Environmental History Teaching

Survey
In order to find out what humanities students think of science and their knowledge of key scientific concepts a survey was carried out that had four objectives:

1. To trace their pre-university education in science.
2. To establish the reasons why students had chosen to avoid science subjects at university.
3. To get in insight in their attitudes and impressions towards science.
4. To establish what the qualitative knowledge of six science key concepts among humanities students.

The survey was carried out among 300 undergraduate students at the University of Newcastle in the Schools of Historical Studies and Geography, Politics and Sociology and University of East Anglia in the School of History.

To establish the six most widely used scientific concepts in environmental history and humanities based environmental education in general a survey was conducted among colleagues working in the field of environmental history. This was done through the H-Environment discussion list and generated twenty two responses from colleagues in half a dozen countries. The answers were very consistent among the respondents and the six concepts used in the survey were based on these results to test the knowledge and understanding of these concepts.

This small survey resulted in an interesting and revealing list, which is shown below.

- Ecosystem dynamics
- Biological exchange
- Climate Change
- Greenhouse effect
- Evolution
- Gaia hypothesis
- Resource management
- Species history
- Malthusian population theory
- Exponential growth
- Deep time
- Radiocarbon decay (C14 method)

Summary of results
The first part of the study tried to establish the causes of the resistance among humanities students and whether these are rooted in the belief of a “two cultures” problem or something else. Part of this survey was also a test of the knowledge about some core concepts used in environmental history teaching as an indication of science literacy.
The second part of the study involved the experimentation with a different teaching strategy involving the use of narrative as vehicle of science.

Roots of resistance to science

The survey among 300 humanities students at university level showed that resistance to science is caused by a combination of the belief in the "two cultures" divide as well as the institutional organisation of the education system and pressures from society. It is striking that roughly a quarter to a third studied one or more science subjects at A-level. Although this seems much better than twenty years ago the fact that so many humanities students drop science at A-level is largely due to curricular and institutional barriers and include:

- Students are locked in disciplinary structures from GCSE level which limits the development of interdisciplinary thinking and perspectives.
- Specialization and separation of disciplines in different faculties and departments at university level (see also Klein, 1998).
- The organisation of education at secondary and tertiary level results in disjoint programmes with separate streams for humanities and science students.
- Benchmark statements exclude interdisciplinary perspectives and focus on core elements of a particular discipline.
- Funding for students provided by separated humanities, science and social science funding bodies.

Student attitudes to science

Student attitudes and knowledge towards science is in part the result of the way it is taught and the failure to make it relevant to every day life and contemporary problems. This is partially visible in the survey results among the 300 students:

- A fifth of students perceived science as difficult.
- The combined responses "Dull", "Not Interesting", "Did not enjoy it" and "science does not allow discussion" accounted for 50% of the students. Science is not necessarily difficult but perceived as dull, uninteresting and not worthwhile pursuing.
- Some students indicated, "in science all the answers are known" which suggests a poor understanding of the principles of science. Science is distinguished from other subjects by its concern with "right and wrong" answers and its lack of opportunity of forming a personal opinion (see also Osborne, 2001).
- Science is principally valued for its instrumental value to solve a problem.

These results suggest that science has an image problem caused by the way it is presented, and examined at secondary school level. The most serious problem seems that science does not connect to the daily experiences of students because it is dehumanization well as dehistorisized by a focus on mathematics, formulas and the laws of physics. Present day science curricula do not include mechanisms to connect contemporary social, environmental and ethical issues with an understanding of science and technology (Strube, 1994: 314; Millar, 2007: 69). Thas is problematic in a society that increasingly relies on science and technology. Another problem observed is that teaching does often not include critical thinking combined with a result driven culture in which the answers matter (the Wikipedia culture), not the methodology. Therefore the exam culture does not require answers with analysis or critique resulting in shallow interpretation of facts and no understanding of complex issues. This results in students' dislike of probability because it does not provide them with ready made answers that can be readily understood and used. Ready made unambiguous answers are easier to understand and use.

Concepts
To get better grips on the understanding of science among students they were confronted with a list of science concepts used in the teaching of environmental history. The first three concepts are large overarching hybrid concepts that connect a whole host of other ideas and concepts. The second group were singular concepts or related to numeracy . The results of the test suggests that students struggle with providing qualitative descriptions of large overarching concepts such as global warming and ecosystems. Presenting large complex scientific ideas as singular concepts without providing any context makes it difficult for students to grasp what it means. To overcome this problem science can be embedded in narratives to provide a context.

Narrative
At present humanities curricula lack a recognised mechanism to integrate science and link it to social, ethical and environmental issues that out society is facing at present. It has been suggested that narrative can provide such an integrative mechanism, providing a structure that allows scientific concepts to be more easily integrated in conceptual understanding (Strube, 1994: 313). To put it differently, narratives seem to play a central role in memory by providing an organising structure for new experiences and knowledge (Mandler, 1984). A narrative can be defined as the telling of a series of events in a time sequence and in a way that it portrays a meaningful coherent whole. Narrative places specific humanities and science knowledge in contexts so that it is no longer compartmentalised but integrated. Narrative is an adhesive force, that adds coherence and meaning to diverse and abstract ideas and concepts.

From a pedagogic point of view using narrative to integrate science in a humanities context has the following advantages:

1. It places concepts in context that makes it memorable and connected with other knowledge contexts.

2. Narrative reflects the way the human mind organises the world. Narrative forms an organising principle linking abstract science to the "real world", i.e. every day experience.

3. It provides opportunities to teach students critical thinking. This is the recognition that there are no wrong answers, only valid questions and that there are many rival views in all areas of knowledge. Narrative often revolves around different views and seemingly opposite conclusions.

The bottom-line is that in a humanities course, science has to be humanised in order to connect it to the “real world problems” humanities students are interested in.

Contextualizing is a method of embedding people, artefacts, places, animals, etc. in the fabric of time, culture and space. It is a vehicle for humanizing knowledge in a humanities type inquiry. The humanities can form an interface for interdisciplinary enquiry, e.g. environmental history uses time, space, culture, environment and history as vehicles of integration (history and environment as context) and crosses over into the realm of science.

Science conceptualizes physical data by abstracting it to its mathematical or other formalised form or empirical core and linking this to general underlying patterns and processes, sometimes referred to as laws or principles.

Conceptualizing strips real world events and processes from its context that humans need to understand the world they live in and to give it meaning (Nikitina, 2002).

Conclusion: Science can be humanised by stripping concepts of mathematics and abstract notions and transform them into narratives which makes it possible to integrate into humanistic discourse.

Background

In 1959 the famous author and scientist, C.P. Snow presented a lecture in which he argued that the critical intellectual weakness of the later 20th century was the separation of humanities from sciences.**[1]** This divide between sciences and humanities has become part of our intellectual baggage and is passed on to our students. As a result students in the humanities avoid science in order to focus on "real world issues". With the emergence of global warming and other global environmental threats as real world issues, humanities students have to be educated in understanding the intricacies of climate change, ecosystem functions, toxicology and other areas of environmental research.

Unfortunately, few humanities undergraduates have an understanding of the scientific processes that underlie these issues and lack the scientific training needed to do so. This produces humanities students, incapable to fully understand environmental issues. There may be several reasons for humanities students difficulties with science, many of which stem from misplaced perceptions of the scientific approach. Firstly, there has (naturally) been little exposure to scientific content in most traditional history curricula. Secondly, differences in modes of teaching delivery between humanities and science subjects can perplex and confuse students. The unfamiliar mode of teaching may be compounded by strange language (jargon). Thirdly, there are often perceptions of the relevance of scientific evidence, or lack of it, to students studying history. The use of evidence from the natural sciences is often seen as the realm of archaeologists, historical geographers or historians of science. Fourthly, students may be intimidated by what is considered the inflexible logic, or use of numerical or tabular data in science. Fifth, some of the concepts used in science may be difficult for humanities students. Finally, there are many institutional obstacles, such as the organisation of universities in subject based departments that may prevent the infusion science in humanities curricula and courses.

1. C.P. Snow, *The two cultures and the Scientific Revolution* (Cambridge: Cambridge University Press, 1960).

Environmental History Resources
http://www.eh-resources.org/

Environmental History Teaching
http://www.eh-teaching.org/index.html

links :

Academic Info - Environmental History
http://www.academicinfo.net/ehist.html

Algae Base NUI Galway *Listing the Worlds Algae*
http://www.algaebase.org/

aNSwer - *online register of environmental research being undertaken in the island of Ireland*
http://www.answer-online.org/

ASLE - *Association for the Study of Literature and Environment*
http://www.asle.org/

Burrenbeo - **information and education for the Burren, land of the fertile rock**
http://www.burrenbeo.com/

CELT - **Centre for Environmental Living & Training**
http://www.celtnet.org/

Center for Environmental Research University of Limerick
http://www.ul.ie/~cer/main.htm

Early Classics in Biogeography, Distribution, and Diversity Studies: To 1950
http://www.wku.edu/~smithch/biogeog/

Environmental History Bibliography
http://www.foresthistory.org/Research/biblio.html

Environmental Protection Agency Ireland
http://www.epa.ie/

Environmental Science Association of Ireland
http://www.esaiweb.org/esai_homepage.php

European Society for Environmental History
http://eseh.org/

Martin Ryan Institute NUI Galway
http://mri.nuigalway.ie/

Peoples, Identities, and Environments - New Zealand
http://www.otago.ac.nz/nzpg/index.html

WWW Virtual Library - Environmental History
http://vlib.iue.it/history/topical/environmental.html