

# A REVIEW OF SUSTAINABILITY WITHIN PRODUCT AND INDUSTRIAL DESIGN COURSES IN BRITISH UNIVERSITIES

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## **ABSTRACT**

This paper presents preliminary research from a doctoral study which is investigating effective sustainable product design education in British universities, with respect to how social aspects are incorporated. The findings detailed and discussed in this paper relate to an online survey of academics that teach on undergraduate and postgraduate Product and Industrial design courses within the UK, undertaken between October and December 2009. The results show that the teaching of sustainability is more widespread than previous reports have suggested, with most respondents evidencing the consideration of social, environmental and economic considerations in their teaching. The respondents' attitude towards sustainability within design education is also shown to be strong. This paper finishes by outlining further work to be undertaken by investigating best practice in the teaching of sustainable product design.

*Keywords: Sustainable design, British universities, survey, product design*

## 1 INTRODUCTION

Sustainable design education has become increasingly prominent in recent years, with 2005 to 2014 being designated as the 'Decade of Education for Sustainable Development' [1]. This trend has been reflected in industrial and product design education in the UK, with 9 universities running courses, which specifically reference sustainability in their titles and many more which integrate it within their curriculum.

The growth of sustainable design in product and industrial design education was highlighted by Ramirez (2007) in his worldwide survey. Over half of the 221 universities surveyed stated that sustainable design considerations were compulsory on their courses whilst a further 37% stated it was optional [2]. However the survey revealed that many of these institutions only taught the environmental considerations of sustainable design, neglecting the additional social and ethical considerations [2]. This lack of social considerations within sustainable design is also reported in research conducted in the UK [3]. Literature also revealed that other significant hurdles to successful delivery of sustainable product design education were; a lack of staff training and understanding [4-6]. This paper presents findings from an online survey, conducted to determine whether these literature findings are also common in UK universities, whilst also gathering evidence on the breadth of sustainability teaching and the attitudes of teaching staff.

## 2 METHODOLOGY

An invitation to participate in an online questionnaire was sent to product and industrial design lectures in 40 British universities. These universities were located through the universities and colleges administration system (UCAS) and identified as offering bachelors' degrees in Product or Industrial design. A total of 38 lecturers responded, representing 29 universities. Eleven of the replies were incomplete with the remaining completed questionnaires representing 24 universities; 60% of all those initially contacted.

The questionnaire contained 15 questions, of which the first 3 were administrative, to ascertain the breadth of response; 9 were multiple choice responses using tick boxes and 3 were open ended. Five of

the multiple choice questions also gave the option for academics to specify their own answers, by selecting ‘other’ or entering their own thoughts in the additional comments section. The structure of the questionnaire enabled many of the questions to be analysed in a quantitative manner, permitting the results to be shown graphically. Key ‘additional comments’ are also discussed within this paper. Question four asked academics to define sustainable product design, presenting a wide variety of individual responses, which required a more considered approach to analysis. Coding and clustering was used to analyse the data because this approach enables data to be reviewed and dissected in a meaningful way whilst still keeping the relationships between the data intact [7].

### 3 FINDINGS

#### 3.1 Understanding of Sustainable Design

At the start of the questionnaire academics were asked to define sustainable design. The results shown in Figure 1 detail the predominant themes in the definitions given and suggest that the majority of academics understand sustainable design in terms of social, environmental and economic considerations. This is in contrast to the findings of Ramirez’s worldwide study [2], which found that most defined sustainability in terms of environmental considerations only. Here just over a third still referred principally to environmental considerations in their definition.

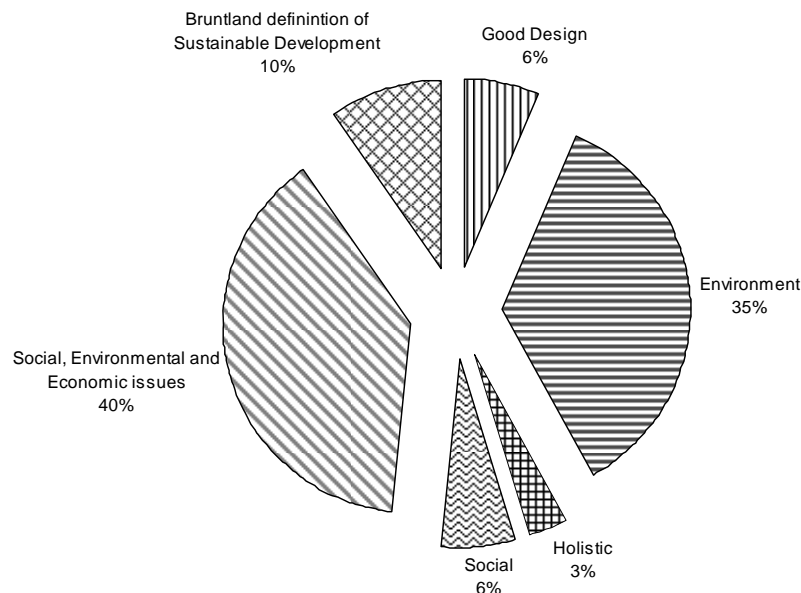


Figure 1. Definition of Sustainable Design

However, it is worth noting that the definitions provided do not seem to correlate with what is taught. In all the responses where academics defined sustainable design in terms of only environmental issues, they have still highlighted social design requirements in their teaching later in the questionnaire. Suggesting, therefore, that their definition of sustainable design is only a relative measure in their understanding of the subject and cannot be used to solely judge the content of their teaching.

#### 3.2 Design Requirements

Academics were provided with a range of environmental and social design requirements which had been derived via an inductive approach from the literature. They were asked to identify those that are currently taught on their courses and then asked to select which design requirements ‘could’, ‘should’ or ‘are’ taught on their courses specifically under the umbrella term of sustainable product design. The results are presented in Table 1. 26 academics attempted this section, all of whom agreed that inclusive design and sustainable design should at least be considered in the teaching of sustainable product design. The other requirements had varying responses. Emotionally durable design received the lowest response with only nineteen responses. This was perhaps due to limited understanding of the term, as indicated by two academics in the comments section. Overall, most issues were considered by the majority of universities, with a high proportion of respondents indicating that they already include such requirements in their teaching.

Table 1. Design requirements taught through Sustainable Design

Topic	Currently Taught	Taught through Sustainable Design			
		Could	Should	Are	Total
Design for the aged	21	6	2	16	24
Design for behaviour change	19	4	5	14	23
Design against crime	18	6	3	12	21
Design for disassembly	19	3	6	16	25
Design for the environment	23	1	3	19	23
Design for manufacture/assembly	26	0	3	22	25
Ecodesign	23	1	3	21	25
Emotional design	20	4	1	17	22
Emotionally durable design	14	3	4	12	19
Ethics of design	23	1	4	20	25
Inclusive design	26	1	4	21	26
Product service systems	17	3	4	14	21
Responsible design	18	2	3	17	22
Sustainable design	26	1	4	21	26
Systems design	17	3	4	18	25
Universal design	17	4	3	14	21

### 3.3 Course Structure

When asked which year and level sustainable design is taught to, 60% of the academics indicated that sustainable design is taught in at least two of the three years of their undergraduate programs as well as the postgraduate program, where applicable, whilst the remaining 40% only taught sustainable design in the final year of undergraduate or postgraduate studies.

Respondents were asked to list the product/industrial design related courses at their institution which included sustainable design teaching. A wide range of undergraduate and postgraduate courses were listed, the most commonly listed was the undergraduate product design program, with no apparent distinction made between the BA or BSc award in terms of sustainability teaching.

Table 2. Types of courses that incorporate Sustainable Design teaching

BA Product Design	14	BDes Other	2
BA Product and Furniture Design	4	BEng Other	2
BA Industrial Design	2	MA Design	2
BA Other	5	MA Other	3
BSc Product Design	14	MSc Other	5
BSc Industrial Design	3	MDes Other	3
BSc Industrial Product Design	1	MEng Other	1
BSc Other	4		

Academics were asked how sustainable design content was included in the course content and given five prompts shown in Figure 2, from which they could select multiple criteria as well as adding their own considerations. Figure 2 shows that the majority of respondents deliver sustainable design in conjunction with at least one design project, with only one instance of sustainability being taught outside of the design department. Other methods described by academics included teaching sustainability through: the philosophy of product design, optional contextual studies modules in sustainability, focused lectures with knowledge being applied through design projects or discreetly through group or individual discussion in a tutorial or seminar setting. One academic also discussed how sustainability is embedded into the ethos of all teaching at the university through their specialist Sustainable Futures centre.

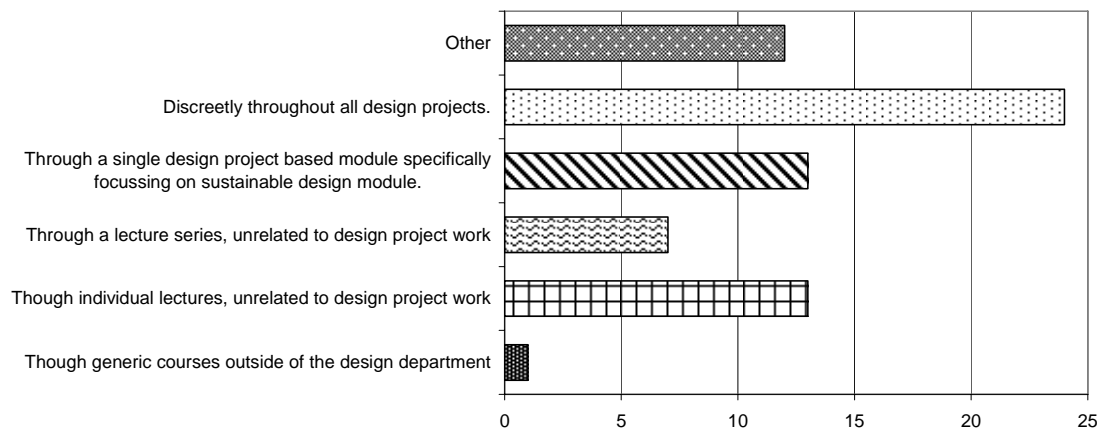


Figure 2. How Sustainable Design is taught within the course

### 3.4 Staff Expertise

Participants were asked to gauge their personal knowledge of sustainable design by selecting one of five set criteria. 5 respondents indicated that their knowledge was *'that of a specialist'*, 13 indicated that they felt they had a *'full working knowledge'* and 8 said they were *'familiar with and can grasp the basic concepts'*. No respondents selected *'limited understanding'* or *'no understanding'*, perhaps indicating that only those who are confident in sustainable design decided to undertake and complete the questionnaire.

When asked later about their personal educational needs regarding sustainable design, 2 academics who had stated that they had the knowledge of a specialist, indicated that they would find more detailed resources and guidance helpful. Another 6 academics who stated they had *'a full working knowledge'* indicated that they would find more detailed resources and guidance helpful; 1 indicated that they would like dedicated training and another indicated that they would appreciate guidance on the consideration of social and ethical issues. Other responses included the benefits of being part of the debate on sustainability through external practice and live student projects, as well as attending lectures and conferences to keep abreast of the latest developments. One academic suggested there was a need for training on specific aspects of sustainability, such as the technical details of materials. Overall, the consensus was that detailed resources and guidance to support teaching would be helpful.

### 3.5 Collaboration

When asked whether they collaborate with other universities, almost half of the respondents stated they had no links with other institutions (see Figure 3), whilst a quarter highlighted Universities with whom they have informal connections. Three respondents cited conferences or seminars where they have collaborated with other institutions, whilst two other respondents mentioned collaborations between different departments within the same university. Finally, two respondents mentioned links with centre's such as the Ecodesign Centre Wales and the Centre for Sustainable Futures as providing opportunities to work with other academics. Individual respondents cited links between postgraduate students and a working group that had been setup to address collaboration.

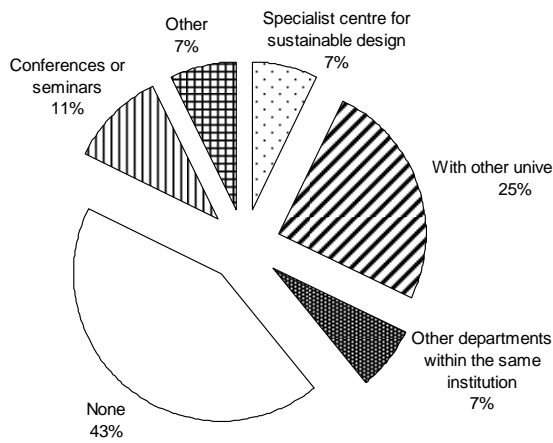


Figure 3. Collaboration with other institutions

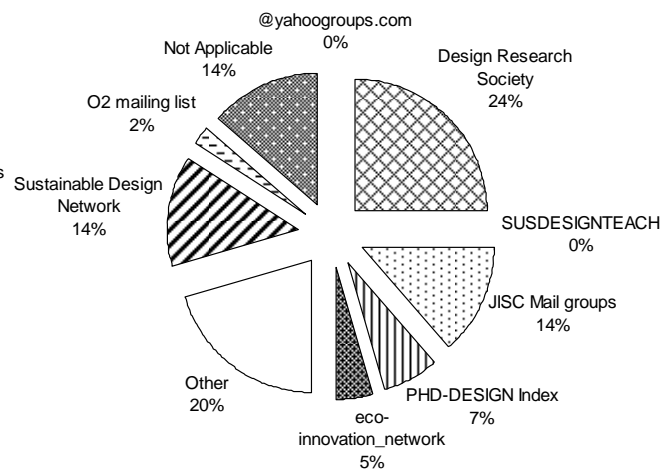


Figure 4. Networks regularly used by academics to network with others.

Figure 4 shows the networks which academics regularly use to connect with other academics. Those entered under the 'other' category included the EcoDesign Centre Wales and the Centre for Sustainable Futures, Royal Academy of engineering, European research projects and Cumulus.

### 3.6 Curriculum

The questionnaire findings have highlighted a number of common areas of agreement amongst the academics. The greatest consensus was found in the final question, where academics were asked to select their preferable method for the teaching of sustainable design, by selecting either; 'a specialist optional module', 'a compulsory module' or 'integrating sustainability throughout the core design curriculum as an aspect of good design'. 97% of the academics agreed that sustainable design should be integrated throughout the core design curriculum as an aspect of good design; only one academic preferred teaching the subject as a compulsory module. 15 academics felt so strongly about this that they wrote justifications for their stance in the additional comments section. Three academics noted that they were working towards integrating sustainability through all design projects, whilst one noted that while integration is the ideal situation it can be quite difficult to implement. Potential barriers to implementation will be explored in the further work.

## 4 LIMITATIONS OF THE QUESTIONNAIRE

11 of the 38 respondents failed to complete the questionnaire, of these 6 failed to complete question 4, which asked for a definition for sustainable design. This suggests perhaps that either these academics had little confidence in their understanding of sustainable design, or that such a question required too much consideration and may have been better placed towards the end of the questionnaire. The questionnaire permitted the survey to be stopped and returned to at a later date and this was possibly the cause of a number of the incomplete surveys, particularly if academics were required to give information that may have not been immediately available to hand. However, this feature meant that the academics could return to their original questionnaire for completion and was used to some success in reminder emails to encourage academics to complete their incomplete surveys. An inherent limitation of questionnaires is that the information obtained is limited, however where consent was given a number of academic's comments were followed up via email or later in the further work.

## 5 CONCLUSIONS

The questionnaire findings have shown that sustainability is correctly understood by half of the academics in the survey, defining sustainable design as the consideration of the economic, environmental and social aspects of design. Whilst this indicates a lack of complete understanding by the other 50%, it is a marked improvement over previous findings in literature [2, 3].

The response rate of the survey was particularly high encompassing over half of all the universities in the United Kingdom that teach product design related courses. It was therefore promising to see that all of the respondents teach both social and environmental issues within their product and industrial design courses. The majority of respondents agreed on the inclusion of a number of social

requirements in sustainable design teaching; 96% of respondents agreed that inclusive design is or should be taught as part of sustainable design, whilst 92% agreed that the ethics of design is or should be taught as part of sustainable design. Even the academics, who had previously defined sustainable design only in terms of environmental issues, indicated that they all teach social aspects such as inclusive and ethical design.

The awareness of sustainability amongst the academics, who responded to the survey, is high, with 70% stating they have at least a full working knowledge; however the lack of academics with limited or no understanding could suggest that the questionnaire only appealed to academics with a prior interest in sustainability. Knowledge sharing between academics was found to be predominately informal with individuals using networking opportunities offered by email groups and specialist centres rather than formal collaborations between universities.

The most interesting finding, however, was the positive attitude of academics to sustainability within the curriculum and the strength of the consensus, with 97% supporting the integration of sustainable design within the core curriculum as an aspect of good design. Such a strong consensus, for a quite radical shift in the curriculum, would suggest that the majority of the respondents are not merely interested in, but passionate about sustainable design. In addition, the relatively high response rate to the survey; over 40% of all the academics emailed participated, perhaps further illustrates the interest amongst British academics in sustainability.

The findings of the questionnaire would suggest that midway through the 'Decade of Education for Sustainable Development' [1] British Universities are well placed in educating the product and industrial designers of the future. However further research still needs to be conducted in order to examine how sustainability can be fully integrated in the product design curriculum and to learn how this is best achieved.

## 6 FURTHER WORK

The findings from this study have led to semi-structured interviews being conducted with a number of leading academics within UK universities, to investigate best practice in sustainable product design education and delve into some of the questionnaire findings more deeply. The 10 academics were selected on the basis of publications in the field of sustainable design and/or their responses to the questionnaire. They were asked to draw upon their experiences of teaching sustainability and reflect on; assessment, the ideal teaching environment, inclusion of social and ethical considerations, student attitudes to sustainability, opportunities for student group work and collaboration between departments and universities as well as barriers to teaching sustainability. It is intended that the findings will draw conclusions on appropriate methods of teaching sustainable design with a view to disseminating these to the Universities in the UK that participated in this study and wanted more guidance.

## ACKNOWLEDGEMENTS

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