Sustainable Design Education in New Zealand

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Abstract: In 2007 the opportunity to visit the northern hemisphere to interview individuals who are currently teaching sustainable design emerged. These interviews shaped my preliminary research, which questions what is understood by sustainable design, how it is taught and why. The principal research for my doctoral thesis considers what is happening in New Zealand’s tertiary education system and includes data gathered from design institutes, design educators and design students. Furthermore, information gathered from two design businesses provides the practical and economic perspective essential for sustainability education. This paper predominantly considers the findings of design education in New Zealand and aims to determine barriers, constraints, enablers and facilitators related to sustainability in design curricula. Arguments regarding sustainability, design and sustainable design education have developed rapidly over the past decade, therefore my research looks toward augmenting design education’s attention to the importance of developing students' appreciation for the need to act as facilitators for change.

Key words: Social and environmental sustainability, Education for sustainability, Design education.

1. Introduction
The initial research findings presented in this paper are aimed at providing an understanding of the current status of sustainable design education within graduate design education in New Zealand. This paper is not proposing changes or solutions, but intends to inform and inspire. Prior to sharing my initial findings it is important to acknowledge previous and current developments in this field and to emphasise why design education and design educators are key in the global effort to instigate change. According to my research, augmenting what we are currently doing will encourage change to happen, rather than forcing change from a top-down approach.

2. Research Inquiry
2.1 Guiding research questions relevant to this paper
- How is the education of sustainability being implemented within design education in New Zealand?
- What are the similarities and differences between national and international approaches to sustainability in design?
- Are patterns emerging regarding barriers and opportunities for institutes educating sustainability in design?
2.2 Data Collection
The following research data was gathered during two different periods of time. The preliminary study was conducted between March and July 2007 and consists of 16 interviews with participants from international design, engineering and architecture academic programs. The participants are from nine universities, in six countries and were specifically chosen due to their involvement in sustainability and design. These interviews are referred to as the preliminary (or international) research data and labelled as case studies Y and Z. In New Zealand there are six universities and/or polytechnics (referred to as ‘institutes’ from now forward) that offer undergraduate students the opportunity to study industrial or product design. These are three or four-year degree programmes based on core (compulsory) and elective (optional) courses that include lectures, tutorials, studios and workshops, each based in a design department. The principal research data consist of four perspectives gathered from New Zealand tertiary educational institutes between February 2008 and March 2009. The data comprise the graduate attributes for six institutes with a design department, the course guides, prospectuses and websites from the design departments and interview transcripts from 15 design staff and 23 second-year design students.

Sustainability is a term frequently used to discuss long-term and short-term goals relating to society, our environment and the economy. This doctoral research set out to understand what is currently happening within New Zealand in terms of sustainability within design and more specifically design education. It is essential to note the importance of anonymity for the cases studied, for the institutes, the staff members and the students that participated in the research. The integrity of my research depends on this anonymity; every attempt has been made to ensure this is not compromised. The six institutes and their departments are labelled I1 to I6 and can be easily indentified through the public information of graduate attributes or through the prospectuses, course guides and websites. Therefore in order to preserve anonymity these labelled numbers (I1-I6) change to become letters A-C, SA, SB, when the findings originate from staff or students.

2.3 Research Approach
The principal research is based on a qualitative research approach with an interpretive methodology of case study design. The method for analysis is a combination of approaches for each guiding research question. For the research in this paper an inductive category construction approach is used to draw out patterns and themes from the preliminary and principal research studies.

3. Design’s dirty little secrets
History reveals our move from pre-industrialisation where goods were treasured, made from predominantly environmentally inert materials, and consumed little energy compared to our current practices of over-consumption, pollution and waste. Mass production and an increase in population resulted in an economic push that raised the standard of living in developed countries and, in some, lifted them out of post-war depression. Research indicates that this ‘push’ was based on carefully considered business economics; thus the term “planned obsolescence” was born, first used in 1955 in an article in Business Week by industrial design pioneer Brooks Stevens. Stevens thought it a virtue to “implant the desire to own something a little newer, a little better, a little sooner than is necessary” [20]. Controlling the duration of a product’s lifespan is not the only method of encouraging consumption. There is a more complex system in play: “perceived obsolescence” which can be described as consumers replacing working, usable products with ones that are
comparable but with more interesting features [24]. These products have become identity symbols and the continuous replacing of products “perceived as obsolete” enables the consumer to keep up with fashion [13]. Designers play an important role in shaping, serving and giving meaning to the objects that surround us [11] and this externalised identification says a lot about who we are, what we want to do or to identify with, such as cars, furniture, music players or flat screen TVs. These types of products can affect the way people experience and interact with the world. Consequently designers can be among the most active contributors to social change, hence economic, social and environmental sustainability.

4. **A brief review of the process of design**

Certain areas within the process of design are of critical importance to my argument. A typical and simplified design process model incorporates sequential phases of researching, making, testing, refining and evaluating. Iterative cycles are integrated and “act as safety nets in order that the designer may test and analyse the design solution(s) throughout the design process” [6]. Research shows that within these linear processes the detailed design phase not only embeds the form and function of the product but also specifies 75% of resources used [1]. Additionally, 80% of the economic cost [3] and 80% of environmental and social impacts are influenced at this stage [3, 7, 14, 29, 34]. Researchers [15] argue that it is not only the traditional design process that follows such an orderly flow, but that there are “four stages of existence: introduction, growth, maturity and decline”. Their argument can be related to the life cycle of the majority of furniture and products, which also progress sequentially in this “cradle to grave” linear process [21, 28].

Reflecting upon the notion of design as “shaping”, “serving” and “giving meaning” [11] or as “a hinge that inevitably connects culture and nature” or as “shaping the physical details of our daily experience” [32], we begin to associate design with the social and environmental issues previously summarised. Many design researchers, design practitioners and design educators assert “designers have a direct role in creating environmental impacts”. Despite the argument for inherent responsibility, on a global scale a large percentage of people, including designers, manufacturers and educators, are not changing their behaviour even though people from all disciplines are urging that action needs to be taken today.

5. **A brief consideration of wicked problems**

There are alternative arguments by prominent design theorists and practitioners who claim the linear process does not reflect the actual nature of designing [4, 8, 10, 12]. Yet often these linear process descriptions are taken back into design education to influence students’ design activity. Heape argues that the continued reliance on linear process models in design education actually creates more difficulties due to their expectations [10]. Students grasp onto the “rational and expedient resolution of design tasks”, which is actually contrary to their “actual experience of designing” [10]. Conklin conducted a study in the 1980s to reveal how designers deal with complex problems [4]. Figure 1 illustrates the results of designers designing a complex, unfamiliar item; their natural pattern of problem solving is far from a linear process.
Figure 1: Pattern of cognitive activity of one designer – the “jagged” line [4]

Figure 1 shows Conklin’s analysis of the cognitive patterns of designers which appears to be sporadic and unorganised; however, this “non-linear process is not a defect, but rather the mark of an intelligent and creative learning process” [4]. There is a name for these complex problems that create this jagged line in designers’ cognitive activity. The concept of “wicked problems” was coined by Horst Rittel and Melvin M. Webber in 1973 [25; see also 2, 4, 17, 26] and further explored by Buchanan in 1992 [2] as appropriately describing the specific kinds of complex problems that designers face compared to the “tame” problems that can be answered following a linear design process [2, 4]. Wicked problems are not found in the field of design alone; issues of sustainability have also been labelled as “wicked”. Most interestingly the University of Toronto [26] devotes 132 pages to Wicked Problems, in which Neumeier’s article tells us:

In a 2008 survey sponsored by my consulting firm and Stanford University, 1,500 top executives were asked to identify the wickedest problems plaguing their companies today. While the top ten included the usual suspects of profits and growth, it also revealed concerns that hadn’t shown up on corporate radar screens until now: aligning strategy and customer experience, addressing eco-sustainability, collaborating across silos, and embracing social responsibility. The number-one wicked problem cited by corporate leaders was the conflict between long-term goals and short-term demands [22]

“Long term goals and short term demands” thus summarises the problem space within which sustainable design so often must work. These issues are becoming some of the top concerns for businesses. As for design businesses in such a small country as New Zealand that are reliant on global supply chains, wicked problems are ubiquitous. Sustainability in itself is confusing and misinterpreted. There will never be an easy, “one-size-fits-all” solution. How can we help future and current product designers resolve the feelings of guilt and frustration this paradox inevitably creates? Well, it is not as bad as it all sounds, because although there may be negative connotations towards design and designers, we are creative people by nature and given the right conditions we are particularly adept at creating our way out of difficult situations.

6. A brief plug for education

Why and how is education the key to integrating design and sustainability? Leading design theorists and practitioners have been debating the question for over a decade [17], one of which considers “design as context” [9] where sustainability fits alongside other facets, activities and priorities of design and design education, furthermore tends to focus on single issues such as recycling, cradle-to-grave, dematerialisation, etc. A proposed alternative considers
“sustainability as context” [9] and locates design alongside other disciplines, so instead of “trying to put sustainability into design, you put design into sustainability” [Dewberry, personal communication] see Figure 2.

![Figure 2: Adapted from “Range of possible starting points for education in design for sustainability” [9]](image)

It is argued that truly integrating sustainability into all education is vital in the global effort to instigate change; the notion of ‘sustainability as context’ necessitates acknowledgement throughout the whole institution. Consider the possibility of future graduates spending three years at university questioning how their contributions to a project might impact on people, on the planet and even long-term business goals. We can then argue whether we will be in a better position than if the same individuals learn that they can reap greater rewards by choosing an approach depending only on what might make their contribution appear the most elegant.

7. Initial research findings

7.1 The institutes’ perspective

In order to determine how sustainability is incorporated into design education within New Zealand, I began by exploring the graduate attributes of six national institutes that have a design degree programme (see Table 1).

Table 1: Examples of graduate attributes from six New Zealand Institutes that have a design degree programme.

<table>
<thead>
<tr>
<th>Summarised terms from the graduate attributes:</th>
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<tr>
<td>“… skills of analysis, critiques, synthesis and problem solving… the ability to locate, evaluate and use information in a range of contexts… ability to communicate formally and informally… the ability to work effectively in teams” (I1)</td>
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<tr>
<td>“… skills of analysis, critiques, synthesis and problem solving… the ability to locate, evaluate and use information in a range of contexts… ability to communicate formally and informally… the ability to work effectively in teams” (I2)</td>
</tr>
<tr>
<td>“… our mission is to inspire people to discover and apply their intellectual and creative potential and contribute responsibly to their societies and cultures… students learn to reason, adapt, innovate, communicate and grow” (I3)</td>
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<tr>
<td>“… our graduates… understand the concepts of social, environmental and economic sustainability in order for them to evaluate, question and discuss their role in the world and to enable them to make changes where and when appropriate. Our goal is that every graduate may think and act as a sustainable practitioner” (I4)</td>
</tr>
<tr>
<td>“… prepare graduates to practice effectively, think critically, and be leaders in their fields nationally and internationally” (I5)</td>
</tr>
<tr>
<td>“… the ability to communicate information, arguments and analyses effectively… a knowledge of ethics, ethical standards and social responsibility… intellectual openness and curiosity, and the awareness of the limits of current knowledge and of the links between disciplines… the ability to work effectively as both a team leader and a team member” (I6)</td>
</tr>
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Data Sources: University websites [30, 31]; New Zealand’s Vice Chancellors Committee, Functions and Procedures [23]; ‘Faculty Delegate Information’ handout [33]; and published conference proceedings [27] (collected 2008-2009).
The findings from these attribute descriptions indicate that one institute explicitly states that its objective for their graduates is to “think and act as a sustainable practitioner” (I4). The other five institutes are less specific in their objectives with attributes similar to the follow list:

- Relational understanding (i.e. multi-disciplinary and/or global perspective)
- Critical, reflective or creative thinking and communication skills
- Social, cultural, environmental and economical responsibility

Other significant characteristics emerged from each institute's description, for example, ‘leadership’. However, all of these attributes indicate a capacity for learning about issues of sustainability. So how are issues of sustainability incorporated in education from the perspective of the design departments?

7.2 The design departments’ perspective

All six institutes allude to an awareness of issues relating to social or environmental sustainability within design within their respective prospectuses, course guides or online information. Two design departments describe key experiences that focus on sustainability that will be addressed within their courses. Another two institutes assert that students will learn some form of environmental responsibility after completing the programme whilst the last two institutes do not specifically discuss sustainability but rather indicate an understanding of relationships between technology and ecology.

The research data led me to believe there is awareness of issues relating to sustainability and design. But which design departments are actively educating in this area? To answer this question I considered what courses are offered that contribute to the design degree programme. From the six design departments identified within this research two departments offer a specific course on sustainable issues within design; in both departments, the course is optional. Furthermore, one of the two departments also offers an optional, general design course that includes elements of sustainability. The research findings also indicate that two other design departments offer compulsory, general design courses that include elements of social or environmental sustainability. For the last two of the design departments, information detailing a specific course in sustainable issues or a general design course that includes element of sustainability could not be found within the published promotional material. This raises questions as to whether the staff members in these two design departments might implicitly include elements of sustainability in their teaching. To more thoroughly examine what is currently being taught, I interviewed staff members from three of the six design departments. As previously mentioned it is essential to preserve anonymity of participants in the three case studies; therefore, instead of the institutes being labelled by their respective number (I1-I6), the three in-depth case studies are referred to as A, B and C in the discussion below.

7.3 The design teams’ perspective

As previously determined, issues of sustainability are complex and wicked in nature. In order to elucidate the nature of implicit sustainable design education, a detailed framework to determine what and how it is communicated is required. In response to the complexity of the problem findings from my literature review are drawn upon, including Dewberry’s [5] twelve components of communicating sustainability in design education to provide categories for the detailed framework:
1. See the whole  
2. Make connections  
3. Take different perspectives  
4. Process oriented  
5. Ask good questions  
6. Challenge  
7. Concepts and capacity building  
8. Construction of meaning  
9. Responsibility (ecological limits)  
10. Local ownership  
11. Human needs  
12. Material concerns

These categories represent twelve different perspectives within which to analyse the integrated approach to communicating ideas regarding issues of sustainability in design. Singly each perspective only considers a fraction of the complexity of sustainability; however, as a whole they can begin to elucidate how the design teams think about the communication of sustainability in design. From the findings a graph is created for each staff member depicting which issues they discuss. Then through amalgamating the staff for each department, a graph can be created that represents how the design team in each case study discusses sustainability in design (see Figure 3).

Data Source: Participant interviews with 15 design staff in three New Zealand Design Departments, 2008.

The key finding is that these diagrams show relatively little difference between two of the cases studied, A and B, even though institute B specifically teaches sustainable design. Can we interpret this to mean that design department staff members in case study A have similar knowledge regarding sustainable design? Is this knowledge integrated into their design teaching? The findings show a variety of opinions held by design team members in case study A regarding the inclusion of issues of sustainability in design. Some members of the design teams do not think they are teaching sustainable design (A1), some believe the institute could do more in regards to issues of sustainability and design (A1, A2, A3, B3), whilst others suggest that a separate course could be included in the industrial/product design programme (A4, A6). Suggestions emerged from this design team on the need for a “sustainability champion” (A1) and “better collegiality amongst staff” (A6). The design team from case study B indicates a level of collegiality amongst themselves and all indicate they champion sustainability (B1, B2, B3, B4). Compared to the diagrams of design staff from overseas that are currently integrating sustainability into design education (shown in Figure 4), New Zealand design educators can see what we might want to aim towards.
Every staff member from New Zealand contributed something towards the categories, indicating that staff members are aware even if they believe they don’t know how to teach sustainability in design. Does it make a difference to the design student if sustainable design is integrated or separated?

### 7.4 The design students’ perspective

To answer this question I interviewed 23 second-year students from two of the case studies (A and B) to consider their level of general awareness of sustainable issues in regards to design. Figure 5 illustrates the findings.

These bar charts indicate that the students who have a specific course in sustainable design (case study B) have relatively more awareness regarding issues of sustainability in the ‘high level’ category compared to those students who do not (case study A). Significantly, however, the findings show a different distribution of students for all three levels of awareness with a considerable spike for the ‘medium level’ category in case study A. These patterns imply that an integrated approach to sustainability is potentially producing similar results to the specific course of case study B. To determine what or who influences the students in regards to sustainability within design, I analyzed their responses to identify where there were motivating and de-motivating factors.
Figure 6: Graph illustrating the percentage of design students' statements regarding motivating and de-motivating factors.

Data Source: Participant interviews with 23 design students from two case studies (A and B) in New Zealand, 2008.

Figure 6 illustrates motivating and de-motivating factors that can occur in many different contexts of teaching and learning about sustainability in design education. Predominantly it indicates that an integrated approach to sustainable design encourages the students to consider a greater variety of motivations. When sustainability is taught separately, as in case study B, students appear to be motivated through the course and the staff associated with the institute. Furthermore, the research shows that the students who took a separate sustainability course have more motivation to locate others associated with sustainability.

8. Reflection upon this research

To summarize my findings, I offer these conclusions. Economic, social and environmental sustainability within design proves to be ‘wicked’ in nature and these problems require a different approach to the previous linear model used with ‘tame’ problems. New approaches include ‘sustainability as context’ where exploring relational, critical and reflective thinking, responsibility, leadership and communication are essential for building ‘context’ and not solely in the discipline of design. Applying these notions in design education, however, will be most successfully achieved through an integrated approach with support from all levels within the institute including students, as opposed to a top-down approach. Finally, there is still a place for specific sustainable design education.

9. Where to from here

This doctoral research is part of a wider network of sustainable action, research, design and education. There are many exciting initiatives occurring every day around the world in terms of the wicked problems of sustainable design [16, 18, 19]. Closer to home there is the stimulating work of Dr. Pam Williams [35] whose research considers the role of leadership in sustainability within education. Finally, my intention is to use the results from my thesis to create a knowledge-sharing implementation strategy, initially for universities but ultimately for businesses, to assist in the actualisation of ‘sustainability as context’. The development of this strategy aims to empower design teams within universities, polytechnics and businesses to consider sustainable practices, to teach sustainability principles and to inspire future design graduates to become ‘change agents’.
10. References:


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