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AN EVALUATION OF EXISTING ONLINE LEARNING AND TEACHING RESOURCES FOR THE SOCIO-CENTRIC ASPECTS OF SUSTAINABLE DESIGN

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ABSTRACT
This paper fits into the topic of eco-design education and explores questions related to the modern student's perspective on design education and how we should consider the curricula from a future perspective. This paper first confirms the state of the art by reviewing the literature on the socio-centric dimension of sustainable design. This will determine the component sections required of a learning and teaching resource which focuses on the implications of human expectations and aspirations for the development of solutions to sustainable design problems.

The paper then presents an evaluation of the existing learning and teaching resources, including well regarded resources such as the 'Toolbox for Sustainable Design', part of the larger Information Inspiration Ecodesign web based resource at www.informationinspiration.org.uk. The paper also considers the outputs of groups such as the Product Life Spans Network, based at Sheffield Hallam University and the Sustainable Design Network, based at Loughborough University. The paper concludes with some suggestions for a new learning and teaching resource which is specifically aimed at assisting with the socio-centric aspects of sustainable product design.

Keywords: sustainability, sustainable design, socio-centric, psychology of design

1   INTRODUCTION
"Everyone, especially engineers, should have sustainability literacy as a basic skill"
Lord Sainsbury, 21st February 2003.

In saying this, Lord Sainsbury is re-iterating the current emphasis on the need for sustainability to appear in the education agenda. Beginning with UNESCOs Decade of Education for Sustainable Development 2005-2015, via HM Government UK [1] to HEFCE [2], sustainability is emphasised. The Royal Academy of Engineering [3] confirms the importance of sustainability for engineers but acknowledges successful sustainable development requires three dimensions, the techno-centric, the eco-centric and the socio-centric, to be brought together. These are sometimes known as the three pillars, social, economic and environmental. This, it is recognised, will require a significant shift in consumer behaviour and patterns of consumption, along with a change in the nature of solutions developed to sustainable design problems. It is

increasingly important for product designers and engineers to consider all aspects of sustainable design when developing solutions to design problems. Indeed the new standards of Professional Engineering Competence (UK-SPEC) [4] require engineers to "undertake engineering activities in a way that contributes to sustainable development." Humphries-Smith [5] questions to what extent it is possible to embed sustainability in the engineering or product design curriculum.

2   LITERATURE REVIEW

Firstly, exactly what is meant by the socio-centric dimension? In the context of sustainable product design it can be argued that "the methods through which we currently address sustainability are not as sustainable as we might like to think" [6] (p170). The rationale behind this argument is that the methods and techniques currently in use appear to go straight to the third, and least preferable, of the 'three Rs' of sustainable design - "REDUCE - REUSE - RECYCLE", when focus should be placed on reduce and reuse first. McDonough and Braungart [7] are also critical of ecological waste by recycling, pointing out that this is still a one way process from 'cradle to grave' rather than a cycle of reuse such as their notion of 'cradle to cradle'. It is now recognised that the focus needs to move from the techno and eco-centric dimensions, to include the socio-centric dimension. Namely, to move to reusing and increasing product life span. Cooper [8](p63) identifies that - "A deeper exploration of consumer values and attitudes is needed to understand how people might reduce their desire to acquire more possessions and, instead, increase their attachment to those that they currently own."

As it can be seen the socio-centric dimension links several areas of study: - sustainable design; psychology of attachment; design & emotion; and design tools. Thus, for clarity, the literature associated with each of these aspects will be considered in turn.

2.1   Sustainable Design

Gant and Chapman's new book [9] "Designers Visionaries and Other Stories" contains edited samples of the 2000 visions generated at 100% Sustainable? exhibition in 2006. These could prove to be an invaluable resource for those trying to produce further tools for designers.

Otto[10] offers her thoughts on sustainable design via The Design Council. She refers to the 3 pillars of sustainable design being: social, environmental and economic and comments that if seen as 3 balls - "The trick is to keep them working together in a single, smooth process….we often don't juggle too well." Among the social aspects she discusses are dematerialization and life extension, concepts which reappear later in this discussion. Fuad-luke [11] in the eco-design handbook defines a comprehensive range of eco-design strategies but while providing a wide range of product examples and referring to a robust tool kit, does not actually provide any real 'how-to' information for the designer.

2.2   Psychology of Attachment

There are 4 areas where psychology can inform understanding of how we relate to products:
- self-expression (can consumers distinguish themselves from others with the product – theories from personality psychology are relevant here);

- group affiliation (does ownership of a product connect the individual to a group – drawing on social psychology theories on identity)
- memories related to product (e.g. storage, recall, schemata etc – theories from cognitive psychology are relevant here)
- pleasure, emotion (drawing on theories from experiential / positive psychology)

These areas encompass both design and emotion and the psychology of product attachment. Dittmar [12] conducted research in the area of social psychology theories on material possessions. Taking a social constructionist viewpoint he concludes that while material goods fulfil many functions, a sense of identity is a significant driver. Dittmar identifies understanding the psychological function of material goods as a relatively new field that needs further study. More recently Desmet & Hekkert [13] consider how products are experienced and claim to have developed a framework of product experience which includes instrumental interaction, non-instrumental and non-physical interaction. They use core affect theory to organize product experience into 3 levels – aesthetic pleasure; attribution of meaning and emotional response.

Savas [14] states that "One of the reasons underlying today's high consumption levels …is the termination of emotional connection between individual and product." The research involved 54 respondents who identified one product they feel attached to and another detached from, from 14 product categories. Findings indicate that the average time for products to be kept when attached is 19.8 years and used nearly every day. The types of products showing this level of attachment vary depending upon the reasons for the attachment which include (% indicates level of mention):
the past/ heirloom eg reminders of person or past event (35%); experience/enjoyment eg TV/stereo (41%); utilitarian/usefulness (55%); personal being/reflection of self eg self made (48%); social being/ social status (26%); form/physical description (22%).
The average time of using detachment products was found to be 4.4 years and used one or two times. Reasons include:
utilitarian/uselessness (83%); personal being/dislike/boredom (17%); social being/social status/image (22%); form/ style (33%); purchase eg products being superfluous (28%); environmental eg change in living conditions or technological obsolescence (17%).

Schifferstein et al [15] sent a mail questionnaire to 200 members of a consumer household panel, 12 of whom were later interviewed. The responses were subjected to principle components analysis (PCA) and regression analysis which resulted in the suggestion that products show a decrease in attachment after the first year but products over 20 years old had the highest levels of attachment. Ornaments had higher attachments than the other three categories (clocks, cars and lamps). 7 factors were identified from PCA – the memories of persons; events and places; the extent to which the product supports the person's identity; the products utility; the life vision it symbolises; the enjoyment it activates; its market value and its reliability. They also concluded that enjoyment is important for attachment to new products, whereas memories are more influential for older products.

Mugge et al [16] consider how attachment to a product, in their case a bicycle, is effected by personalisation. They make a clear distinction between personalisation which require consumers to invest energy in to make creative alterations, and customisation which "merely increases consumers' choice in alternatives."

2.3 Design & Emotion & Design Tools

The area of design & emotion has a number of tools associated with it which may be of use or be suitable for adaptation in the area under investigation here, the following two in particular should be investigated further. Felton Suri [17] refers to projective methods that are used to explore emotional aspects, including cultural probes of user groups; collage making; personal narratives; photo-journal assignments and cognitive map-making. Stappers and Sanders [18] present generative tools and ways of analysing their outcomes which can help designers to understand the experience of the domains of those they are designing for.

3 EVALUATION OF EXISTING LEARNING &TEACHING RESOURCES

A number of the 52 resources on the Sustainable Development section of the Engineering Subject Centre website (www.engsc.ac.uk/er/sustainable/index.asp) offer web-based provision of learning materials. The most comprehensive is the 'Toolbox for Sustainable Design Education' part of the larger Information Inspiration Ecodesign resource at www.informationinspiration.org.uk. The 'Toolbox' is significant in that it brings together known tools for analysis and idea generation in a sustainable design context. This web-based resource is run by the Sustainable Design Network, (www.sustainabledesignnet.org.uk) based at Loughborough University.

Evaluation of the Information Inspiration resource took the form of an introduction and exploration by second year Product Design students (cohort size 50) as part of a design project, to design and prototype an electronic lap counter for sports. Their evaluation was captured by a discussion forum via the virtual learning environment (VLE) of Bournemouth University, in which they were divided into 5 groups with all looking at the Product Inspiration section and one group looking at each of the other sections – tools; new ways of doing it; optimal life and end of life. It should be noted that these students were not familiar with the concepts and tools of sustainable design, however, they were given an introductory lecture. The students did have some prior knowledge of Life Cycle Analysis and Material Selection for sustainability.

Clearly what the discussions indicate is that this web-based resource has got the students thinking and very engaged with sustainable design issues. In particular, some of the issues that had to be faced with respect to current business models and the actual costs of re-cycling as can be seen from the quotations taken from the discussion forum quoted below:

> On a more general aspect, what intrigues me is the fact that how sustainability contradicts certain consumer behaviour that big companies feed upon. I don't think there are many companies out there who build products to last as long as they can…They want you to go buy the next new thing that they just produced.

> We as designers can reduce these recycling issues by designing products and using materials that don't rely on the recycling process. Rather than asking 'What reyclable materials can use in this product?' we should be asking 'How can I make the product reusable, repairable, upgradable, longlasting, etc?'

> Maybe when setting briefs for products in industry environmental issues should be looked into during this process, instead of conducting research after to make your

design more eco friendly. To design environmentally, this should be an issue from the start.

However, most of the discussions focused on the techno-centric and to some extent eco-centric dimensions. This is not surprising as this is where most of the resource is directed, although the Optimal Life section, particularly the sub-sections on Product Life Span and Dematerialisation, which are clearly related to the socio-centric dimension attracted the attention of the students, resulting in the following comments:

> I think there is the opportunity for dematerialisation of the sports counter. It could be possible to gear the marketing of this product towards use in sports clubs, schools and gyms, and therefore providing a service to multiple users rather than being a consumer product….. however this will have adverse effects on the volume of sales which isn't in the stakeholder's best interests.

> I was thinking, one of the only ways we can really increase the Product Life is to make the styling of the product ahead of what's already out there which is pretty hard to think about to be honest…

> For the sports counter… we may consider a competitive (or social, maybe) motive. What if there was a way of storing your personal best lap count record; then you could have passed the counter to one of your friends, and he/she would try to beat your record whilst using the same counter. That way the counter would become a social tool which more than one person can interact with. Therefore the need for purchasing a counter, individually, would reduce.

Simon & Dixon [19] at Sheffield Hallam University focus on life extension and comment is made that "designers often ignore the social and cultural aspects. Ecodesign especially when practised by engineering designers, is taken as a technical problem."

4   CONCLUSION AND SUGGESTIONS FOR A SOCIO-CENTRIC L&T RESOURCE

Clearly if the desire is to enable designers to engage with the socio-centric dimension of sustainability, and this seems so important to developing a viable way forward for sustainable design, then more direction is needed. Some of the tools being developed in the design and emotion area need be investigated for adaptation for socio-centric sustainability. The concepts of personalization and/or customization also need further exploration. In terms of the psychology of product attachment, the research findings from psychologists like Dittmar and designers like Desmet and Hekkert need to be translated into concrete advice or, preferably tools, for the student and practising designer. The plan now, under a Higher Education Academy, Engineering Subject Centre funded project, is to produce a web-based resource that will complement and add to the InspirationInformation resource.

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