

The Education of an Informed and Critical Ethical Designer

Angela Dean, University of Derby, Division of Design, Technology and the Built Environment

Roy Parker, University of Derby, Division of Design, Technology and the Built Environment

Abstract

Ethical design is based on the desire to minimise the environmental and social consequences of products in the broadest sense. It is recognised that all engineers and designers should be aware of the issues concerned and be able to design eco-friendly products. This paper describes the use of a number of teaching methodologies that have been developed over the last few years to enable students to gain an appreciation of wider social issues, the science behind the ecodesign hype and the latest computer tools used by business to ensure they produce eco-products. The methodology also challenged current ideology that a westernised industrial society is the only model on which to base the planet's future.

1. ETHICAL DESIGN IN CONTEXT

1.1 Introduction

'Ethical' may be considered to be synonymous with sustainable for many designers: both terms are interchangeable and concerned with social, environmental and economic issues (1). The value of the formation of the ethical designer as a distinct entity is being increasingly recognised in the higher education sector. The global consequences of the design, manufacture, use and disposal of all products has moved into the mainstream and both businesses and individuals have to accept their social responsibilities. This means that business is more ready to engage with this area and demand ethical designers as prospective employees (2).

At Derby we offer a range of programmes of undergraduate study in design, all of which engage in ethical debates. However, both the BSc(Hons)Product Design (Innovation and Ecodesign) (PDIE) and the BSc(Hons)Architectural Technology and Digital Innovation (ATDI) programmes offer a more in depth insight into these areas, in their respective disciplines. Both sets of students use taught theory to design products that manipulate raw material inputs, manually or mechanically, into finished articles. The programmes also educate students to assess other inputs and outputs such as indirect inputs of physical resources (buildings, factories) and mental resources (awareness, management) and outputs, some beneficial to society (the product itself) and some not (pollution).

This paper seeks to explain how lack of awareness in students of the negative impacts produced during the lifecycle of a product can be addressed as part of the normal curriculum. Ethical design is emotive and previous to the present initiative was not viewed with any great

sense of personal ownership or understanding on the part of students and academic staff, but rather as an academic exercise which did not affect their daily lifestyles or actions. The authors aim, through this paper, to describe how this perceived deficiency was addressed in all stages of the degree programmes above, but how primarily at stage 1 underpinning knowledge and critical evaluation were introduced to support the succeeding stages.

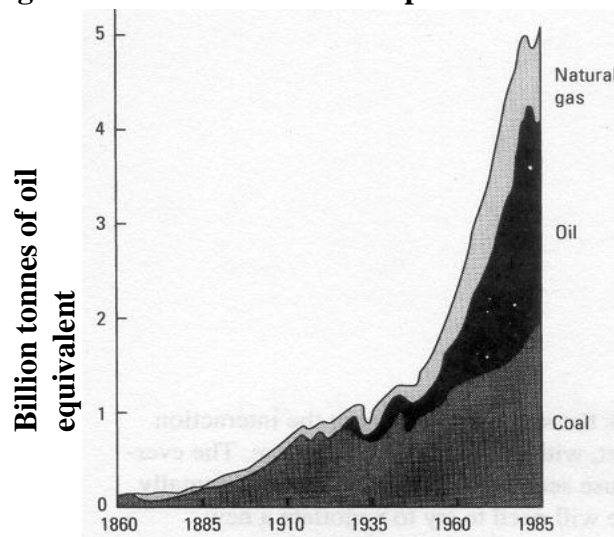
Ethical design is based on the desire to minimise the environmental and social consequences of products in the broadest sense. In order to achieve this, graduates must be armed with a variety of knowledge and skills that cross the boundaries of traditional subject disciplines such as design, science, humanities and engineering. They must also possess critical evaluation skills that allow them to assess a number of different eco-friendly alternatives and to make an informed decision.

1.2 The global situation

The argument for embedding knowledge about the environment in students and the need for resource awareness are reinforced by consideration of global and domestic weather patterns. The 1990s were the warmest decade on record, 1998 the hottest year on record and the worst for storm damage in the UK (3). Furthermore, Autumn 2000 was officially the wettest since records began in 1766, with an average 457mm of rain falling between September and November (4). Globally, 2002 was predicted to be the second warmest year since 1860 (5). A pattern seems to be emerging and these statistics form the basis for the interest underpinning the climate change agenda. Indeed, there is a consensus view of the world's leading climatologists, supported by business leaders and politicians that a positive link between global warming and increased fossil fuel usage does exist (4).

As Figure 1 identifies (6), the rate of consumption of fossil fuels since the middle of the Industrial Revolution has significantly increased particularly from post World War 2. This is a period characterised as the era of 'mass consumption'.

Figure 1 – Fossil Fuel Consumption 1860 - 1985



Students are introduced to the dichotomy that says an Indian's annual consumption of commercial energy is the equivalent of 210 kg of oil, whilst an average UK consumer uses the equivalent of 3,756 kg over the same period (7). With the predicted population in India set to

increase from 1008.90 millions to 1572.1 millions in 2050 (8), together with a demand for human rights for Indians to have a similar lifestyle as a person from the West the students are asked to consider the problem from both the developed world's viewpoint and the Indian's.

Waugh has suggested the approximate dates by which a country reaches a stage of economic development (9). Table 1 appears to confirm Elliot's findings above, that the period (Stage 5) from 1930s onwards, saw significant consumption of fossil fuels.

Table 1 – Relative stages of economic development

Key to table:

- Stage 1 = Traditional society (assumed all countries meet this criteria),
- Stage 2 = Infrastructure in place,
- Stage 3 = Commencement of economic exchange with foreign countries, development of institutions to support society etc.,
- Stage 4 = Drive to maturity,
- Stage 5 = High mass consumption.

Country/Stage	2	3	4	5
UK	1750	1820	1850	1940
USA	1800	1850	1920	1930
Japan	1880	1900	1930	1950
Venezuela	1920	1950	1970	N/A
India	1950	1980	N/A	N/A
Ethiopia	N/A	N/A	N/A	N/A

Predicted population increases in the Far East and other third world areas which are entering the period of mass consumption will add considerable strain to fossil fuel demand and climate change. Students are asked to examine this paradox between the western, developed lifestyle compared with the developing world.

The authors consider that the developed world has a duty to redress consumption balance and take the lead in ethical design. However, this will be a long-term objective and delivered to successive generations through the medium of higher education.

1.3 The personal situation

The global situation presented, does lead to the conclusion of a world out of control. Despite attempts at harnessing sustainable and ethical consumption for all, initially through the Brundtland Commission, then the Rio and Kyoto summits, it appears that these global institutional frameworks are not working. Through Agenda 21, it was considered that sustainable patterns of society could filter down with the local government playing a key role in its vision.

In Europe, a survey into public opinion on environmental issues in the European Union discovered a high level of apathy and unawareness of key issues. However, a 44% response was elicited when people were questioned about whether they believed that changes in their everyday lives, in areas such as transportation and recycling, could reduce environmental damage (11). This concern is not put into practice in the UK - we have one of the lowest rates of recycling waste within Europe (12).

Although students are generally interested in using eco-friendly materials, many lack a sense of awareness of how the rise of western consumerism has affected the stock of materials and the environment (13). In the architectural/construction field, a recent report found that a number of developed and developing countries were concerned with the relatively slow pace with which innovations contributing to sustainable development and construction were being adopted (14). Thus, the gulf between the graduate and businesses' social responsibility can be vast in terms of knowledge base.

The authors considered an appropriate teaching methodology to bridge this gulf would be to examine the ethics of the students' daily lives, primarily their time and consumption patterns outside the learning environment. Students were asked to make a diary of their day, the environmental consequences of their activities and to suggest more eco-friendly alternatives. During the first semester, in a personal skills module, students from PDIE produced a website entitled "Student Guide to Eco-Living". Each student was responsible for a 'page' within the site that reflected their interest in the subject and a menu page that provided an overall theme to the work.

Figure 2 – Example of menu page from the students' website



1.4 Bridging the global and personal at stage 1

Many graduates from the PDIE and ATDI programmes will be working on the design and production of products ranging from pens to large multistorey buildings. However, the aim of the authors is to imbue critical ecologically friendly principles to underpin an individual's professional work, irrespective of the work situation and the products they will produce. We also hope that the graduate will engage in the same way with society and not restrict their involvement to the products they design. The aim is to arm students at stage 1 with a critical awareness of the science and legislation for the four aspects of ecology: air, water, noise and waste that affect ecodesign. In the module Industrial Ecology, students are required to complete a 'Green Design Project' The assignment assesses the learning objectives: be knowledgeable on current environmental legislation affecting industry and what affect this has on companies, be aware of the ethics involved in designing for the environment with the view to developing an environmentally sounder approached to design.

The students are given the brief that they are part of an environmental design group working for a large multinational car manufacturer that is responsible for advising the company on environmental issues that affect their products. The design team is in separate parts of the world and has been asked to work together to produce a design concept for a new energy efficient family car. The team is required to produce environmental information and a possible green concept design car that will need to be taken into account when the designers produce the final design. This information will not only be to the legal requirements the company have to meet, but also any green design strategies that could be incorporated into the design that would give a marketing 'edge'. It would also include the moral issues faced by the company and how the public may react to the product. The website front page produced by one group of students is shown as Figure 3 and the Eco Issues page as Figure 4.

Figure 3 – Menu page from the students' website



Figure 4 – Page illustrating the eco car design



However, in some programmes the concern for the environment seems to be outweighed by other considerations. A typical example illustrates our concern:

A presentation given by stage 3 BSc(Hons)Product Design, Innovation and Marketing students. They delivered a presentation to their peer group about hydroelectricity as a power source. When questioned as to whether the installation of a dam would affect the local communities downstream, the students' response was that the locals had no right to stand in the way of progress and should move somewhere else.

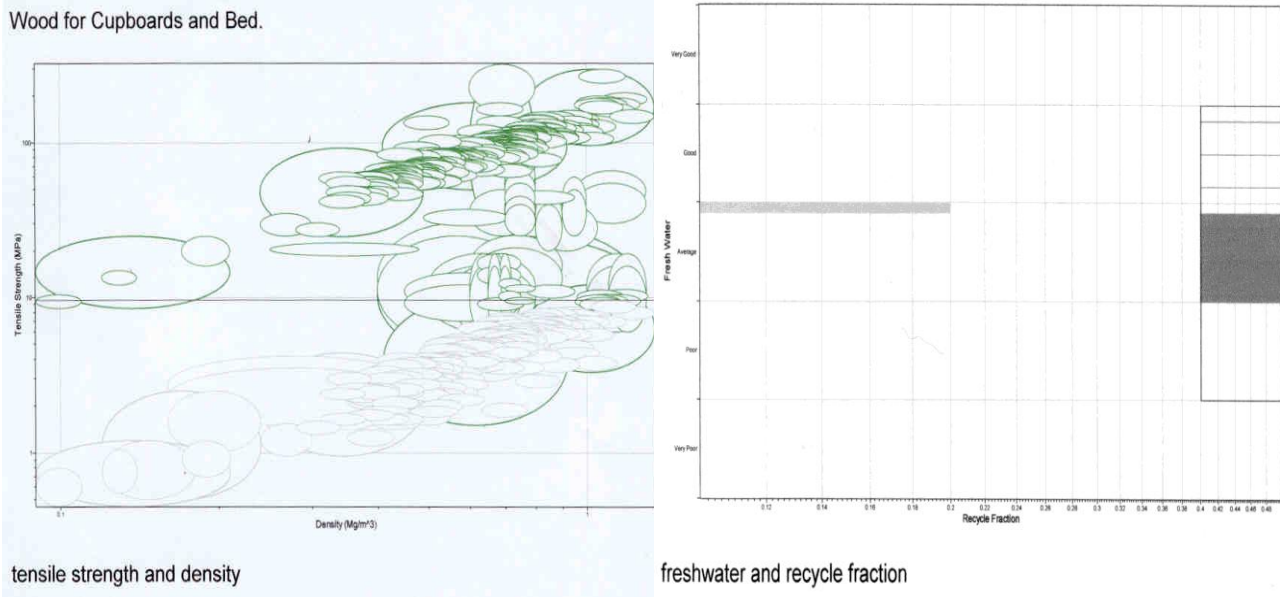
Where appropriate, examples such as the one illustrated above are passed to students for information during lecture periods or informal meetings in order to underpin the importance of ethical behaviour. Despite agreeing in principle with ethical considerations, their personal behaviour, certainly outside the classroom in terms of time and consumption patterns remains firmly unecofriendly in nature.

Students behaviour will certainly change in the long-term, but there is much that universities can and should do to embed a critical awareness of personal behaviour beyond academic study to embrace all aspects of lifestyle. Current provision in secondary schools is for students to be aware of the overall issue surrounding climate change etc but the link needs to be reinforced at Higher Education level.

1.5 Developing skills in ecodesign in stages 2 and 3

The module Environmental Use of Materials can illustrate the development of the students' knowledge and understanding within stage 2. The module is dedicated to one product, a caravan (ay 2002/3), through which the students learn how to modify the design, by the use of different materials, in order to produce a 100% recyclable product. Basic materials concepts are developed within this module to include the selection of materials using the Cambridge Engineering Selector (CES) and the use of a simple lifecycle analysis technique. An example of some of the graphs used to select a suitable environmentally friendly material for the internal fixtures in the caravan is shown in Figure 5.

Figure 5 – Cambridge Engineering Selector graphs



The stage 2 module Ecodesign Strategies and Methodologies takes a much more analytical view of the subject and allows students to use Eco-It and Simapro to qualitatively and quantitatively assess the environmental impact of existing products. Products may then be redesigned to reduce their environmental impact. Students produced lifecycle analyses for a conventional upright vacuum cleaner and a cyclone cleaner and compared the impacts. They then offered a redesign to reduce the impacts. Students were asked to act as though they were part of a development team reporting to the managing director of a large company manufacturing vacuum cleaners. The company has two types of cleaners it manufactures - traditional and cyclone. They were part of strategy review that is assessing all the company's products and recommending how the company can progress its product portfolio over the next 10 years. They were supplied with two cleaners one traditional and a new Dyson cleaner. Students produced reports and presentations based around the phases shown in Table 2. Students assessed each other's work.

Table 2 – Phases in analysis and development of an eco-product

Phase 1	Product Selection and General Product Analysis Market Competing Products Pressures and potential for a change of product Product information Process Tree with possible supplied products
Phase 2	An analysis of the products' environmental impact and setting of the design directions. Life-cycle analysis (using Simapro) Process tree Limited inventory analysis Impact analysis matrix
Phase 3	The realisation of a new environmentally improved product. Redesign Marketing Incorporating redesign into your company

The use of the Independent Studies module as a means of connecting all the ideas within the degree has been used successfully for a number of students. Projects including the design of shoes for the third world, an ecofriendly board game for children and the use of heat from waste to heat greenhouses are just some of the successful projects by different students.

A strategy to heighten ethical awareness is being extended across the programmes. Thus the initiative is now embedded within the stage 1 module, Materials Technology for Design, which is offered on both the architectural and product design programmes. Succeeding stages offer modules such as Appropriate Technology where students are asked to join a current local environmental debate. In the last academic year this was the siting of a recycling and incineration plant in Sinfyn, Derby. Students role played interest groups such as developers, local residents, the local council and environmental groups. The 'public enquiry' held by the

students was attended by the developers, local interest groups such as Friends of the Earth and the Derbyshire Renewable Energy Centre.

2. EXTENSION OF THE PROJECT

From the staff and students' experience of the pilot study, the initiative was successful in that it demonstrated that staff were committed to educating students regarding ethical issues.

2.1 Teaching and Learning Strategy

Staff feel that the teaching and learning strategy used engaged students and produced commitment in the modules and assignments. For the next academic year it is envisaged to extend the project as below. The use of IT equipment within the project enhances the students' experience and introduces a 'fun' element into the modules.

Internal debate amongst teaching staff concerning the module elicited the following comments.

Time - We need the student to be able to record how they use their time throughout a day. What are they doing?

Consumption - Are students aware of the consequences of purchases they make? Again, a record needs to be kept.

Record production - The use of the Internet to record students' time and consumption patterns in the form of a 'Video Diary' is suggested for next year. This builds on the pilot study and we believe is a highly engaging form of record keeping.

Resources - The University has extensive digital equipment which can loaned to students as needed.

Underpinning knowledge - Students on entering the programme have differing levels of understanding of sustainable/ethical issues and this needs to be addressed early in the course.

REFERENCES

- (1) Hockerton Housing Project *'The Sustainable Community: A Practical Guide'* pp 6.
- (2) Elkington J. *'Cannibals with Forks'* (1999) Capstone pp 5.
- (3) New Statesman 6/3/2000.
- (4) Environment Action December 2000.
- (5) <http://news.bbc.co.uk/1/hi/sci/tech/2583357.stm>
- (6) Elliot D. *'Energy, Society and Environment'* Routledge (1997) pp 4.
- (7) Tully M. *'No full stops in India'* (1992) Penguin pp 9.
- (8) New Statesman 4/11/2002.
- (9) Waugh D. *'Geography - An integrated approach'* (2nd Edition) Nelson (1995) pp 574.
- (10) Rifkin J. *'The Hydrogen Economy'* Polity Press (2002) pp 24.
- (11) <http://www.greenconsumerguide.com>
- (12) <http://news.bbc.co.uk/1/hi/uk/1668242.stm>
- (13) Maynard G. *'We're Rubbish at Recycling'*, Daily Express, Monday 6th January 2003.
- (14) International Council for Research and Innovation in Building and Construction (CIB) quoted in Graham P. *'Building Ecology'*, Blackwell.