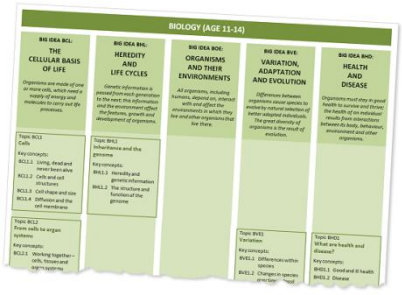
Key concept map (age 11-16)
Biology



The **Best Evidence Science Teaching (BEST)** resources can be incorporated into your existing scheme of work, if desired. However, we have used research evidence on learning pathways and on effective sequencing of ideas to develop maps that can help with curriculum planning.

This map shows how understanding of five **big ideas** of biology education can be developed through a series of **key concepts**, organised into teaching topics. It presents a possible route for progression through a five-year curriculum in biology for age 11-16.

The numbering and placement of key concepts in the 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 map need to be understood before progressing to key concepts that appear later
- topics that appear in the same row can be taught in any order.

However, the teaching order can be tailored for different classes as appropriate.

Publication of resources

Best Evidence Science Teaching (BEST) resources are developed based on careful consideration of the best available research evidence on learning pathways, common student misunderstandings, and effective teaching approaches.

The research and writing work for key concepts at age 11-14 is complete, and all resources have been published. Resources for age 14-16 will be published on a topic-by-topic basis throughout 2021 and 2022.

Therefore, the key concept map for age 14-16 is a working draft that will be updated during the process of researching and writing resources for the key concepts.

To find out when new topics have been published, please follow @BestEvSciTeach on Twitter or check the BEST web pages at **www.BestEvidenceScienceTeaching.org**

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BIOLOGY (AGE 11-14)

BIG IDEA BCL: THE CELLULAR BASIS OF LIFE	BIG IDEA BHL: HEREDITY AND LIFE CYCLES	BIG IDEA BOE: ORGANISMS AND THEIR ENVIRONMENTS	BIG IDEA BVE: VARIATION, ADAPTATION AND EVOLUTION	BIG IDEA BHD: HEALTH AND DISEASE
Organisms are made of one or more cells, which need a supply of energy and molecules to carry out life processes.	*Genetic information is passed from each generation to the next; this information and the environment affect the features, growth and development of organisms.*	*All organisms, including humans, depend on, interact with and affect the environments in which they live and other organisms that live there.*	*Differences between organisms cause species to evolve by natural selection of better adapted individuals. The great diversity of organisms is the result of evolution.*	*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 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	Topic BHL1 **Inheritance and the genome** Key concepts: BHL1.1 Heredity and genetic information BHL1.2 The structure and function of the genome			

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 Biodiversity, conservation and sustainability

Topic BVE3
Adaptation and evolution

Key concepts:

BVE3.1 Explaining evolution

Topic BHD3
Health and infectious disease

Key concepts:

BHD3.1 Pathogens

BIOLOGY (AGE 14-16)

BIG IDEA BCL: THE CELLULAR BASIS OF LIFE	BIG IDEA BHL: HEREDITY AND LIFE CYCLES	BIG IDEA BOE: ORGANISMS AND THEIR ENVIRONMENTS	BIG IDEA BVE: VARIATION, ADAPTATION AND EVOLUTION	BIG IDEA BHD: HEALTH AND DISEASE
Organisms are made of one or more cells, which need a supply of energy and molecules to carry out life processes.	*Genetic information is passed from each generation to the next; this information and the environment affect the features, growth and development of organisms.*	*All organisms, including humans, depend on, interact with and affect the environments in which they live and other organisms that live there.*	*Differences between organisms cause species to evolve by natural selection of better adapted individuals. The great diversity of organisms is the result of evolution.*	*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 BCL4 **Cell structure** Key concepts: BCL4.1 Eukaryotic and prokaryotic cell structure	Topic BHL4 **Inheritance and the genome** Key concepts: BHL4.1 DNA and the genetic code BHL4.2 Genome, environment and phenotype BHL4.3 Modelling inheritance	Topic BOE4 **Interdependence of organisms** Key concepts: BOE4.1 Trophic levels and biomass transfer		

Topic BCL5
Exchange and transport

Key concepts:

BCL5.1 Diffusion, osmosis and active transport

BCL5.2 Supplying cells – exchange surfaces and transport systems in humans

BCL5.3 Supplying cells – exchange surfaces and transport systems in plants

Topic BCL6
Coordination and control

Key concepts:

BCL6.1 The human nervous system

BCL6.2 The human endocrine system

BCL6.3 Homeostasis

Topic BVE4
Classification systems

Key concepts:

BVE4.1 Kingdoms, domains and subcellular evidence

Topic BHD4
Human lifestyles and health

Key concepts:

BHD4.1 Promoting good health: interacting factors and risk

Topic BHL5
Growth and development

Key concepts:

BHL5.1 Growth by cell division

BHL5.2 Stem cells and differentiation

BHL5.3 Plant hormones

Topic BHD5
Health and infectious disease

Key concepts:

BHD5.1 Defences against disease in plants and humans

BHD5.2 Promoting good health: reducing the spread of infections

Topic BCL7
Biochemistry

Key concepts:

BCL7.1 Biological molecules and enzymes

BCL7.2 Photosynthesis and limiting factors

BCL7.3 Cellular respiration and ATP

Topic BHL6
Reproduction

Key concepts:

BHL6.1 Hormones and human reproduction

Topic BOE5
Organisms in their environments

Key concepts:

BOE5.1 Cycling of materials through ecosystems

Topic BOE6
Biodiversity and human impacts

Key concepts:

BOE6.1 Measuring biodiversity

BOE6.2 Human interactions with ecosystems: negative and positive

Topic BVE5
Explaining evolution and speciation

Key concepts:

BVE5.1 Natural selection at the genetic level

Topic BHD6
Maintaining health

Key concepts:

BHD6.1 Use and development of drugs and medicines