

# THE DELIVERY OF GREEN DESIGN TECHNIQUES IN AN IMMERSIVE LEARNING ENVIRONMENT

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## **ABSTRACT**

This paper details the immersive learning techniques pioneered in the delivery of a postgraduate module within a new course, *MSc Advanced Product Design*. The course was written to help graduates engage with thinking and techniques that are at or slightly in front of industry's cutting edge. The module at the focus of this paper, *Sustainability Issues in Design for Production (SIDP)* was designed to bring the consequences of the design choices in terms of resource depletion, pollution and climate change to the student's attention. To make the consequences of energy use, consumption of materials and subsequent waste more meaningful, the graduates were taken to the *Centre for Alternative Technology (CAT)*. While at CAT the students were given lectures on sustainability and access to information on alternative materials. Most importantly however, they were housed in specially designed accommodation where they directly experienced the consequence of their use of resources. Hence every time they used too much power they would experience a short power cut, when they needed heat they had to collect wood, and throughout their stay they were required to monitor their energy use.

The paper starts by briefly discussing learning environments and their authenticity. It continues by describing the SIDP module delivery in more detail and presents a case study of the project with an analysis of the results. In conclusion it looks to the future and how the module is expected to develop.

*Key words: Immersive Learning Environments, Sustainable design, Eco Design, Product design, Design Environments, Product Design Process, Learning, Curriculum, Education*

## 1 INTRODUCTION

This paper explores learning environments typically used in higher education in general and immersive learning in particular. It presents an androgical case study that details the purpose of using immersion and outlines some of the benefits.

Post-graduate students on the MSc Advanced Product Design programme at UWIC undertake a module entitled "Sustainability Issues in Design for Production". An integral part of this module is a residential visit to the Centre for Alternative Technology, Machynlleth. It is here that the students are immersed in a "real" sustainable environment to learn about potential solutions for sustainable living, enjoy a sustainable quality of life and undertake design tasks within sustainable constraints.

## 2 LEARNING ENVIRONMENTS

Learning environments employed in higher education can take many forms. The default formats are often that of the traditional didactic lecture theatre or more frequently when teaching the design-related disciplines, the classroom or studio environment.

The praxis of Kolb's very well known four-stage cyclical experiential learning process [1] is now well established and is particularly appropriate for the practical activity product design education. Increasingly however academics are finding these traditional learning environments too limiting and are exploring ways of augmenting the traditional methods which for practical reasons are often focussed on IT based simulated learning solutions [2]. A good example of one such development is described in a recent paper authored by academic staff at UWIC entitled Emulation of Real Life Environments for User Testing [3]

## 3 AUTHENTICITY OF LEARNING ENVIRONMENTS

### 3.1 The need for authenticity

The traditional learning and teaching approach typically experienced by students in higher education today is largely based on the didactic model, where lecturers transmit the established theory supported by academic case studies and examples. Marton & Saljo argue that this often leads to a type of surface learning which never the less is good enough to allow students to pass exams [4]. Herrington and Herrington [5] argue that universities need to realign learning and teaching with the way learning is naturally achieved in real- life settings. Typically design-focussed courses such as Product Design attempt to come close to this ideal by simulating real world learning by asking the student to play the role of the professional designer either in a fictitious client-designer scenario or preferably in a live project based on real world client needs. Savery and Duffy [6] support this approach by asserting that only real world problems should be presented to ensure authenticity. They offer two guidelines for problem based scenarios for learning and teaching: firstly that the problems must raise the relevant concepts and principles, and secondly that the problem must be *real*. However, Petragalia [7] claims that this results in little more than "pre authentication" or in other words, "the attempt to make learning materials and environments correspond to the real world prior to the learners' interaction with them" (p53).

Clearly the aim of this search for authenticity is to find a way to facilitate the students' learning by immersing them in as real an environment as possible. Brown, Collins and Duguid [8] refer to this approach as "situated learning". The findings of this paper support the arguments for immersive learning and hold that immersion in a real Immersive Learning Environments (ILE) is highly beneficial in post-graduate education. The andragogical use of an ILE described in the case study below describes the physical placing of students in an appropriate learning environment that is apposite to the specific topic and/or activity being learnt.

### 3.2 Immersion in Relation to the Teaching of Sustainability Issues in Design

When dealing with zeitgeist-altering issues such as sustainability, it is the holistic influence that immersion can provide that is required. Empathy can be a powerful asset for designers, so immersion may be appropriate for other scenarios whereby atelier practice can be augmented by immersion in authentic learning environments.

### **3.3 Immersion and Assessment**

To ensure consistency for the student experience, authentic assessment for immersive techniques should be considered. With relation to the module that this paper is based around, it is the design challenge and assessment by resident experts at the CAT that ensures authenticity throughout the whole process.

### **3.4 Immersion and International Students**

Immersion is also an effective technique for normalising preconceptions of students. This is particularly effective for international students who come from different cultures where societal expectations can vary. So when dealing with issues such as sustainability, immersion in a uniform environment can ensure students approach the complex issues from a equitable perspective.

## **4 THE MODULE**

### **4.1 Module Philosophy**

The purpose of the module is to give the students the skill set needed to bridge the gap between contemporary modes of consumption and a sustainable ideal. This interim period between traditional models of consumerism and sustainable consumerism carries a unique set of challenges that require balancing knowledge and goals of companies with the expectations of consumers without compromising sustainability. The aims of the module were:

- To explore the issues surrounding the social, ethical and ecological impact of various approaches to product development commensurate with post-graduate study
- To facilitate the development of a critical approach to product development based on knowledge of sustainability and ethical considerations
- To develop graduates' understanding and appreciation of the principles of sustainable design practice, such as the "three R's" (Reduce, Recycle and Re-use) and cradle to cradle design considerations and life cycle impact assessments.
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### **4.2 Module Logistics**

The module runs for five weeks towards the start of the twelve month course. It is delivered through seminar delivery of information, research and delivery of findings by students and assessed through a series of formative exercises and a summative submission.

### **4.3 Choosing the Immersive learning Environment**

In line with the arguments for apposite learning environments outlined above the academic team needed an ILE that would impact student thinking about sustainability related design issues at a fundamental level. Initially a virtual ILE was considered but research by Keller & Strappers [9] has shown that the creation of a *virtual* learning environment had proven to carry too high a cost. After some further investigation the *real* environment at the Centre for Alternative Energy emerged as an ideal venue.

## **5 THE CENTRE FOR ALTERNATIVE TECHNOLOGY**

### **5.1 The Centre**

The CAT was founded in 1973 as "a project to show the nature of the problem and show ways of going forward." It currently covers seven acres, has an onsite community,

publishes books, has a visitors centre, operates a consultancy service and delivers education up to MSc level. They provide expertise in such areas as alternative materials and alternative energy solutions as well as a unique immersive environment.

## 5.2 The eco-cabins

The eco-cabins were added to the CAT in the 1990's to provide on-site residential accommodation for visitors. The eco-cabins are equipped with their own renewable energy system, water supply and sewage disposal systems, providing a tangible demonstration of the finite nature of resources. Groups staying in the ecocabins can choose to start off with a limited amount of energy at the beginning of their stay, which they then need to manage carefully. The cabins are also equipped with monitoring equipment so that groups can measure their inputs and outputs.



*Figure 1 The ecocabins at the Centre for Alternative Technology*



*Figure 2: Working on the Design Challenge in an eco-cabin*

## 6 THE VISIT

The trip takes place towards the end of the module so that students can contextualise some of their learning. The schedule for the visit is based around information dissemination, exploration and then evidencing understanding. Upon arrival there is orientation and a tour of the CAT by one of the staff. This is followed by induction to the cabins which cover the requirements for energy consumption and monitoring. The second day starts with a lecture from one of the resident experts followed by a discussion about the CAT. The rest of the stay is given over to the design challenge.

### 6.1 The Design Challenge

The design challenge is part of the itinerary for three reasons. Firstly it gives the students an opportunity to evidence their understanding, it then allows them to be evaluated by resident experts and finally it ensures that they have to work whilst immersed in a sustainable environment, so they consider this aspect of life as well as the practical considerations of daily living. The brief is agreed with the CAT prior to arrival, as they will be the clients who assess the work; this ensures impartiality. As an example, the design challenge for 2007 was the redesign of the power usage monitoring station. This was a particularly successful brief as it drew upon a broad range of design skills and enabled the students to demonstrate their understanding of sustainability throughout the UWIC product design Process [10].

## 7 STUDENT FEEDBACK

Students were asked to provide their opinion on the success and validity of the visit:

- “(The trip) made me realise that you can get by without a hairdryer”
- “It’s made me think more about materials in my professional design work”
- “It was different. Not like anything I’ve done before.”
- “The time at the CAT made me recycle more at home.”
- “Having to think about the electricity and water usage really made me think about what I used.”
- “Being there encouraged me to take a more holistic approach to sustainability in my design work, instead of just changing materials.”
- “It was more realistic. It showed the impact sustainability will have on my life.”



A more sustainable  
“eco hairdryer”



Multi-use “eco packaging”



An “eco PC” for schools

Figure 3 Three examples of student project work from the case study

To balance this enthusiasm for the experience it is important to recognise that there was a financial cost for the University. The costs incurred included paying for transport to and from CAT, accommodation (in the eco cabin), plus specialist guest lectures and tours of CAT. In addition, one UWIC lecturer was employed to facilitate the three day project. The financial cost of the project averaged out at less than £200 per student and may therefore be argued to be very cost effective.

## 8 CONCLUSION

The immersive learning environment case study presented in this paper proved to be a great success and was much more effective in achieving the aims and learning outcomes of the module than the more traditional studio-based role play approach that had been tried previously. This was demonstrated by positive feedback from the students together with the depth of engagement they achieved in the sustainability aspects of their design work. The students engaged in a level of thinking about sustainability that they simply could not have achieved without the immersive experience evidenced by the detail design in the project work that they produced.

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