Design education for sustainability

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Design education for sustainability

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Abstract

The demi (Design for the Environment Multimedia Implementation) project has produced a web resource to support the learning and teaching of sustainability in a wide range of contexts in design education in higher education. This is searchable and holds cross-referenced ecological information on design materials and applications; it also provides a detailed overview of generic sustainable development concepts and debates and provides opportunities for learners to navigate an extensive, refereed database on environmentally responsible design. Critical to the demi framework has been the formulation of six design principles which relate generic to specific elements.

This paper explores the definition, testing and implementation of the pedagogic framework through which it is hoped students will be critically engaged in aspects of sustainable design, influencing their design practice. It also presents the field research undertaken with undergraduate design students from 11 sites piloting the use of the web-resource during its development. The results of the research will be discussed and possible future applications in school design and technology will be considered.

Keywords: higher education, pedagogic framework, sustainability, web

Introduction

Following the Rio treaty on climate change and the European Union Fifth Environmental Action Programme in 1992, among other responses the UK Government set out the environmental responsibilities of institutions of further and higher education in the ‘Toyne’ Report (1993). As well as changes in the management of institutions, the report included requirement for the environmental education of all students in all disciplines. A review carried out in 1996 showed little progress had been made (Kahn, 1996) and in the design sector in particular, Ali Kahn found that only one institution had specified a learning agenda for sustainability for all design students. In this context the demi project was proposed under the Teaching and Learning Technology Programme (Phase 3). The intention was to exploit information and communication technologies (ICT) to produce a teaching and learning resource, promoting sustainability for design students and supporting their design decision-making. In this paper, the term ‘sustainability’ will be used where sustainable development refers to ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (Bruntland, 1987) and sustainable design pursues sustainability as a key objective.

The demi project started in September 1998 with a consortium of academic institutions, national design sector organisations, and the CTI for Art and Design. The project team engaged in sector-wide consultation and collaborated in the formulation of the Sustainable Learning Agenda for Design Education (Kahn, 1999). This formed the starting point for the development of the framework which specified the demi web resource. The level of response from higher education design again highlighted the low priority given to sustainability in the sector.

The aims of the demi project were:

- ‘to establish an appropriate demi learning specification for the HE design sector…
- to develop appropriate demi resource content and inter-relationships in order to establish information resources with multiple access levels and pathways for learners
- to develop and integrate suitable technology-based teaching and learning delivery methods and … to provide learners with appropriate, dynamic and active access to and through the
resource and support teachers in integrating this in their teaching

- to disseminate the project outcomes to the HE design sector

- to carry out post-programme evaluation and devise a suitable continuity plan. *(Woolley, 1998)*

**Sustainability concepts**

| need for precaution | value of diversity | interdependence of major systems | needs and rights of future generations | limits to growth |

**Sustainability debates**

| design debates | the natural environment | assessing the environment | environmental problems | human sustainability activities |

*Figure 1: demi Framework – generic elements (after Dewberry and Fletcher, 2001).*

**Design applications**

| fashion and furnishing | transport electronic products | buildings packaging other other |

| types of application lifecycle consumer comparing policy and trade & application focus issues alternatives labelling ethics |

**Design materials**

| textiles timber polymers composites metals finishes other |

| types of material lifecycle consumption comparing policy and trade material focus issues alternatives labelling |

*Figure 2: demi framework – specific design elements (after Dewberry and Fletcher, 2001).*

**Gallery (examples of designers’ work)**

- accessories
- fashion & furnishing
- furniture
- transport
- electronic products
- buildings
- packaging
- paper and publishing
- miscellaneous
- other
This situation prompted the need for a widely applicable framework that clearly related generic and specific sustainability elements in a way that was meaningful and engaging to design students. In the demi framework these links have been termed design principles, which seek to interpret the wide ranging, generic debates and concepts for design students in appropriate and relevant ways. This has necessarily been developed into more than a convenient mapping of information. Existing information was rarely in an appropriate form; the design principles required defining and there was the need for the framework to lead to an ICT resource designed to promote active learning.

The framework describes a curriculum and includes pedagogic aspects. The network of links between nodes of information and thus the journeys learners take between elements are as important as the information itself. It is also possible for journeys to begin and end at any points in the framework. The web resource through which the framework has been realised is intended to mediate the active involvement of students in taking these journeys and includes attributes of Grabinger and Dunlap’s Rich Environments for Active Learning (1995), in that is has the potential to:

- promote study and investigation within authentic contexts
- encourage the growth of student responsibility, initiative, decision-making and intentional learning
- utilise dynamic, interdisciplinary, generative learning activities that promote higher order thinking processes to help students develop rich and complex knowledge structures

The intention was that students looking for particular information would be enticed to investigate

<table>
<thead>
<tr>
<th>Appropriateness</th>
<th>Choosing the right solution</th>
<th>e.g. not using high quality materials for disposable products.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity</td>
<td>Fairness within and across all systems.</td>
<td>e.g. being sensitive to inequalities that exist.</td>
</tr>
<tr>
<td>Systems</td>
<td>Connections between society and nature.</td>
<td>e.g. permaculture.</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Doing more with less.</td>
<td>e.g. by promoting product sharing.</td>
</tr>
<tr>
<td>Scale</td>
<td>The right size from the right place involving the right people.</td>
<td>e.g. local vs. global, conserver vs. consumer.</td>
</tr>
<tr>
<td>Sufficiency</td>
<td>Knowing how much is enough.</td>
<td>e.g. acknowledging the differences between needs and wants.</td>
</tr>
</tbody>
</table>

Figure 3: demi design principles of sustainability (after Dewberry and Fletcher, 2001).
issues of sustainability related to their particular search. The intention was that through repeated, useful and interesting engagements with the learner-centred framework; consideration of sustainability at all stages of design practice would be encouraged. With a high quality of presentation using a variety of media and the dynamic use of links within the resource to relevant, refereed external sites, students will better be able to develop a perspective on designing that fundamentally incorporates sustainability.

It was anticipated that in their studio work, the immediate concern of students was for quick access to accurate information on materials or applications, or to examples of other designers’ work. Similarly, in contextual studies, quick access would be required to relevant concepts and debates. These were seen as initial entry points to the framework and the intention was to provide students with meaningful encounters with relevant sustainability issues as they navigate the complex network of links and nodes from these starting points.

Research

This paper deals only with the research undertaken with undergraduates using trial versions of the web-resource focusing on the learning opportunities. The purpose of this being to distinguish aspects of the framework, in the form of the web resource, identified by the students as supportive of learning and teaching, usable, effective and considered valuable.

The data gathering took place between October 2000 and April 2001 in 11 higher education institutions across the UK and involved 120 undergraduates. One programme was selected in each piloting institution by tutors as the focus of the research. This gave a range of student groups for the evaluation from years/levels 2 and 3 across a range of design contexts (Table 1).

| BA 3-Dimensional Design         |
| BA Architecture                |
| BA Art and Design              |
| BA Design                      |
| BA Design Innovation           |
| BA Interior Design             |
| BA/BSc Industrial Design and Technology |
| BDes                           |
| BSc Engineering Design and Innovation |

Table 1: Range of undergraduate programmes.

The learning and teaching took place either in studios or lectures. The studio-based design projects led to assessed outcomes as exhibited works; including individual and group projects based on project briefs that were sustainability-focused or included sustainability-related criteria. The lecture-based contextual studies had essays as assessed outcomes. In some courses, the pilot demi web resource was recommended to students and in others its use was made compulsory. In two courses, the use of the web resource was incorporated in assignment criteria.

Following students’ use of the web resource data was collected as field notes from semi-structured group, interactive interviews in semi-formal settings and with all participants explicitly encouraged to contribute. It was recognised that students might be reluctant to report negatively and responses might follow existing practice mediated by social relationships.

The aspects dealt with in this paper relate only to the schedule questions on the usefulness of the web resource to the students in terms of their design disciplines; the usefulness in addressing issues of sustainability; reference to generic issues; the types of work the web resource supports best and an overall assessment.

Results

Students overall responses to the web-resource were positive (see Table 2).

<table>
<thead>
<tr>
<th>Response</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very good or very useful</td>
<td>8 (approx. 85 students) groups</td>
</tr>
<tr>
<td>Good</td>
<td>3 (approx. 35 students) groups</td>
</tr>
</tbody>
</table>

Table 2: Students’ overall assessment of the framework.

The web resource was described as:
well-structured, high quality, in-depth, a large-scale information source, too reliant on text, needing more images.

It was seen as:
valuable, a one stop shop for information on sustainability in design, having useful and validated links to other useful information, lacking a glossary or index.
The web resource was considered:
  interesting, challenging, motivating.

Most criticisms related to the design and use of the trial *user interface* and the lack of a *printing* function.

The most likely application identified by students was *research*, particularly for essays.

The parts of the web resource considered most useful were, equally:
  - materials,
  - applications,
  - the gallery,
  - the design principles,
  - debates,
  - generic issues and
  - the life cycle approach.

**Discussion**

Students were positively disposed to the *demi* web resource, although issues concerning the degree that responses were authentic in the face-to-face interview are important. Students were motivated to use the web resource to support their studies in self-directed ways, at least initially with clear intentions in mind. Particular aspects of their experiences do not follow obvious patterns with lecture and project contexts dispersed fairly evenly. Students saw most value in using the web resource for research for essays or projects. The quality of the content and the validation of external links were cited as particular strengths as was the ‘one stop shop’ nature of the web resource. Most criticisms related to the user interface, with more use of images recommended widely. The need for more interaction was also referred to, as was the need for printing.

Across the student groups, all aspects of the framework were considered valuable, and within that the gallery of designers’ work was the most widely cited. This and the positive response from students who had undertaken successful journeys, at least in terms of not getting lost or stopped, indicated that the framework allowed the anticipated range of uses. The research shows signs of students investigating sustainability in a self-directed way through which they accessed the information they were seeking but also did engage in other, further aspects of sustainable design extending their learning. In some cases they discovered new perspectives, one student reporting the discomfort generated when she explored generic issues linked from a specific design-focused query.

It is important to make the point that the research here does no more than give support to the framework developed as a model for communicating and interrelating a complex knowledge structure in a way that is accessible to students. The ambition of the project is to use this to embed notions of sustainability in students’ design practice inspired through the use of *Environment for Active Learning*. Measuring a shift in culture is notoriously difficult and detecting any impact on practice is a long-term endeavour if at all possible in the higher education context. What is inescapable is the need for a shift in design education in its incorporation of issues of sustainability. The work of Fuller, Papanek and Manzini listed above show the potential in the sector and legislative imperatives are forcing the change. It is hoped the *demi* web resource will have a role in encouraging students and their tutors to become proactive in these changes.

The *demi* framework has possible wider applications in design education as well as refinement at undergraduate level. Initial discussions with school teachers and their post-16 students support this. Future work is planned to use the web resource to support GCE A’ Level design activities, providing contextual information and also a stimulus to explore wider sustainability concerns.

**Acknowledgement**

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