



**UNIVERSITY OF
BRADFORD**

MAKING KNOWLEDGE WORK

Final Report

Embedding ESD in Life Sciences Curriculum

**Dr Nigel Lindsey*, Dr Peter
Hopkinson**, Mr Peter Hughes***.**

* School of Life Sciences (N.J.Lindsey@Bradford.ac.uk)

**Sustainable Education Directorate

(P.G.Hopkinson@Bradford.ac.uk)

*** Teaching Quality Enhancement Group

(P.Hughes3@Bradford.ac.uk)

University of Bradford

Bradford

West Yorkshire

BD7 1DP

Aim of the Project

To evaluate the potential for the integration of ESD within a Life Sciences Curriculum and develop a tool for assessing this potential.

Underlying Principles and Approach of the Study

This report presents the findings from the first stage of the project up to Jan 31st 2007.

Sustainable development (SD) can mean many different things depending on the experience and outlook of the individual involved. For the purposes of this work, and to align with other ESD initiatives at the University of Bradford, we have chosen to adopt the UNESCO definition:

http://portal.unesco.org/education/en/ev.php-URL_ID=23292&URL_DO=DO_TOPIC&URL_SECTION=201.html

This definition is broad and so our first task was to review a curriculum against this definition to see if there were significant subject areas that could be identified as being suitable for the development of ESD within a programme. For this we looked at the range of programmes across the School of Life Sciences with strong external constraints on their curricula, in terms of the Professional Body accreditation and a strong focus on achieving the Professional Qualification that enables them to work within the profession. The programmes looked at were: Pharmacy, Optometry, and Biomedical Sciences.

In order to develop a tool for the assessment of the ESD potential of the curriculum the potential blocks to the incorporation were identified. These were

- 1) Suitability of the curriculum
- 2) The engagement of the accrediting body
- 3) The willingness of the staff to engage with the process
- 4) The student perception of the relevance of the material

Any tool to identify the ESD potential of a curriculum needs to be able to determine these and identify ways to overcome the issues.

Extent of ESD in the existing curriculum

Curricula were reviewed against the UNESCO definition and scored according to the degree of identifiable ESD material with the curriculum. The following series of questions were considered in reviewing material:

- Which interpretation(s) of SD is (are) presented and endorsed?
- How might these interpretations be classified?
- What kind of epistemology underlies the presentation of SD?
 - *Realist*: Knowledge is seen as objective fact – albeit that it may be partial, uncertain and subject to addition/revision

- *Constructivist*: All knowledge, including scientific knowledge, to some degree, reflects the social context within which it is produced, and is therefore seen as subjective, value-laden and contestable.
- To what extent are students enabled to engage critically with knowledge claims concerning SD, including the values that permeate those claims, and to develop their own ideas on the subject?

Table 1. Outline the scoring criteria of the extent of the involvement of ESD within the curriculum.

Score	Description
1	SD is a central concern of the programme, and features strongly in most modules
2	SD is a significant concern of the programme, and features strongly in more than half of the modules
3	SD is a minor concern of the programme, and features significantly in several modules
4	SD is not a concern of the programme, but does feature to some extent in at least one of the modules
5	SD is not covered by the programme, and does not feature in any of its modules

These indicative measures do not provide an absolute score of the degree of ESD involvement in the curriculum, rather they provide a basis for debate as to how these topics may be included in the curriculum being reviewed.

A single reviewer with no specific experience of the programme undertook the review of the programmes.

Pharmacy

Nature of the content and pedagogic engagement with ESD

Firstly, curriculum documents were reviewed against the UNESCO definition and the extent to which the curriculum contained ESD material and material that could be developed to deliver ESD was assessed. The programme is an Integrated Masters programme comprising 480 credits delivered in 35 modules. The analysis of the programme suggests that SD is not explicitly covered by the programme, and does not feature in any of its modules but has the potential to incorporate SD as a minor concern of the programme, which features significantly in several modules. This programme currently scores 5 on our scale of engagement with ESD.

Opportunities for engagement with ESD

Over 50% of the modules have the potential to incorporate material appropriate to the UNESCO framework of ESD. Examples of areas where ESD could be developed in the curriculum include:

- 1) The availability of AIDS therapy
- 2) Pharmacognosy, in particular the significance of biodiversity to the development of new drugs
- 3) Uptake and completion of treatment regimens and the cost of unused drugs

Increasingly, the role of a Pharmacist is not simply a dispenser of medicines but also as a monitor of health and a source of advice on medicine and treatment. This indicates that this programme could score between 2 and 3 on our scale of engagement with ESD.

Optometry

Nature of the content and pedagogic engagement with ESD

Review of the curriculum of the degree in Optometry through its programme specification does not show any current engagement in the education for sustainability. However, the Programme Aims do state that the programme is intended to “Develop an awareness of the legal, ethical and commercial context of optometric practice”. This reference to the ethical context of optometry could provide a basis for covering the ethical issues associated with SD in the programme.

Opportunities for engagement with ESD

The curriculum also shows limited opportunity for incorporation of ESD into the curriculum. However, a review of the modular-level information showed there was the potential of increasing the number of modules with at least some SD-related content from 0 to 5.

Biomedical Sciences

Nature of the content and pedagogic engagement with ESD

The programme specification does not contain any references to SD, sustainability, the environment, or any other related terms/concepts, so does not, therefore, give any indication that SD is a concern (primary or otherwise) of the programme.

Examination of the module descriptors shows at least one module that appears to have a significant amount of SD-related content (Diagnostic and Public Health Microbiology). There may be at least some SD-related content in a further four modules (Microbiology; Disorders of the Blood and Immune Systems; Toxicology and Oncology; Professional Development Skills 2). The

majority of this involves the social context of disease and its implications for the pathogenesis of disease. There appears to be no SD-related content in 22 modules. In one module (Research Project) there are no references to SD (direct or otherwise) but it would clearly be possible for students to undertake research directly concerned with SD to a greater or lesser degree.

Opportunities for engagement with ESD

Examination of the curriculum suggests that there is potential for increasing the number of modules with significant SD-related content from 1 to 5. Furthermore there is potential for increasing the number of modules with at least some SD-related content from 4 to 7 and reducing the number of modules with no SD-related content from 22 to 15.

In its current form, the programme attracts a score of 4 in that SD is not a concern of the programme, but does feature to some extent in at least one of the modules. However, the programme could attract a score of 3 in that SD is a minor concern of the programme, and features significantly in several modules. This could be achieved without changing the fundamental philosophy or purpose of the programme by enhancing the SD-related content of the several modules and making more explicit references to SD in the key programme documents. The SD content of the programme could be enhanced further by the introduction of new modules focusing explicitly on the relationships between the biomedical sciences, public health and SD. It is unlikely that a score of 2 could be achieved given the nature of the programme.

The engagement of the accrediting bodies and external drivers

All Healthcare Professions

The Department of Health (the DH), as part of the UK Government's overall strategy, has published a *Sustainable Development Action Plan*¹ that sets out how it will contribute to the UK Sustainable Development Strategy, *Securing the Future*². This plan encompasses both the internal operations of the DH and NHS (purchasing policy, energy management, waste and recycling, etc) and the delivery of health services to promote public health and well being. This can only be delivered if healthcare professionals are aware of and understand issues linking SD and healthcare. However, the role that the education of healthcare professionals can play in the process will be determined largely by the engagement of the professional bodies who accredit curricula and so determine the extent of ESD with the their programmes.

¹ Available online at: <http://www.dh.gov.uk/assetRoot/04/13/22/23/04132223.pdf>

² Available online at: <http://www.sustainable-development.gov.uk/publications/uk-strategy/index.htm>

Pharmacy

The professional body for Pharmacists, the Royal Pharmaceutical Society of Great Britain, does not overtly engage with ESD in its published documentation, however the increasing importance of the Pharmacist in delivering improvements in Public Health as evidenced by several areas in their business plan strongly suggest that there is engagement with the health-related component of SD. One of the five key principles of SD is “Ensuring a Strong, Healthy, and Just Society”. Pharmacy companies are moving into the monitoring of general health and well being through, for example, blood pressure monitoring and cholesterol. The removal of the prescription-only status of drugs, such as statins, will increase the role of the Pharmacist in these areas. Whilst there is no explicit engagement with SD, there is clear evidence that engagement with the health-related aspects of SD, and so ESD, is of some significance to a Pharmacy programme. There is no benchmark statement for Pharmacy.

Optometry

The programme is accredited by the General Optical Council (GOC), which is the official regulator for optical professions in the UK. A search of the GOC website³ – including the Council’s *Annual Report 2006/7* – failed to reveal any references to SD, sustainability or the environment. According to its website⁴, the College of Optometrists is “the Professional, Scientific and Examining Body for Optometry in the UK, working for the public benefit.” A search of the College’s website – including the *Annual Report 2006* – failed to reveal any references to SD, sustainability, the environment, etc. The guidelines for accreditation make no reference to ESD.

The subject benchmark makes no explicit reference to ESD; however, in line with the programme specification it does refer to “an awareness of the legal, ethical and commercial restraints and constraints within which optometry operates” and “an understanding of the expectations and responsibilities of entering a regulated healthcare profession“. This reference to the ethical context of optometry and responsibilities could provide a basis for covering the ethical issues associated with SD in the programme.

The Higher Education Academy Subject Centre that covers optometry is the Subject Centre for Health Sciences and Practice⁵. It is one of the few Academy Subject Centres that has not yet undertaken any work on ESD – stating in its *Annual Report 2005-6*: “Whilst we whole heartedly support the idea of sustainability being included in learning and teaching in principle we have yet to find the capacity to be proactive.”

³ See: <http://www.optical.org/>

⁴ See: <http://www.college-optometrists.org/>

⁵ See: <http://www.health.heacademy.ac.uk/>

Biomedical Sciences

Biomedical Sciences are currently approved by two separate bodies.

Health Professions Council

The programme is accredited by the Health Professions Council (HPC), “a statutory regulator that works to protect the health and well-being of people using the services of the health professionals registered with us. The HPC currently registers over 180,000 professionals from 13 professions. We only register professionals who meet our standards for their professional skills, behaviour and health.”⁶

A search of the HPC website – including a document entitled *Standards of Proficiency: Biomedical Sciences* – revealed numerous references to the importance of safe working environments and the safe management of hazardous waste, but no references at all the wider issues associated with SD.

The programme is also accredited by the Institute of Biomedical Science (IBMS), “the professional body for biomedical scientists in the United Kingdom. It aims to promote and develop biomedical science and its practitioners.”⁷

A search of the IBMS website revealed very few references to SD, etc. The most significant of these, though, was a link to *Rigour, Respect and Responsibility*, a “universal ethical code for scientists” produced by Sir David King (The UK Government’s Chief Scientific Advisor) and international colleagues at a Carnegie meeting (a regular informal meeting of science ministers and advisors from G8 countries). Amongst other things, the Code states that scientists should:

- Minimise and justify any adverse effect your work may have on people, animals and the natural environment.
- Seek to discuss the issues that science raises for society. Listen to the aspirations and concerns of others.

In the accompanying Background Paper, David King writes:

Science presents us with some of our greatest opportunities and challenges. It impacts on every aspect of our lives: wealth creation, sustainability and quality of life. It underpins policy across government, where the principle of evidence-based policy-making has long been accepted. And it is the key to addressing many of the greatest challenges we face, such as climate change, energy generation, poverty and disease.

However, it is unclear how this is interpreted in terms of the specific accreditation of programmes. The subject benchmark statement suggests that students should “be aware of the need for good laboratory practice, health

⁶ See: <http://www.hpc-uk.org/>

⁷ See: <http://www.ibms.org/>

and safety, and legal and ethical considerations”, “critical awareness of the quality of evidence”, and “have some understanding of ethical issues and their impact on advances in biomedical science [in order to] construct reasoned arguments to support their position on ethical issues which impact on advances in biomedical science”. In all three areas, the high-level policy statements do not seem to have translated into guidance into the requirements for accreditation. This will seriously hamper attempts to develop ESD.

The willingness of the staff to engage with the process

Discussions with the Professor of Pharmacy Education and the Programme Manager for the Pharmacy programme suggest that there is enthusiasm for the development of appropriate and contextualised ESD within the programme and that it fits with current thinking on the developments in the Pharmacy curriculum. The next step will be to identify the enthusiasm amongst staff to modify curricula at the modular level and develop the pedagogical approach and resources needed to provide this education. However, the major priority of staff is to develop in accordance with the requirements of the accrediting bodies and, as outlined above, the requirements for accreditation do not explicitly specify the need for ESD. Until the requirements for accreditation become more explicit, the drivers for changes will be relatively weak.

The student perception of the relevance of the material

A focus group with six undergraduate (UG) students was conducted to ascertain student views about SD as a concept and about the relevance of the concept to the degree programme. The students were asked why they had chosen to study pharmacy. Interestingly, a number of the students were ambivalent about pharmacy as a subject, having been directed to the discipline as a ‘safe choice’, a well-paid profession or a next best option to dentistry or medicine, the preferred option of two students. That said, the students were enjoying their programme. All the students equated SD with environmental concerns – primarily climate change – but through discussion they had some notion that the term SD entailed a broader agenda. Through the discussion it transpired that all the students have strong social concerns around poverty, inequality, global change, faith and religion. The majority of students identified and enjoyed parts of the UG programme that have a close accord with SD, notably problem-solving scenarios around pharmacy practice. They all enjoyed modules in alternative forms of treatment (homeopathy) and the opportunities within the programme for debates around ethical and social issues. Some found the ‘hard science’ parts of the course challenging but recognised the science base of the discipline. All the students agreed that more problem solving, scenario and real world learning would be positively supported.

Outcomes

The outcomes for the project were originally defined as:

Produce a detailed ESD map of the School of Life Sciences curriculum as the basis for discussion, planning and benchmarking

This has been achieved for the three major programmes in Life Sciences and has revealed a varying extent and potential for the development of ESD within them. The analysis appears to have underestimated the extent of ESD-suitable materials in some areas; for example, specific curriculum areas in Biomedical Sciences, which have potential for ESD, were not identified by the review process. This emphasizes the need for close consultation with the course team when undertaking such an analysis. The analysis of external drivers shows that there is little external pressure for the development of ESD despite high-level policy statements that stress the need to develop awareness of the issues involved. The accrediting bodies have not addressed the issues in their requirements for accreditation and these are the main drivers for curriculum development in the courses review.

Engage with a large number of Life Science academics and a sample of students to create dialogue around ESD and the specific disciplines

Dialogue with both students and staff reveals that, whilst they are initially cautious about ESD, discussions reveal support for the ideas that underpin ESD and they can see the relevance to their curriculum. However, the role of the accrediting bodies will be crucial to seeing this work developed in these curricula and there needs to be a greater dialogue with them. Academy Subject Centres could play a significant role in this. Only one of the programmes, though, has an exclusive Subject Centre which recognises the need to engage with ESD but is also aware of the difficulties in doing this.

Produce teaching and learning actions plans linked to the four programmes reviewed, which in turn will provide the basis for the development of the ESD aspects of the School's learning and teaching strategy

The development of these plans is hampered by the lack of engagement of these issues by the professional bodies. Discussions have centred around the ability to develop this work in the light of these issues and how we can develop these plans in a manner acceptable to these external stakeholders.

Identify resource requirements for teaching and learning in relation to ESD within Life Sciences at Bradford

The major resource issue relates to staff time for undertaking the developmental work. Given that the main drivers for curriculum development have not embraced ESD, there is little motivation amongst staff to prioritise work in this area. And although the development of appropriate educational materials is intensive in terms of staff time, it does not require substantial

capital investment. Routes by which time may be provided are being investigated.

Create and make available a process tool for analyzing and interpreting Life Sciences curricula, particularly in "hard to get areas" which can be adapted to other schools/departments

A tool has been created that enables an initial identification of areas that provide ESD and areas that have potential for the development ESD. The tool does not require specialised knowledge of the subject area. However, the use of independent review can miss areas with potential that are embedded within the curriculum. Nevertheless, the tool is a useful starting point for discussions about the integration of ESD into curricula. A paper describing the tool is to be submitted for publication.

Future Work

The tool will be applied to other curricula and is being used to develop ESD within current curricula within the School of Life Sciences. Funding (£14K) has been gained from the University of Bradford to develop teaching materials within the School of Life Sciences.

Dissemination

A presentation was made to the Higher Education Academy's Education for Sustainable Development conference in Bradford in July 2007.

We are planning to present at the National Science Teaching and Learning Conference in 2009.

A paper will be submitted for publication.