SCoPE

Scientists' Collaborative Project with Educators

The Cell Explorer:

GCSE Teacher Notes

The structure of eukaryotic and prokaryotic cells is one of the first concepts taught in many of the current GCSE specifications. While we might think that these are "easy" concepts for students to understand, the very concept of understanding something too small for the human eye to see, and its impact on the organism as a whole, is a leap in understanding which is large from KS3 to KS4. The teachers and scientists involved in this project decided to make easy to use, relevant teaching resources to help students conceptualise this idea, to understand just how tiny but complex cells are, and how important an understanding of what they do is to biology as a whole.

Many of the misconceptions surrounding cells and cell structure are focused on issues of scale and content. The interactive 3D model is designed to address these issues by allowing students to zoom in and out of the cell, understand what can and can't be seen at different levels of magnification and how the cell components create the cell's structure. By physically manipulating the cell and its organelles we hope it will be easier for students to visualise the cell and its processes.

The scale bar and magnification allows students to calculate the actual size of each organelle in a eukaryotic cell. Students can use the model to fill in worksheet A to identify structures, their function and their relative sizes.

Links to GCSE curriculum

The list below shows the current GCSE exam board curricula and possible areas of study where these resources may aid teaching.

AQA

Unit 4.1 Cell Biology
4.1.1.1 Eukaryotes and Prokaryotes
4.1.1.2 Animal and plant cells
4.1.1.3 Cell specialisation
4.1.1.4 Cell differentiation
4.1.1.5 Microscopy
4.1.2.1 Chromosomes
4.1.2.2 Mitosis and the cell cycle
4.1.2.3 Stem cells

Unit 4.2 Organisation
4.2.1 Principles of organisation
4.2.2.7 Cancer

Unit 4.6 Inheritance Variation and Evolution
4.6.1.2 Meiosis
4.6.1.4 DNA and the genome
4.6.2.4 Genetic engineering
4.6.2.5 Cloning (Biology only)

OCR

B1.1 Cell structures
B1.2 What happens in cells?
B2.1 Supplying the cell
B2.2 The challenges of size
B5.1 Inheritance
B6.2 Feeding the human race
B6.3 Monitoring and maintaining health

EDEXCEL

Topic 1 – Key Concepts in Biology

1.1 Eukaryotes and prokaryotes
1.2 Adaptations
1.3 Microscopy
1.4 Size and scale
1.5 Quantitative units
1.6 Core practical – microscopy
1.15 Cell transport

Topic 2 – Cells and control

2.1 Mitosis and the cell cycle
2.2 Role of mitosis
2.3 Formation of cells
2.4 Cancer
2.5 Cell division
2.6 Cell differentiation

Topic 3 – Genetics

3.3 Meiosis
3.4 DNA structure
3.5 Genome

Topic 8 – Exchange and transport in cells

8.1 Transport
8.2 Exchange surfaces
8.4 Diffusion (Biology only)
8.5 Fick's Law (Biology only)