

Teaching ideas for Topic 10: Genetics and evolution (HL)

This is a relatively short topic in the HL core and forms a natural extension to the work covered in Topic 3, *Genetics*.

Ideas for the lesson

- Provide students with as many examples of dihybrid crosses as possible to allow them to practise their skills. Examples can be found in the student's book and in the Topic 10 support and extension worksheets.
- Ask students to research and discuss Mendel's work from a historical perspective. Why was his work not recognised sooner? How was he able to share his work with the outside world? There is the opportunity to link to TOK (see below).
- Polyploidy can be discussed and investigated using familiar crops plants and students can research the ancestry of these species and varieties. *Allium* is the example required by the syllabus and this can be considered at the same time.
- The types of reproductive isolation are usually well understood but examples of behavioural and geographic isolation can be simulated using abstract 'species' in the classroom.
- Videos providing good visual information on continuous variation and polygenes are widely available online, for example, see www.greatpacifimedia.com (select 'Genetics videos', and then 'The Human genome: Traits, Disorders and Treatments').

Practical activities

- Supply students with modelling materials to construct simple representations of meiosis, which can cause confusion if it is not clearly visualised. Students should identify maternal and paternal chromosomes and demonstrate how crossing over and random orientation contribute to variation in gametes.

ICT

- Students can conduct internet research on polygenes and consider international aspects of biology such as the selective advantage of dark or fair skin in different parts of the world.
- Students may like to consider the accuracy of the statistics provided by Mendel to support his research. It has been suggested that these are too accurate to be true.
- Some useful population biology and speciation simulations are available at <http://darwin.eeb.uconn.edu/simulations/simulations.html> and <http://ats.doit.wisc.edu/biology> (select 'Speciation').

Common problems

- Students often struggle with dihybrid crosses and the idea of crossing over. Practice using Punnett grids and modelling or drawing out chromosomes can help support these students.

Theory of knowledge (TOK)

- Mendel's work provides a good opportunity to discuss scientific communication and methodology today and compare it with that more than a century ago.
- Discuss punctuated equilibrium as an alternative to the theory of evolution and a challenge to the long established paradigm of Darwinian gradualism. How do paradigm shifts proceed? What factors are involved?

International mindedness

- By carrying out their own reading, students can develop an understanding of the complex issue of the polygenic control of skin colour and the relationship between skin colour and vitamin D synthesis. Many articles available on the internet are a good starting point for considering risks and benefits of exposure to sunlight and vitamin D production in the skin, for example, www.bupa.co.uk/individuals/health-information/health-news-index/2010/hi-270810-vitamin-d-deficiency and www.ncbi.nlm.nih.gov/pmc (search for ‘Sunlight and Vitamin D: A global perspective for health’).