

Teaching ideas for Topic 4: Ecology

Both SL and HL students are likely to have a basic knowledge of ecology from previous studies and courses so it is a good idea to build on this knowledge. If students are likely to be taking Option C, Ecology and conservation, either at SL or HL, understanding of these basic concepts is very important.

Ideas for the lesson

- Ask students to consider a range of food chains and food webs from different ecosystems. By considering a terrestrial, aquatic and marine food chain they may be able to deduce reasons for the lengths of food chains in different environments. Fieldwork is invaluable here if there is a suitable local ecosystem. (If students are taking Option C, the Lincoln Index can be used and, if animals are sampled, there is a good opportunity to discuss classification.)
- Encourage students to consider heat losses, the degree of support organisms receive in aquatic environments and the resulting saving in energy in each situation. Poikilotherms require less energy expenditure on homeostasis. The biomass of a consumer such as a jellyfish is less than that of an equivalent terrestrial organism, which must support its body on land.
- Supply students with the following example of a food chain, or a similar one, and ask them to consider the advantages and disadvantages of exploiting a food chain nearer to its starting point:

plant plankton → shrimps → eels → cod → people

Is it more efficient to be a vegetarian and, if so, why? This provides a good link to conversion ratios discussed in Option C.

- An understanding of the carbon cycle can be gained by taking a wide overview of each aspect so that not only carbon dioxide, photosynthesis, combustion and respiration are considered but other areas such as calcium carbonate in shells and limestone are also built in. Students can each tackle one aspect of the cycle, and present their information to the class, who can then build up the whole cycle.
- There are many thought-provoking videos available that may broaden students' knowledge of the greenhouse effect. A free online clip can be found at: www.skillsone.com.au (search for 'carbon footprint').

Full-length programmes available include:

- *An Inconvenient Truth* (2006) (www.takepart.com/an-inconvenient-truth/film)
- *Burning the Future (Coal in America)* (2008) (www.burningthefuture.org)
- *Climate Change and Coral Reefs: Comprehensive Classroom Resource* (www.videoproject.com)

Practical activities

- Provide students with data on the same organism living in two different habitats in different numbers (or use data the students have collected) and use it to calculate mean and standard deviation for each habitat. If appropriate, use the *t*-test to assess the significance of any differences.
- Set up a mesocosm (as described in Practical 1). This needs to be done early in the academic year in order for students to gain insight into the sustainability of the system. This is a good point at which to discuss the systems approach to studying ecosystems.

ICT

- The precautionary principle is considered in the context of the greenhouse effect in this chapter. Students can consider this in relation to related aspects like drilling for oil in risky locations, such as the Arctic or the deep oceans. Are the risks taken to ensure a supply of fossil fuels worth taking? News items on this topic are available at www.bbc.co.uk.



- Data on atmospheric gases can be sourced from the United Nations World Meteorological Organisation www.wmo.int.

Common problems

- Students confuse the increased greenhouse effect (and associated climate change) with damage to the ozone layer. The latter is not required by the syllabus but it may be helpful to discuss the issues and dispel any confusion.

Theory of knowledge (TOK)

- How can reliable, accurate measurements of gases in the atmosphere be made? Is it ever possible to compare these with measurements from the past?

International mindedness

- The increased greenhouse effect and the relationship between industrialisation and carbon dioxide concentration in the atmosphere is a good example of a truly global issue. Different students could research and put forward the views of different countries from around the world and consider which countries do and will contribute most to the problem.