Five Years on: Evaluation of Education for Sustainable Development (ESD) in the Biosciences

A report of a survey of higher education bioscience teaching staff.

July 2010

The Higher Education Academy

UK CENTRE FOR bioscience

In 2005 the UK Centre for Bioscience surveyed its Bioscience Representatives (contacts in bioscience schools and departments in Higher Education institutions (HEIs) across the UK) to give a baseline of Education for Sustainable Development (ESD) provision in the biosciences. This followed the publication of the consultation document from HEFCE "Sustainable Development in Higher Education – Consultation on a Support Strategy and Action Plan". The full report of the 2005 survey is available from *www.bioscience.heacademy.ac.uk/ftp/esd/esdreport.pdf*

In 2010 the STEM (Science Technology Engineering and Mathematics) Subject Centres decided to repeat the survey in order to investigate changes in ESD provision and attitudes towards ESD across the STEM subjects.

The 2005 survey showed a mixed response to ESD in the biosciences, both in terms of attitudes towards sustainability and the provision of ESD in bioscience teaching. The 2010 survey showed a more homogenous response from bioscience teaching staff, with the majority of respondents saying they thought it was very or quite important for students to have some understanding of ESD and the majority stating that sustainability issues were included within their bioscience degrees.

However there was a low response to the 2010 survey (15 respondents) and therefore care must be taken in evaluating the responses.

Contents

Undertaking the survey

An online questionnaire (see appendix), hosted by the ICS (Information and Computer Sciences) Subject Centre, was sent via email to 116 Bioscience Representatives (Reps) in a range of institutions across the UK in March 2010. Reps are named points of contact in bioscience departments across the UK and the Centre has Reps in institutions across England, Scotland, Wales and Northern Ireland. Reps were able to forward the email to a colleague within their department if they did not feel able to complete the survey.

From 116 Reps there were 15 respondents, a 13% response rate. These responses have been anonymised and, as response rates were low, care must be taken in inferring too much from the data. The 2005 survey was sent to 150 Reps and received 33 responses, a 33% response rate.

Respondents were from a range of departments including Biological Sciences, Animal and Land sciences, Aquaculture and Microbiology.

The survey was divided into four sections:

- Personal details (name, email, department and institution) N.B. respondents could choose to remain anonymous;
- General questions about sustainability;
- Review of current practice of ESD in disciplines; and
- Identification of ESD in other disciplines.

Section 1 – General questions about sustainability

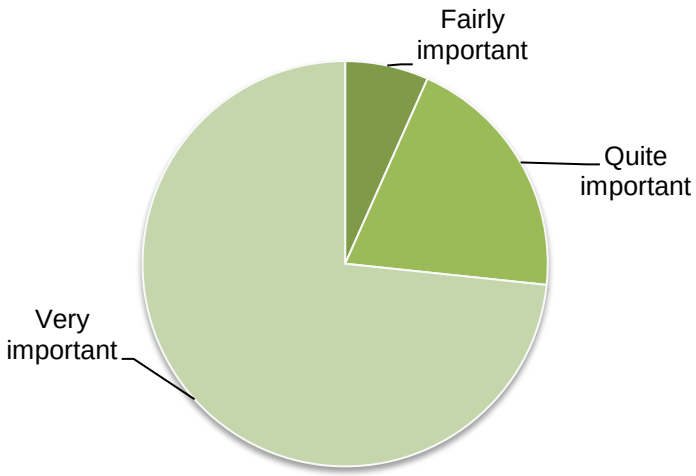
Sustainable development is a contested term and many use the Brundtland definition:

> "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

Of the 15 survey respondents all but three had a similar personal definition, or used a similar definition within their department to that of the Brundtland definition.

Respondents were then asked how important they thought it was for students to have some understanding of sustainability. Eleven respondents thought that it was very important for students to have some understanding of SD (figure 1). Although the number of responses was small a higher proportion of respondents thought it was "very important or "quite important" for students to have an understanding of sustainability in the 2010 survey (93%) than the 2005 survey (82%). None of the respondents selected "little" or "no" importance.

Figure 1. How important do you think it is for students to have some understanding of ESD?



Respondents were then asked if they thought higher education should play a role in helping society to develop sustainability. All 15 respondents (100%) thought higher education should play a role in helping society to develop sustainability; this showed an increase on the 2005 survey where 88% thought it should.

When asked how higher education could contribute to a greater understanding of SD, teaching, research and practice were highlighted as ways of raising awareness of sustainability issues. Some suggestions of how this could be done included incorporating relevant sustainability examples, such as GM crops, into the curriculum, developing relevant modules and enabling students to develop the skills needed to contribute towards sustainability. Practical measures were also suggested, such as having HEIs and departments leading by example and taking an active part in improving environmental sustainability. Suggestions included:

- *"Educating the leaders of tomorrow and generally raising awareness through teaching and practice"*;
- *"Teaching and research – but also by getting its own house in order (e.g. serious carbon cuts, acting by example on flying etc.)"*; and
- *"Raising student and the wider community's awareness"*.

When asked how they thought their department or school could contribute to a greater understanding of sustainability responses were varied and most likely reflected the current levels of inclusion of ESD within curricula and across the respondent's department / school. Suggestions included:

- *"Teach (more / better) graduate skills and also include broader modules/activities about sustainability across disciplines. For example an understanding of ethics, values and society including rights and responsibilities of graduates / scientists"*; and
- *"By integrating SD concepts into all our activity: teaching, research and enterprise"*.

Some responses focussed on the teaching of sustainability, others also considered inclusion of sustainability principles in research and sustainability as a concept across the department.

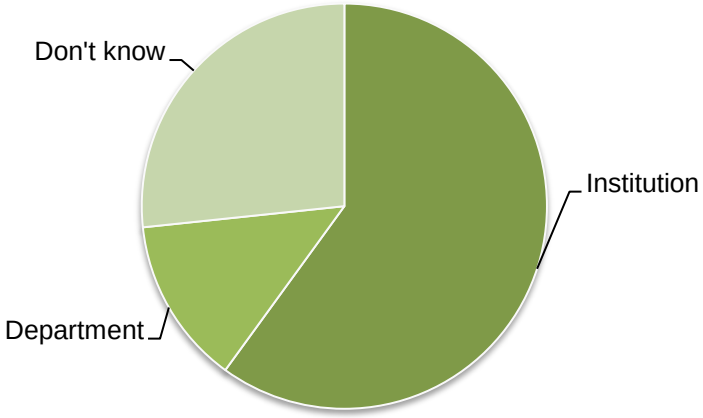
Section 2 – Review of current practice in ESD in your discipline

Respondents were asked a number of questions focussing on sustainability and ESD within their department / school and discipline.

The majority of respondents knew of a sustainability strategy within either their institution or department, none of the respondents knew of a strategy in both, see figure 2.

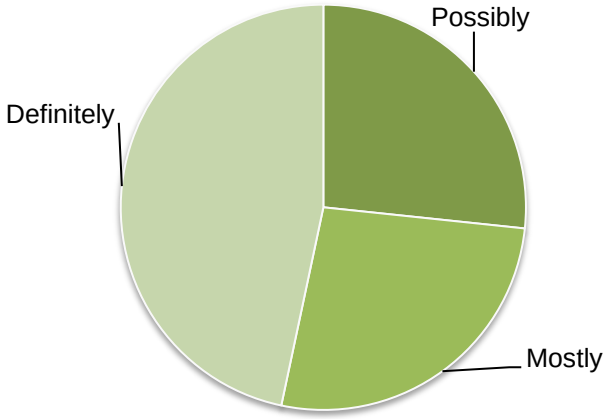
Respondents were also asked a number of questions related to the teaching of sustainability issues. When asked if they thought the teaching of sustainability was relevant to their discipline, 13 of the 15 respondents said "yes" and the remaining two stated they "didn't know". This contrasts to the 2005 survey where 21% of the respondents saw sustainability as totally unrelated to their subject and therefore not an issue for themselves or their students.

Figure 2. Is there a strategy for sustainability in your: Institution, Department or Both?



Respondents were asked whether they thought sustainability should be a compulsory part of bioscience programmes. In 2005 43% thought it should be definitely included and 21% said it should "definitely not" or "not much" be a part of bioscience programmes. The 2010 survey showed 11 respondents saying sustainability should "definitely" or "mostly" be included in bioscience programmes – the majority of responses, see figure 3.

Figure 3. Do you think SD should be a compulsory part of bioscience programmes?



Comments related to this question were varied:

- *"Certainly biosciences (core issue!). Generally positive elsewhere though am wary of the touch of death of some compulsory 'skills' modules"*;
- *"I think we need to more explicitly consider SD issues whereas I think many academics, myself included, simply think it is embedded in the learning provided"*;
- *"Students have to see the relevance to them. If it's done well, then it could apply to all"*; and
- *"I think SD may be a consequence of multiple factors and labelling it reduces its effectiveness across disciplines as it will end up labelled as "eco" and given to the ecologists to work with"*.

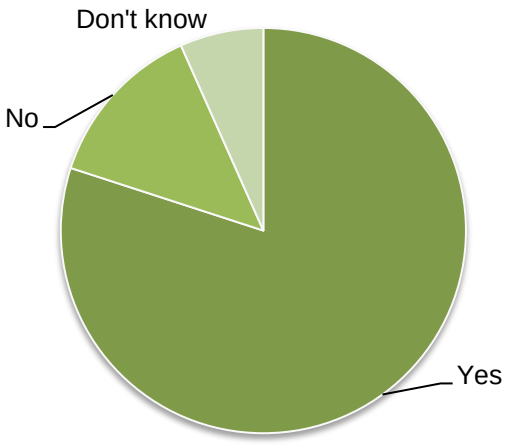
The general consensus appeared to be that sustainability should be included in curricula as an intrinsic part of the course as opposed to a bolt-on or additional module. Some respondents thought that highlighting sustainability issues which are already taught and explicitly labelling them

as sustainability issues could help to raise awareness. There was also some concern about how sustainability might sit within some bioscience disciplines, echoing concerns raised in the 2005 survey about the relevance of ESD:

- *"It may not always be appropriate"*; and
- *"Although ESD is important to include in the curriculum, I am not sure, how this would sit in a biomedical or biochemistry degree programme"*.

In question 2d respondents were then asked if sustainability issues were already incorporated within their bioscience degrees. Of the 15 respondents, 12 said "yes", see figure 4.

Figure 4. Are issues of sustainability already incorporated within your bioscience degrees?



Those who responded yes were then asked how sustainability was incorporated. The comments showed sustainability was included in a variety of ways. There were:

- 10 mentions of sustainability being embedded within modules;
- 2 mentions of dedicated sustainability modules;
- 2 mentions of inclusion in modules where the theme / topic area was environmental or ecological; and
- 3 mentions of inclusion in e.g. tutorials or specific assignments.

Respondents were also asked which sustainability topics were included. A variety of topics were given which fell into 5 broad themes:

- Biodiversity and Conservation;
- Resource use – sustainable resource use and resource conservation;
- Bioethics – including GM food, biotechnology issues, biofuel crops (food or fuel debate) and ecosystem services (valuing the services and products ecosystem provide);
- Direct human impacts on the environment; and
- Economics and sustainability.

Figure 5 shows a Wordle of the responses to question 2dii) If yes, which areas of sustainability are incorporated?

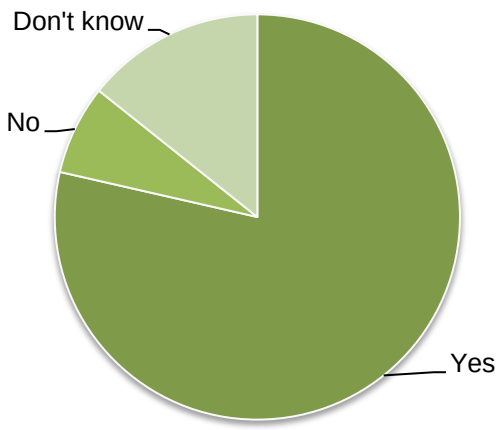
Figure 5. Wordle illustrating the responses to question 2dii) If yes, which areas of sustainability are incorporated? Wordles (*www.wordle.net*) take text and turn it into a visual representation of all the words present, the most common words in the text are the largest in the Wordle.

Those who had responded "no" to question 2d (Are issues of sustainability already incorporated within your bioscience degrees?) were asked "Which sustainability issues do you think should be incorporated?". This question received only three responses:

- *"An appreciation of the role of bioscience in understanding SD"*;
- *"Energy and resources skills / tools"*; and
- *"Not sure"*.

Respondents were then asked if they thought they and their colleagues had the knowledge and skills to teach issues related to sustainability. Of the 15 respondents, 11 (79%) said "yes" (figure 6). This shows an increase from the 2005 survey in which 55% were confident they had the knowledge and skills.

Figure 6. Do you think you and your colleagues have the knowledge and skills to teach issues related to sustainability?



Respondents were asked about the training or support they thought they or their colleagues would require in order to teach or increase teaching of sustainability. Responses were varied, some felt they knew where and how to seek out information and felt there was a lot of information and resources already available for those who were familiar with the topic and the organisations involved with ESD and SD in higher education. For those who were not familiar, basic information, case studies and pointers on where to start would be useful.

Those who were familiar with sustainability suggested that what was needed was more of a change in opinion from other members of the department on the inclusion of sustainability issues. Employers recommending that graduates have sustainability skills would encourage ESD. Some respondents also noted that offering resources and training would be likely to attract the interested and those already teaching sustainability rather than those who didn't have the knowledge and skills needed.

- *"… I think it's more about the process of reaching SD, e.g. communication and participation and getting senior management support than gaining the knowledge and understanding to teach the subject"*
- *"Case studies to illustrate how SD can be incorporated into Bioscience teaching would be useful. Employers recommending that graduates should have SD skills would also be helpful"*
- *"Colleagues that are not teaching anything related yet, might possibly benefit from an introductory pack with e.g. literature recommendations, case scenarios, examples of learning activities"*

Respondents were then asked if they used any specific learning resources linked to the teaching of sustainability in the curriculum. Resources included:

- Practical Evaluation Tools for Urban Sustainability (*www.petus.eu.com/*);
- The Environmental Association for Universities and Colleges (*www.eauc.org.uk*);
- Case studies;
- Current media concerns;
- Examples from original and review literature;
- Specialists from industry/community;

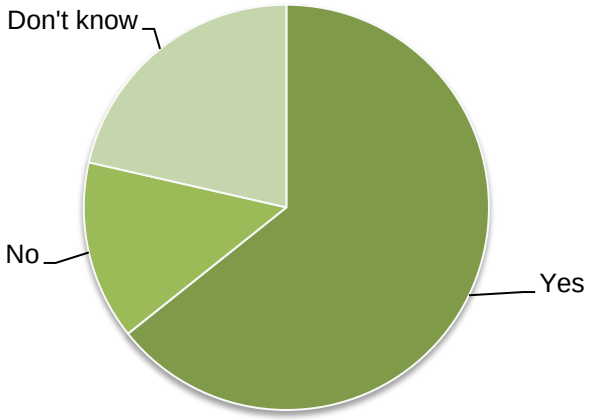
- Own expertise;
- Materials from the Higher Education Academy (*www.heacademy.ac.uk/ourwork/teachingandlearning/sustainability*); and
- Materials from the Centre for Sustainable Futures (*http://csf.plymouth.ac.uk/*).

For the last question in section 2 respondents were asked how they thought Subject Centres could support teaching staff in embedding the teaching of sustainable development in their teaching. This question was not included in the 2005 survey.
Four responses asked for case studies in a bioscience context – this was the most common response. Two respondents referred to the QAA benchmark, one asking for guidance on how SD maps onto the QAA benchmarks for bioscience and another recommending inclusion of SD into the benchmark for the biological sciences.
Many highlighted the need for a bioscience context or angle – a discipline-specific focus and some also requested the development of, and access to, interdisciplinary resources.

Section 3 – Identification of ESD in other disciplines

The final section of the survey looked at ESD and sustainability within disciplines other than that of the respondents. Respondents were asked if they know of any other departments or schools within their institution who were teaching ESD (figure 7). A higher proportion of respondents were aware of sustainability being taught within their institution than in the 2005 survey (64% compared to 52% in the 2005 survey).

Figure 7. To your knowledge do any other departments or schools within your institution teach sustainability?



A variety of departments were known to be teaching sustainability within respondents' institutions:

- Animal Behaviour and welfare;
- Animal Science;
- Anthropology;
- Biological and Environmental Sciences;
- Business;
- Civic Design;
- Economics;
- Engineering;

- Equine Science;
- Geography;
- Geography Earth and Ocean Sciences; and
- Geography Geology and the Environment.

When asked if they would consider using staff from other departments to teach sustainability to bioscience students eight respondents said "yes", with some caveats:

- *"yes, outside speakers can give authority to non-discipline topics, but there does need to be an element of contextual learning within the Biosciences area to make it obvious to all students why they are doing it"*.

Cost was also an element mentioned by some. Others felt they had the expertise needed in house and some were already using teaching staff from other departments on interdisciplinary modules.

Summary of the survey

Due to the low response rate care must be taken in analysing the results of the survey. Those who have responded may be a self-selecting group who take more interest in ESD than the "average" bioscience lecturer.

Overall, in comparison with the results of the 2005 survey, the respondents appeared to have a higher awareness of sustainability, a higher awareness of departmental and institutional sustainability strategies, were more confident in their ability to teach sustainability and were more inclined to think sustainability should be a part of the bioscience curriculum.

They echoed concerns of the respondents to the 2005 survey that sustainability may not be relevant to include in some bioscience disciplines, biochemistry and biomedical sciences were mentioned explicitly. There was also concern about how ESD was included in bioscience curricula. Most felt it should be an embedded part of, for example, a module or course, and that a stand-alone module on sustainability issues would not be effective; students needed to see the relevance of sustainability to their discipline. However there was some call for interdisciplinary ESD teaching resources, recognising the cross-disciplinary nature of sustainability.

When asked what would support them in their teaching of sustainability two respondents specifically mentioned the QAA benchmarks. One asked for guidance on how sustainability fits with the QAA benchmarks and the other stated that having sustainability included in the benchmarks would support them in being able to include sustainability within their teaching. Graduate skills and employer requirements were also mentioned in a number of responses, implying that if employers called for graduates to have sustainability skills they would be more likely to be included in curricula. A small number of respondents also suggested that growing research into sustainability issues within HEIs and also increasing numbers of jobs in e.g. conservation, green technologies could lead to more students taking an interest.

Respondents noted a number of ways in which the UK Centre for Bioscience could support the inclusion of ESD in the biosciences. Respondents suggested that resources and materials such as case studies would be useful for those starting out. The Centre has a section of its website dedicated to ESD (*www.bioscience.heacademy.ac.uk/resources/esd/*) bringing together resources and information for bioscience teaching staff. Perhaps making this more prominent, ensuring the pages are regularly updated and case studies of ESD practice in the biosciences are made available from the Centre could go some way towards supporting this. The Spring 2010 edition of our newsletter, the Bioscience Bulletin, was a themed issue focussed on environmental ethics and

ESD and brings together a number of case studies of practice (*www.bioscience.heacademy.ac.uk/ftp/newsletters/bulletin29.pdf*).

Practical measures ("greening" departments and institutions), leading by example and taking an active part in improving environmental sustainability were also suggested as ways of introducing sustainability. This aspect of sustainability in higher education is covered by a variety of organisations and resources, for example the Green Gown Awards (*www.eauc.org.uk/green_gown_awards*), Environmental Association for Universities and Colleges (EAUC) (*www.eauc.org.uk*) and is discussed in the "how to" sheets produced by the UK Centre for Bioscience (*www.bioscience.heacademy.ac.uk/resources/esd/howto.aspx*). As sustainability of this nature is already supported by a number of organisations the Centre feels its activities would be most usefully and efficiently focussed on sustainability in curricula.

Overall the survey responses showed a generally positive view towards the inclusion of ESD in bioscience teaching and showed a variety of ESD topics and themes are being taught in a range of bioscience disciplines. However, as noted at the start of the summary, this survey represents only a small number of individuals teaching in the biosciences.

ESD resources from the UK Centre for Bioscience

UK Centre for Bioscience ESD webpages. *www.bioscience,heacademy.ac.uk/resources/esd/*

Baseline Evaluation of Education for Sustainable Development (ESD) in the Biosciences – A report of a survey of higher education teaching staff and bioscience employers. May 2005. *www.bioscience.heacademy.ac.uk/ftp/esd/esdreport.pdf*.

Bioscience Bulletin 29 – Special Themed Edition on Education for Sustainable Development. *www.bioscience.heacademy.ac.uk/ftp/newsletters/bulletin29.pdf*

How to make your teaching more sustainable - a series of "How to" sheets with hints, tips and ideas on making aspects of teaching more sustainable. Six sheets are available: Making your tutorials, fieldtrips, office, practicals and lectures more sustainable and including sustainable development in your teaching. *www.bioscience.heacademy.ac.uk/resources/esd/howto.aspx*

The **Ethics audit tool, incorporating sustainability** is designed to facilitate ethics and ESD provision within a course. *www.bioscience.heacademy.ac.uk/ftp/resources/audit/ethics.pdf*

Case study: Tierney, A., Brown, A. and Dominy, P. (2006) **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*

Centre funded project: **Towards sustainable teaching of bioscience**, Dylan Gwynn-Jones, University of Wales, Aberystwyth.
www.bioscience.heacademy.ac.uk/funding/currentprojects/gwynnjones.aspx

Centre event: **Teaching Ethics to Bioscience Students: Sustainability and the Environment**, December 2009. Event report, presentations and resources are available.
www.bioscience.heacademy.ac.uk/events/cardiff091209.aspx

Appendix – Survey

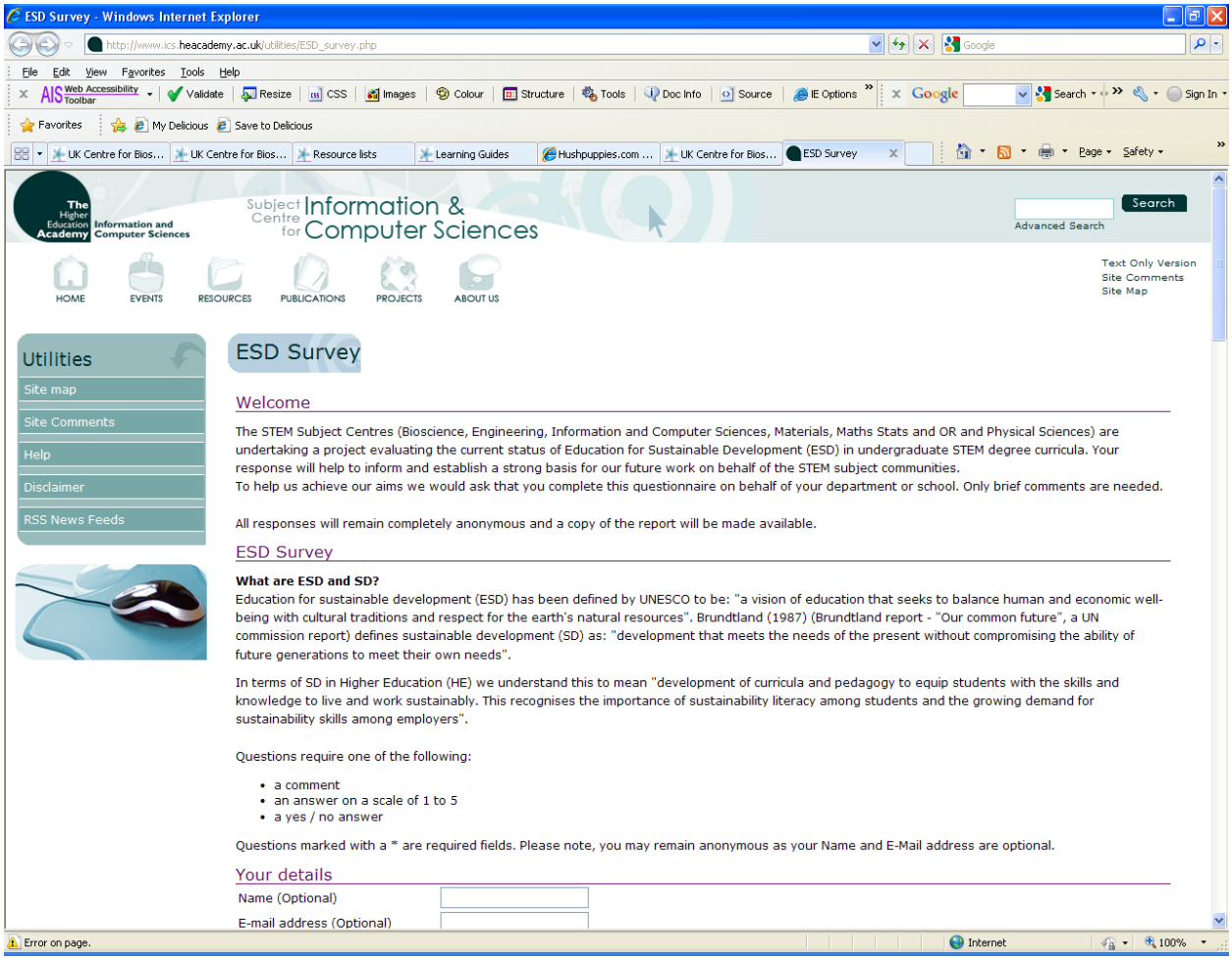


Figure 1. Screenshot of the survey hosted on the Information and Computer Sciences Subject Centre website.

ESD Survey

Welcome

The STEM Subject Centres (Bioscience, Engineering, Information and Computer Sciences, Materials, Maths Stats and OR and Physical Sciences) are undertaking a project evaluating the current status of Education for Sustainable Development (ESD) in undergraduate STEM degree curricula. Your response will help to inform and establish a strong basis for our future work on behalf of the STEM subject communities.

To help us achieve our aims we would ask that you complete this questionnaire on behalf of your department or school. Only brief comments are needed.

All responses will remain completely anonymous and a copy of the report will be made available.

ESD Survey

What are ESD and SD?

Education for sustainable development (ESD) has been defined by UNESCO to be: "a vision of education that seeks to balance human and economic well-being with cultural traditions and respect for the earth's natural resources". Brundtland (1987) (Brundtland report - "Our common future", a UN commission report) defines sustainable development (SD) as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

In terms of SD in Higher Education (HE) we understand this to mean "development of curricula and pedagogy to equip students with the skills and knowledge to live and work sustainably. This recognises the importance of sustainability literacy among students and the growing demand for sustainability skills among employers".

Questions require one of the following:

- a comment
- an answer on a scale of 1 to 5
- a yes / no answer

Questions marked with a * are required fields. Please note, you may remain anonymous as your Name and E-Mail address are optional.

Your details

Name (Optional)

E-mail address (Optional)

*Department / School / Unit

*Institution

*Which of the following discipline areas would you align yourself with?

- Bioscience
- Engineering
- Information and Computer Sciences
- Materials
- Maths Stats and OR
- Physical Sciences

Section 1 - General questions about sustainability

a) Please comment on your understanding of what the term SD means

b) How important do you think it is for students to have some understanding of SD?

1 - Not important
2 - A little important
3 - Fairly important
4 - Quite important
5 - Very important

c) Do you think HE should play a role in helping society to develop sustainability?

yes
no
don't know

d) How do you think HE can contribute to a greater understanding of SD?

e) How could your department or school contribute to a greater understanding of SD?

Section 2 - Review of current practice in ESD in your discipline

a) Is there a strategy for SD in your:

Institution
Department
Both
Don't know

b) Do you think the teaching of SD is relevant to your discipline?

yes
no
don't know

c) Do you think that SD should be a compulsory part of bioscience / engineering / information and computer sciences / materials/ maths/ physical sciences programmes?

1 - Definitely not
2 - Not much
3 - Possibly
4 - Mostly
5 - Definitely

c) i) Please comment on your above answer

d) Are issues of SD already incorporated within your bioscience / engineering / information and computer sciences / materials/ maths/ physical sciences degree(s)?

yes
no
don't know

d) i) If yes, how is SD incorporated (i.e. integrated within modules or a specific SD module)?

d) ii) If yes, which areas of SD are incorporated?

d) iii) If no, which SD issues do you think should be incorporated?

e) Do you think you and your colleagues have the knowledge and skills to teach issues related to sustainability?

yes
no
don't know

e) i) What training / support would you and your colleagues require in order to teach or increase teaching of SD?

f) Do you or your colleagues use any specific learning resources linked to the teaching of SD in the curriculum?

yes

no

don't know

f) i) If you do use specific learning resources, please provide details.

g) How do you think Subject Centres could support teaching staff in embedding the teaching of sustainable development in their curricula?

Section 3 - Identification of ESD in other disciplines

a) To your knowledge do any other departments or schools within your institution teach SD?

yes

no

don't know

a) i) If yes, which?

b) Would you consider using staff from other departments to teach SD to bioscience / engineering / information and computer sciences / materials/ maths/ physical sciences students? Please give details.

End of Questions - Thank you for your time

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