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Article:
**Informing, Teaching, or Propagandising?
Combining Environmental and Science
Studies for Undergraduates**

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Introduction

This article discusses recent experiences in the integrated teaching of Environmental Studies and Science Studies in a generalist curriculum at a new University campus in Scotland. At the University of Glasgow, Crichton Campus, over the past two years, a new mixed curriculum has been developed that coherently combines Environmental and Science Studies, perhaps the first such curriculum in the UK and equally uncommon in America.¹ The Crichton curriculum is intentionally multi-disciplinary, drawing closely on the nineteenth-century Scottish model successfully exported to America.² This generalist approach, emphasising broad philosophical principles, informs the courses and their inter-relationships.

Most components of Environmental Studies, forming one of the five degrees offered, are taught largely from a scientific perspective, reflecting the academic background (geomorphology) of the teaching staff. The subject of Science Studies is introduced as a core first-year course and via optional second and third year courses, dissertations and projects. The analytical themes for the Science Studies courses are history of science and technology, philosophy of science (e.g. epistemology, ontology and moral philosophy) and the sociology of science and scientific knowledge (e.g. interest groups and cultural beliefs).

¹ A version of this paper was presented at the *Taking Nature Seriously* conference, University of Oregon, Eugene, Oregon, in February 2001. The Eugene campus has recently introduced a combined Environmental Studies/Science Studies option in their Environmental Studies degree, apparently the only such linkage in the United States.

² Davie, George Elder, *The Democratic Intellect: Scotland and Her Universities in the Nineteenth Century* (Edinburgh: Edinburgh University Press, 1961), 352 pp.

Our teaching argues that an understanding of the inter-related technical, social and philosophical aspects of environmental research provides a strongly positive approach to engaging real-world problems, by promoting an understanding of multiple viewpoints in the technical and cultural issues at the centre of modern scientific debate. This contextual interdisciplinarity³ challenges both teacher and learner to look beyond the establishment of environmental scientific facts to the creation of an environmental science discourse.

This critical approach to knowledge has required a broadening of the teaching of environmental science to incorporate many of the issues tackled in Science Studies. At the same time, the general themes addressed by the Science Studies courses are illuminated by examples from Environmental Studies. The complementary academic stances of these subjects have been synthesised in a second-year course on Environmental Ethics, co-taught by lecturers from both subjects. Our experiences in integrating these two studies indicate that this can be a fertile approach that links contemporary debates to deep understandings of the natural world and society. We argue that this approach, and the teaching methods utilised, are effective means of engaging and teaching our students, and are particularly relevant in the modern British context.

The context of modern life

In both the UK and America, Environmental Studies and Science Studies began to coalesce as interdisciplinary academic subjects during the late 1960s and 1970s. In both countries some of the obvious triggers for interest in historical and social studies of modern science and technology was the questioning of environmental consequences of technological growth, the rise in pollution and the apparent abuse of ‘the commons’.⁴ Widely publicised cases such as the Torre Canyon disaster in 1967⁵ and questions of nuclear reactor siting through the 1970s began to engage the public directly in questions of policy-making and the evaluation of scientific facts. Students too demanded that academic

³ Boden, Margaret, “What is interdisciplinarity?”, in Cunningham, Rachael (ed.), *Interdisciplinarity and the Organisation of Knowledge in Europe* (Belgium: Office for Official Publications of the European Communities, 1999, pp. 13-23). Boden defines contextual interdisciplinarity as being “concerned with the social relevance, public acceptance and ethical justification of scientific research”

⁴ Hardin, Garrett. “The tragedy of the commons”, *Science*, 162, 1968, 1243-1248.

⁵ in which 119,000 tonnes of crude oil polluted miles of the French and British coasts.

curricula reflected and were relevant to their social environments.⁶ Thus Science Studies and Environmental Studies addressed some common themes from their very beginnings as academic subjects.

More recently, British experiences make the subjects of Environmental and Science Studies particularly relevant to students and to the general public. A relatively compact and densely populated country, Britain has a legacy of human management of the countryside with no remaining wilderness areas. There is a close association between food production, heavy industry (and the resulting pollution) and urban conurbations reflected in a long history of pollution crises and legislation. For most Britons, humankind's effect on the environment is inescapable and obvious.

In the last decade, there has been a skyrocketing awareness in Britain of problems with health, the environment and scientific authority. Readers will be familiar with the rapid succession of issues. In 1988 salmonella in eggs filled headlines; during 1990 Bovine Spongiform Encephalitis (BSE, or "mad cow disease") was identified, and by 1996 blamed for human deaths; the cloning of Dolly the sheep in 1997 brought scientific ethics to public attention; the summer of 1999 was dominated by a vociferous public debate and political debacle over the testing and marketing of GM foods; and from spring 2001 the contentious facts, containment strategies and politicisation of foot and mouth disease have filled newspapers. Between these major events, food poisoning, inoculation, and radioactive contamination affairs have excited public discussion.

The context of teaching, learning and discussion

These issues are particularly pertinent to Southwest Scotland, where our campus is located. Dumfries and Galloway is a rural region that combines mixed farming, small towns and stands of forest. The area has the highest rate of farms converting to organic status in Scotland. It boasts internationally important sites including Special Protection Areas and Special Areas of Conservation (both designated under European Community Directives) and Ramsar Sites,⁷ designated under the Ramsar International Wetlands Convention. Part of its coastline is being

⁶ Soule, M. E and Press, D. "What is environmental studies?", *Bioscience* 48, 1998, 397-405.

⁷ Ramsar sites, listed under the Convention of Wetlands of International Importance, are often designated for their importance to wildfowl habitats.

considered as a World Heritage Site. Around 75,000 hectares of land are protected by national legislation.

On the other hand, like many other areas in Britain, it has a nearby nuclear power station,⁸ waste incinerators and landfill sites. The radioactive fallout from Chernobyl 15 years ago affected its dairy and sheep industries significantly. Its coastline has measurable contamination from discharge by the Sellafield Nuclear Fuel Reprocessing Plant, located near the Sellafield nuclear reactor (70 km south of the campus)⁹. Several areas in the region are used as military practice sites where depleted uranium shells have been fired regularly and where low level flying by fighter jets is a commonplace. A chemical plant is located on the outskirts of Dumfries itself, and Gretna (25 km east) was the site of the largest munitions chemicals factory in Britain during the First World War.

The most current concern—and one of immense economic importance to our immediate region—is the foot and mouth disease crisis. The region has been affected almost as seriously as Cumbria, immediately to the south. Most of our students have been affected directly or indirectly by the widespread culling, decline of support industries, and restrictions on movement. Field classes, for example, were cancelled; some students were restricted to infected farms; most felt or saw the effects on local employment and tourism. In such a context, science is not an abstract academic concern: it is challenged daily in the fields, on the streets and in the classrooms.

Thus food production, pollution and livelihoods are inextricably interlinked at our campus. The environment, and science's influence on it, are immediate public and personal issues in the minds of our incoming students. Students entering first-year courses have consequently been highly polarised on these issues. Nearly all had been saturated with news coverage in the preceding months. Many had convictions without substantive background knowledge; others were bewildered and isolationist. As university lecturers, we are very aware that the students entering our campus are extremely concerned about the very public issues of environmental management, ethical policy and scientific reliability. Our challenge is to convert this inchoate awareness and concern into solid knowledge and reasoned perspectives. How far

⁸ The second oldest power reactor in Britain, Chapelcross is 22 km west of the campus and employs some of our students and members of their families.

⁹ Harvey, M. M. and Allan, R. L. "The Solway Firth Saltmarshes", *Scottish Geographical Magazine* 114, 1998, 42-45.

can students acquire a critical understanding of environmental issues beyond the rapidly changing and media-dominated constructions of these activities?

Our student body, as a whole, has evinced a strong interest in ethical issues, and has demonstrated a willingness and ability to relate them to historical cases and sociological perspectives. Our general approach therefore, has been to work with the inbuilt differences of disparate and opinionated groups to construct courses with interwoven threads of environmental science, ethics, critical thinking and historical and social studies of science.

Shaping an integrative curriculum

The general curriculum at Crichton currently includes five degrees, one of which is Environmental Studies. Environmental Studies focuses on teaching strengths in physical geography and geomorphology, as shown by the list of titles given in the Appendix. It encourages students' recognition that the physical environment cannot be viewed in isolation because of the impact of human presence on the planet, whilst also stressing that in order to understand the extent of human impact there must be an understanding of how the environment functions. Whilst drawn from fields of scientific enquiry, the courses always ensure that there is an understanding of wider social, economic, political and philosophical issues. The first introduction that students have to the environment and environmental issues is through a course called *The Environment and Sustainability* which, while focussing on the technical details of ensuring a sustainable environment (illustrated through issues such as resource/energy use and population), also addresses the social, economic and political issues that are at the centre of much policy making.

There is also a strong and explicit thread of Science Studies in the general curriculum. Our curriculum is perhaps unique in Britain: first-year Science Studies are mandatory for all students for our five degrees.¹⁰ We see this as an acknowledgement of the importance of science and its effects on daily life. We aim to teach students that, while rational methods of creating knowledge are the best that we have, these methods have inbuilt limitations and intimate links with culture and society, and are solidly embedded within a value system and ethical

¹⁰ All five degrees (Environmental Studies, Liberal Arts, Scottish Studies, Health and Social Studies, and Creative and Cultural Studies) fall within the Faculty of Arts at the University of Glasgow.

stance. This emphasis, reflected in both Science and Environmental Studies, is illustrated by one of four ‘core courses’ (or mandatory subjects) taken by all students called *Science: History and Culture*. This is a course about rational knowledge: its evolution over time, its strengths and its weaknesses. The course traces the historical trajectory that has produced our modern reliance on technocentric solutions, and relates intellectual ideas to cultural beliefs. Other Science Studies courses are listed in the Appendix.

The essence of Science Studies at Crichton is the exploration of the social and philosophical dimensions of science and technology. This is also the central premise for the Environmental Studies curriculum. The first link between environmental and scientific issues for first year students is the ‘core’ course *Issues in Contemporary Society*, which as the name suggests, discusses contentious ethics of modern life. The past year’s topics included environmental stewardship and the Human Genome Project; a year earlier we presented a section on agricultural genetic engineering.

The challenge for educators

Such course titles suggest the challenge that we face as educators: first of all, to teach environmental studies to a wide spectrum of students having a variety of incoming beliefs. Some of our students are committed environmentalists. Others arrive as intensely distrustful and dismissive about professional science. Indeed, many begin with a kind of mental paralysis. We can illustrate this by an example. Locally there were plans to construct a landfill site in an area of commercial forest plantation, a development which students commonly identify as being ‘wrong’ or ‘bad’ but without necessarily thinking about the overall implication of the alternatives. This is not apathy: it is a commitment to deeply held beliefs, sometimes incomplete, sometimes inconsistent and occasionally intractable.

Our second challenge is to present science studies material—deferred until second year at some institutions, and usually left as course options or electives—to first-year students already deeply engaged with amorphous concerns. We feel that the nuanced perspective of science studies is very important for our first year students; unless they can begin to question their own convictions, and the convictions of others, they cannot begin to understand the issues at the centre of current environmental debates. This profound questioning is the central theme of the two core courses mentioned above.

Our third challenge as educators is to articulate the scientific and moral objectivity behind our teaching.

It is important to emphasise that we are not ‘environmentalists’, ‘pro-science’ nor ‘anti-science’. We stress in our lectures that we aim to teach, not preach.¹¹ This is something that many first year students are either surprised about, disappointed about, or deeply suspicious about! It is important to be scrupulous in providing a balanced perspective that respects different stances while stressing the importance—and sometimes the ultimate limitations—of scientific knowledge. This should not be interpreted as merely being politically correct. We are not concerned with giving ‘equal time’ to opposing groups. We do not try explicitly to balance the statements of Friends of the Earth with those of local chemical firms. We do, however, explore the reasoning and values underpinning different stances. This is combined with instilling skills in critical thinking—attempting to evaluate the plausibility of factual claims, or the coherency of arguments. The students develop such analytical skills through web-based study units and tutorial exercises.

This point is important: we have titled this article “Informing, Teaching or Propagandising”, because Environmental Studies and Science Studies courses could do any or all of these things.

We use the word “Informing” to mean providing facts. But facts—especially facts about the complex natural environment—can often be contentious or very difficult to discern. For this reason, we believe that a typical strategy of first year science or earth science courses does not work here. We cannot merely supply technical details, from ‘basic’ to ‘advanced’, and expect our students to gain any deep understanding of the environment as a whole. Obviously, we provide the students with technical, often science-based information, but we also provide them with the tools to critically assess some aspects of this information.¹²

The second word in our title—“Teaching”—we take to mean a more wide-ranging activity than merely providing uncontentious nuggets of information. As one student said recently, he felt that our approach was one of sharing knowledge rather than us imparting facts, thereby facilitating student led learning.

¹¹ Indeed, one student exercise in our *Issues in Contemporary Society* course is to vote on whether the lectures have been pro- or anti-genetic engineering, an exercise that opens the door to the debate on the objectivity of scientific investigation and reporting.

¹² This point has also been made in Cantor, Geoffrey, “Teaching Philosophy and HPS to Science Students”, *PRS-LTSN Journal* 1, 2001, 14-24.

The third word—"Propagandising"—can all too easily be incorporated into environmental discourse. It is possible that our personal commitments to the environment, which understandably have led us down this academic road, will flavour our teaching, perhaps giving it a biased view. This is, of course, also a commonly expressed concern of science departments about the content of science studies teaching. To the credit of the University of Glasgow, which has the largest Faculty of Science in the UK, the introduction of Science Studies has engendered little criticism from the Faculty thus far.

Environmental Studies seems to us to be a subject prone to being either trivialised or overtly politicised for a number of reasons. Today, to be environmentally conscious or pro-active is something to which most citizens and, indeed, lecturers claim to subscribe. Isn't everyone for a 'clean environment', whatever that means? Even inanimate objects—everything from underarm deodorant to hamburger boxes are designed to be environmentally friendly. So, too, are companies, governments and social groups. The notion of environmental responsibility is now so dilute and ubiquitous that it has ceased to have much intellectual value.

Yet it is also a concept that has become politicised. Defending waste incinerators, in some contexts, can be as unpopular as defending eugenics. Environmental issues are at the heart of major governmental policy decisions, certainly in Britain. In this context of necessary but sometimes unpopular policy-making, it is all too easy to produce the very opposite of what we, as educators, want. For example, at the end of 2000, Britain was hit by a series of major floods resulting from prolonged periods of rain. These floods were placed firmly at the door of global warming by the Government and environmentalists alike. A few months earlier, equal levels of public criticism were levelled at the price of petrol, an expensive product in Britain owing partly to an 'environment' tax designed to restrain the excessive consumption of petrol and to pay for the research and development of alternative energy sources. In both cases an atmosphere was created that avoided or submerged informed public, and even academic, debate, a position contrary to the ethos of both science studies and environmental studies.

Both the trivialisation and the politicisation of environmental studies are a danger to its academic expression. Indeed, the issue of the academic robustness of environmental studies has been hotly debated in

recent years in some American literature¹³ It is for this reason that we are not interested in being identified as ‘environmentalists’, ‘pro-science’ or ‘anti-science’. Our courses strive to be analytically neutral, scientifically aware and socially perceptive.

The appropriate means to an end

Let us refer back to our challenges outlined above: to teach environmental studies to a wide spectrum of students with a variety of incoming beliefs; to present science studies material to students enabling them to confront the sometime conflicting issues at the centre of current environment debates; to articulate the scientific and moral objectivity behind our teaching. Our approach to engaging with these challenges has been two-fold: firstly to devise an appropriate curriculum; and secondly to utilise appropriate teaching methods.

Let us illustrate this with a second-year course offering, *Environmental Ethics*, taught by the authors, Johnston (Science Studies) and Harvey (Environmental Studies). Such a course has increasingly been offered at UK universities since the late 1970s, most frequently in departments of philosophy. We have conceived our variant of this course as the symbiosis of two studies. It is not merely a dialogue between two specialisms, but an integrated and complementary approach. It is also designed to appeal to at least two varieties of students: first, those studying for the Environmental Studies degree; and second, those studying for the Liberal Arts degree, with a strong emphasis on philosophy and history of science. Thus we immediately have a dichotomy between those students with a strong interest in the environment, on the one hand, and those students with an interest in moral philosophy and scientific practice, on the other.

The course explores the relationship between value systems, scientific uncertainty and decision-making. The value systems and case studies behind environmental ethics are, of course, unusually wide-ranging. The responses from students have been interesting. One response is muted shock; many are surprised that the course does not necessarily validate their own values. Traditional moral philosophy is anthropocentric: firmly human-centred, based largely on the treatment of one individual by another individual. In environmental ethics, however, anthropocentrism is merely one of many systems, ranging from

¹³ For example, Soule and Press, 1998 *inter alia*.; Maniates, Michael “Environmental Studies: The Sky is Not Falling?”, *Bioscience* 50, 2000, 509-517.

biocentric to ecocentric to Gaian, and with many flavours in between.¹⁴ On the other hand, some of the Environmental Studies students are equally disconcerted to find that their own values are not quite as consistent or defensible as they had thought, or indeed universally recognised by the class as being morally correct. Animal rights activists, deep ecologists and social ecologists, for example, could have dramatically different responses to some real-world situations that we introduce, such as the acceptability of a waste dump located near their homes. Other fruitful talking points have been whether the government, to discourage the use of cars, even if the local economy would be affected, and whether the various national stances on the reduction of greenhouse gases are ethically defensible, should raise petrol prices.

In order to deliver the curriculum, this course demands an alternative approach to teaching. Although some core material is taught in lecture format, the greater proportion of class time is given over to group-based discussions on issues that, as indicated above, are of direct relevance to the students. This student-led approach is rarely used in teaching science-based subjects despite the proven advantages. Collaborative learning (also called co-operative, active, inquiry-based etc.) encourages students to engage with materials because, as Herreid puts it “Students enjoy the experience more, have a better attitude toward the subject, develop better social skills, become more articulate, and end up respecting differing viewpoints”.¹⁵ These qualities are vital in teaching a subject which forces students to locate and defend their own ethical positions regarding certain environmental issues.

Conclusions

One of the central questions of this article is how Environmental Studies courses can be related to the interests and concerns of incoming students. We argue that the perspectives of Science Studies can do much to give students a critical and reasoned perspective, not just of the scientific issues at the heart of Environmental Studies, but at the social and moral questions that inform judgements.

Science Studies and Environmental Studies are complementary and interdependent; the former, to bring together disciplines providing

¹⁴ As taught in some Philosophy departments, Environmental Ethics focuses on issues of animal rights. We prefer to extend the discussions of moral questions to plants, microbes, and atmospheric chemistry.

¹⁵ Herreid, Clyde Freeman, “Why isn’t cooperative learning used to teach science?” *Bioscience* 48, 1998, 553-559.

analytical viewpoints and theoretical stances; the latter, to relate these to the real world in a variety of case studies that are important, contentious and inescapable in the modern world, and particularly in modern Britain. This approach has engaged students from their first semester, and has, to date, produced increasingly analytical and articulate proponents for a variety of philosophical positions with respect to the environment.

Our conclusion is that our courses can strive to be 'objective' by combining reasoned thinking with a nuanced appreciation of scientific evidence and historical case studies, and with an exploration of the wide range of differing, but self-consistent, moral perspectives.

Appendix: Current Environmental and Science Studies Curriculum at the University of Glasgow Crichton Campus

A: ENVIRONMENTAL STUDIES COURSES

- Our Changing Environment: An introduction to earth systems and dynamics (1st year)
- The Environment and Sustainability (1st year)
- Shaping the Environment: Applied Geomorphology (2nd year)
- Assessing the Environment (2nd year)
- Applied Ecology and Conservation (3rd year)
- Explorations in Pollution: Causes and Effects (3rd year)

B: SCIENCE STUDIES COURSES

- Science: History and Culture (1st year)
- Technology in Society (2nd year)
- Imagined Futures (3rd year)

C: SHARED COURSES

- Issues in Contemporary Society (1st year)
- Environmental Ethics (2nd year)
- Current Issues in Science, Technology and Medicine (3rd year)

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