How to... include sustainable development in your teaching

Sustainable development (SD) is a wide ranging, multi-disciplinary topic, and within some discipline areas it can be difficult to find links to SD. This sheet aims to bring together some ideas for introducing Education for Sustainable Development (ESD) into teaching within different bioscience disciplines. This sheet is intended more for those who teach areas where ESD is not an integral part of the discipline but may also provide some useful ideas for those who already include ESD in their teaching.

Why bother?

Although the concept of sustainability is not new, there is increasing realisation of the current impact humans have on the environment and that this may be placing an unsustainable burden on the planet. As well as enabling students to develop knowledge of sustainability concepts, ESD can also support the development of a range of skills in students, including critical thinking, the ability to evaluate and assess material, and problem solving skills.

Getting the ball rolling

If sustainability is peripheral to your discipline and you feel you lack knowledge of sustainability issues and developments, then you might want to think about bringing in outside expertise, going on a training course or working in conjunction with colleagues who have an environmental focus in their work. Consider keeping a record of any teaching practices implemented and their impact on students – this could form the basis of a case study or research paper[1].

Make some changes

Data analysis and statistics - use data relating to aspects of sustainability to introduce sustainability concepts to students. Having students analyse data, and then draw conclusions from their analysis, could be a very effective way of encouraging them to think about sustainability issues[2]. Distant Access to an Ecological Field Project[3] provides data relating to conservation. The UK Air Quality Archive[4] has data from across the UK. Gapminder[5] brings together a variety of data, e.g., CO_2 emissions, agricultural land use, population and forest cover. Topics can be varied: for example, the growth of world population and changing food production, increases or decreases in agricultural land and forest, or links between the economy and healthcare provision.

Bioethics - bioethics could bring together a wide variety of themes within sustainability, for example, GM crops, development of medicines from endangered and indigenous species, adaption of traditional remedies by pharmaceutical companies and patenting of crop gene sequences[6].

Debate sessions - debate sessions could encourage students to research a topic and look at both the benefits and issues surrounding a particular activity or standpoint. Groups or individuals could take the viewpoint of a particular individual or group within a scenario, e.g., a farmer wanting to grow GM crops, the research group who developed the crop, the head of the company who funded the development, a local pressure group who don't want the crop grown, and local MP who raises questions in Parliament about GM crops[7,8].

Is your department sustainable? - making changes within your department to increase the sustainability of teaching practices and the department, then highlighting these changes and initiatives to students, could form the basis of discussion of sustainability concepts[9,10]. As a department you might also consider getting involved with local conservation groups or activities[11].

Employability - use discussions around employability to highlight sustainability and the Corporate Social Responsibility (CSR) reporting many companies undertake. If students are considering an environmentally-focussed career, this could be essential for them[12,13].

Seminar series - invite speakers with an environmental or sustainability background to give talks on their research. Local environmental or conservation groups or representatives from UK or worldwide groups with a focus on the environment could also be appropriate.

Tutorials - discuss a paper with an environmental / sustainability theme. New Scientist[14], Royal Society of Chemistry[15], Nature[16] and Scientific American[17] all have sections on their websites which bring together environmentally-themed papers and news which could provide a starting point for discussion.

Online learning - OU Open Learn has a number of environmentally- and sustainability-focussed online modules[18] which may be of interest to you or your students. The Toolbox for Sustainable Design[19] has resources and information to help plan a sustainability lecture or module. Although developed for engineering disciplines, much of the information is transferable to the biosciences.

Going further - think about including aspects of sustainability as module aims and outcomes[20,21]. 'Hot topics' of environmental concern may be popular with students, for both lab- and library-based research projects and fieldwork and field trips can provide an excellent opportunity to highlight sustainability and environmental concerns.

"But my discipline has nothing to do with sustainability" – many subject areas within the biosciences may seem to have, at first glance, little to do with sustainability issues and the inclusion of ESD can feel like an add-on, the following topics could give you a starting point:

- the discovery of drugs and active compounds in plant species and the impact on this of the loss of native species and habitat and local knowledge of medicinal plants;
- breakdown products of drugs in the humans and other animals and their potential effect on ecosystems (e.g., increasing levels of hormones and antibiotics in ecosystems);
- genetic modification of bacterial and fungal species to clear industrial contaminated land;
- impact of increased temperatures and CO_2 on plant growth, crop production and the genetic modification of crop species to tolerate, for example, low water and high saline conditions;
- links between human changes to the environment and subsequent species evolution;
- impact of pollutants (e.g., lead, mercury, SO_2) on hormonal, cellular and nervous systems, in adults, children and developmentally; and
- processes of pollution, (e.g., production of ozone) and the impact of pollutants on biochemical processes and biological systems.

Resources

1. Pedagogic research: *www.bioscience.heacademy.ac.uk/events/themes/pedr.aspx*
2. Using online databases and predictive modelling to develop student understanding of human population growth and global food demand: *www.bioscience.heacademy.ac.uk/ftp/TeachingGuides/elearn/cs4.pdf*
3. Distant access to an ecological field project: *www.bioscience.heacademy.ac.uk/resources/projects/fielding.aspx*
4. UK Air Quality Archive: *www.airquality.co.uk/archive/index.php*
5. Gapminder: *www.gapminder.org/*
6. Bioethics briefings: *www.bioscience.heacademy.ac.uk/resources/ethicsbrief.aspx*
7. The use of the rainforest as a test case in environmental ethics. C. Southgate (2002) in *Bioethics for Scientists*, eds J. Bryant, L. Baggott la Velle and J. Searle, p57-72. Wiley and Sons, Chichester
8. Environmental ethics: further case studies. C. Southgate and A. Aylwar (2002) in *Bioethics for Scientists*, eds J. Bryant, L. Baggott la Velle and J. Searle, p73-83. Wiley and Sons, Chichester
9. "How to" sheets: *www.bioscience.heacademy.ac.uk/resources/esd/howto.aspx*
10. Towards Sustainable Teaching of Bioscience: *www.bioscience.heacademy.ac.uk/funding/currentprojects/gwynnjones.aspx*
11. University of Leeds School of Geography: *www.geog.leeds.ac.uk/about/policies/carbon/doing*
12. Values and Corporate Social Responsibility (CSR): *www.gees.ac.uk/projtheme/emp/valuesandcsr.doc*
13. Employable graduates for responsible employers: *www.studentforce.org.uk/pdf/employablegraduates2008.pdf*
14. New Scientist Environment section: *www.newscientist.com/section/environment*
15. Royal Society of Chemistry; Environment, Sustainability and Energy: *www.rsc.org/gateway/subject/envenergy/*
16. Nature: *www.nature.com/nature/focus/#earth*
17. Scientific American: *www.scientificamerican.com*
18. OU Open learn Science and Nature: *http://openlearn.open.ac.uk/course/category.php?id=10*
19. Toolbox for sustainable design: *www.lboro.ac.uk/research/susdesign/LTSN/introduction/Introduction.htm*
20. How to make your modules a bit more sustainability oriented: *http://csf.plymouth.ac.uk/?q=node/585*
21. Embedding ESD in a life science curriculum: *www.heacademy.ac.uk/projects/detail/esd_lifescience*

Further resources

- Higher Education Academy ESD Project: *www.heacademy.ac.uk/esd*
- Forum for the Future: *www.forumforthefuture.org/*
- Interactive Learning and Teaching Activities for Sustainability: *http://csf.plymouth.ac.uk/?q=node/579*

This "How to" sheet has been compiled by the UK Centre for Bioscience. How to sheets for making your lectures, practicals, fieldtrips, tutorials and office more sustainable are also available.

Available through the UK Centre for Bioscience, Higher Education Academy
www.bioscience.heacademy.ac.uk/resources/esd/howto.aspx