Biology

Biology (age 11-14)
Subject map

Big ideas and key concepts

The **Best Evidence Science Teaching** resources can be used with your existing scheme of work, if desired. However, we have used research evidence on learning pathways and effective sequencing of ideas to develop subject maps for biology, chemistry, earth science and physics.

This subject map shows how five **big ideas** of biology education can be developed through a series of **key concepts**, organised into teaching topics.

Each key concept requires approximately 1-3 lessons' worth of teaching time.

The numbering in the subject map gives some guidance about teaching order based on our review of the research and teaching experience. In general, key concepts that appear earlier in the subject map need to be understood before progression to key concepts that appear later. However, the teaching order can be tailored for different classes as appropriate.

Publication of resources

Teaching and learning resources will be added on a topic-by-topic basis throughout 2018 and 2019.

The resources are being developed based on careful consideration of the best available research evidence on learning pathways, common student misunderstandings, and effective teaching approaches.

To find out when new topics have been published, please email uyseg@york.ac.uk and ask to subscribe to BEST project updates, or follow @BestEvSciTeach on Twitter.

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BIOLOGY (AGE 11-14)

BIG IDEA:

THE CELLULAR BASIS OF LIFE

Organisms are made of one or more cells, which need a supply of energy and molecules to carry out life processes.

Topic BCL1

Cells

Key concepts:

- BCL1.1 Living, dead and never been alive
- BCL1.2 Cells and cell structures
- BCL1.3 Cell shape and size
- BCL1.4 Diffusion and the cell membrane

BIG IDEA:

HEREDITY AND LIFE CYCLES

Genetic information is passed from each generation to the next; this information and the environment affect the features, growth and development of organisms.

Topic BHL1

Inheritance and the genome

Key concepts:

- BHL1.1 Heredity and genetic information
- BHL1.2 The structure and function of the genome

BIG IDEA:

ORGANISMS AND THEIR ENVIRONMENTS

All organisms, including humans, depend on, interact with and affect the environments in which they live and other organisms that live there.

BIG IDEA:

VARIATION, ADAPTATION AND EVOLUTION

Differences between organisms cause species to evolve by natural selection of better adapted individuals. The great diversity of organisms is the result of evolution.

BIG IDEA:

HEALTH AND DISEASE

Organisms must stay in good health to survive and thrive; the health of an individual results from interactions between its body, behaviour, environment and other organisms.

Topic BCL2
From cells to organ systems

Key concepts:

- BCL2.1 Working together – cells, tissues and organ systems
- BCL2.2 Supplying cells – the human circulatory, digestive and gas exchange systems
- BCL2.3 The human skeleton and muscles

Topic BHL2
Changes within an organism's lifetime

Key concepts:

- BHL2.1 Growth
- BHL2.2 Life cycles

Topic BVE1
Variation

Key concepts:

- BVE1.1 Differences within species
- BVE1.2 Changes in species over time – fossil evidence

Topic BVE2
Classification

Key concepts:

- BVE2.1 Identifying and classifying organisms

Topic BHD1
What are health and disease?

Key concepts:

- BHD1.1 Good and ill health
- BHD1.2 Disease

Topic BHD2
Human lifestyles and health

Key concepts:

- BHD2.1 Diet and exercise

Topic BCL3
Biochemistry

Key concepts:

BCL3.1 Plant nutrition and photosynthesis

BCL3.2 Cellular respiration

Topic BHL3
Reproduction

Key concepts:

BHL3.1 Sexual reproduction in humans

BHL3.2 Contraception

BHL3.3 Sexual and asexual reproduction in flowering plants

Topic BOE1
Interdependence of organisms

Key concepts:

BOE1.1 Food chains and food webs

BOE1.2 Interdependence within ecosystems

Topic BOE2
Organisms in their environments

Key concepts:

BOE2.1 Ecosystem components and dynamics

Topic BOE3
Biodiversity and human impacts

Key concepts:

BOE3.1 Human impacts on biodiversity

Topic BVE3
Adaptation and evolution

Key concepts:

BVE3.1 Adaptations and natural selection

Topic BHD3
Health and infectious disease

Key concepts:

BHD3.1 Pathogens

BHD3.2 Preventing infection