) of bacteria, spores from mildews, moulds, and mushrooms, budding of yeast cells, regeneration and cloning
* Sexual reproduction requires the joining of special male and female cells
* Vegetative reproduction: runners (for example: strawberries) and bulbs (for example: onions), growing plants from eyes, buds, leaves, roots, and stems
* Sexual reproduction by spore bearing plants (for example: mosses and ferns)
* Sexual reproduction of non-flowering seed plants: conifers (for example: pines), male and female cones, wind pollination
* Sexual reproduction of flowering plants (for example: peas)
* Functions of sepals and petals, stamen (male), anther, pistil (female), ovary (or ovule)
* Process of seed and fruit production: pollen, wind, insect and bird pollination, fertilisation, growth of ovary, mature fruit
* Seed germination and plant growth: seed coat, embryo and endosperm, germination (sprouting of new plant), monocots (for example: corn) and dicots (for example: beans)
1. **SEXUAL REPRODUCTION IN ANIMALS**
* Reproductive organs: testes (sperm) and ovaries (eggs)
* External fertilisation: spawning
* Internal fertilisation: birds, mammals
* Development of the embryo: egg, zygote, embryo, growth in uterus, foetus, newborn

C. **REPRODUCTION IN PLANTS*** Asexual reproduction
* Example of algae
 | ReproductionOrganismAsexualRegenerationCloningFissionBacteriaPollinationGerminationMonocotsDicotsTestes, Ovaries, Fertilisation, Embryo, Egg, Zygote, Uterus, Foetus, newborn |  |
| **CHEMISTRY: MATTER AND CHANGE****A. ATOMS, MOLECULES, AND COMPOUNDS*** Basics of atomic structure: nucleus, protons (positive charge), neutrons (neutral), electrons (negative

charge)* Atoms are constantly in motion, electrons move around the nucleus in paths called shells (or energy

levels)* Atoms may join together to form molecules or compounds.

Common compounds and their formulas:* + Water H2O
	+ Salt NaCl
	+ Carbon Dioxide CO2
1. **ELEMENTS**
* Elements have atoms of only one kind, having the same number of protons. There are a little more than 100 different elements.
* The periodic table: organises elements with common properties
* Atomic symbol and atomic number
* Some well-known elements and their symbols
* Hydrogen H
* Helium He
* Carbon C
* Nitrogen N
* Oxygen O
* Sodium Na
* Aluminium Al
* Silicon Si
* Chlorine Cl
* Iron Fe
* Copper Cu
* Silver Ag
* Gold Au
* Two important categories of elements: metals and non-metals
* Metals comprise about 2/3 of the known elements
* Properties of metals: most are shiny, ductile, malleable, conductive

**C. CHEMICAL AND PHYSICAL CHANGE*** Chemical change changes what a molecule is made up of and results in a new substance with a new molecular structure. Examples of chemical change: rusting of iron, burning of wood, milk turning sour
* Physical change changes only the properties or appearance of the substance, but does not change what the substance is made up of. Examples of physical change: cutting wood or paper, breaking glass, freezing water
 | Atoms, molecules, compoundsNucleus, protons, neutrons and electronsShellsCompoundsFormulae(Water: H20, Salt: NaCl & Carbon Dioxide: CO2)Periodic TableSymbolNameNumberMetalsNon-metalsDuctileMalleableConductiveShinyMolecule, molecular |  |
| **CLASSIFYING LIVING THINGS**Teachers: As the children study animal classifications, discuss: why do we classify? How does classificationhelp us understand the natural world?Scientists have divided living things into five large groups called kingdoms, as follows:* Plant
* Animal
* Fungus (Mushrooms, yeast, mould, mildew)
* Protist (algae, protozoans, amoeba, euglena)
* Prokaryote (blue-green algae, bacteria)

Each Kingdom is divided into smaller groupings as follows:* Kingdom
* Phylum
* Class
* Order
* Family
* Genus
* Species
* Variety

When classifying living things, scientists use special names made up of Latin words (or words made to sound like Latin words), which help scientists around the world understand each other and ensure that they are using the same names for the same living things* Homo Sapiens: the scientific name for the species to which human beings belong to (genus: Homo, species: Sapiens)
* Taxonomists: biologists who specialise in classification
* Different classes of vertebrates and major characteristics: fish, amphibians, reptiles, birds, mammals

**CELLS: STRUCTURES AND PROCESSES**All living things are made up of cells* Structure of cells (both plant and animal)
* Cell membrane: selectively allows substances in and out
* Nucleus: surrounded by nuclear membrane, contains genetic material, divides for reproduction
* Cytoplasm contains organelles, small structure that carry out the chemical activities of the cell, including mitochondria (which produce the cell’s energy) and vacuoles (which store food, water, or wastes)
* Plant cells, unlike animal cells, have cell walls and chloroplasts.
* Cells without nuclei: monerans (bacteria)
* Some organisms consist of only a single cell: for example, amoeba, protozoans, some algae.
* Cells are shaped differently in order to perform different functions.
* Organisation of cells into tissues, organs, and systems:
* In complex organisms, groups of cells form tissues (for example: in animals, skin tissue or muscle tissue; in plants, the skin of an onion or the bark of a tree).
* Tissues with similar functions form organs (for example: in some animals, the heart, stomach, or brain; in some plants, the root or flower).
* In complex organisms, organs work together in a system (recall, for example, from earlier studies of the human body, the digestive, circulatory, and respiratory systems)

**TAXONOMIES**Teachers: Introduce an example of how an animal is classified, in order for students to become familiar with the system of classification, not to memorise specific names. For example, a collie dog is classified as follows:* Kingdom: Animalia
* Phylum: Chordata (Subphylum: Vertebrata)
* Class: Mammalia (mammal)
* Order: Carnivora (eats meat)
* Family: Canidae (a group with doglike characteristics)
* Genus: Canis (a coyote, wolf, or dog)
* Species: Familiaris (a domestic dog)
* Variety: Collie (a breed of dog)
 | ClassificationClassifyGenusSpeciesVarietyPhylumProtistFungusProkaryoteHomo sapienTaxonomistBiologistVertebrateCellsMembraneNucleusReproductionCytoplasmOrganellesMitochondriaVacuolesNucleiBacteriaAmoebaProtozoanAlgaeTissueOrgans |  |
| **SCIENCE BIOGRAPHIES*** Tim Burners-Lee (inventor of the World Wide Web)
* Humphry Davy (chemist and inventor; discovered alkaline earth metals, chlorine and iodine)
* Dorothy Hodgkin (British chemist, confirmed the structures of penicillin and vitamin B12)
* Carl Linnaeus (botanist and ‘Father of taxonomy’ who standardised the classification system)
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