

RE-THINKING STUDENT DESIGN PROJECTS FOR SUSTAINABLE CONSUMPTION

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ABSTRACT

Sustainability has become a core constituent of most undergraduate Product Design courses. However, many students continue to struggle to put theory into practice when undertaking design projects, often due to their complex nature and conflicting priorities. Considerations regarding sustainability may be limited to the recyclability and reusability of parts and materials, along with attempts to reduce raw material and energy consumption. While their intentions may be admirable, they do little to address the problems associated with human behaviour that are largely responsible for creating most of the global pollution and waste.

In recent years, level 5 students on the Product Design course at Bournemouth University have undertaken live projects in conjunction with the BroomeJenkins Product Design Consultancy. The design brief set by the industrial partner has required students to reappraise the nature of consumption, placing emphasis on alternative modes of acquisition within circular economies. The aim being to challenge students to identify opportunities to innovate beyond the traditional boundaries associated with design and manufacturing. One obstacle this presents is: how to tackle conventional modes of thinking that support economic and societal barriers to change? Something which requires students to reflect critically on their own paradigms and preconceptions.

This paper discusses some of the difficulties encountered when attempting to encourage undergraduate design students to adopt more effective sustainable design practices. It discusses the experiences of those involved in the project and appraises its effectiveness as a means of embedding sustainability in student work more successfully.

Keywords: Circular Economy, Sustainability, Student design projects

1 INTRODUCTION

A study undertaken in 2009 [1] investigated the product-related decisions that undergraduate design and engineering students made when purchasing and designing new products. The purpose of that study was to better understand what was important to those students, both as consumers and as designers and creators. The students surveyed had already attended lectures in which the impact of manufacturing (sustainable or otherwise) on the environment had been discussed. As a result, they had been provided with the relevant information and insight to be able to recognise the significance of sustainable themes in relation to design and consumption. However, the study found that most students were never-the-less influenced predominantly by traditional drivers such as cost/profitability, quality, and aesthetics. At the same time, it found that the same students put the least emphasis on sustainable issues such as environmental impact, fair trade, or ethical policy, despite efforts having been made to raise their awareness of these issues in relation to their subject disciplines.

Since that study, environmental factors relating to industry and manufacturing have become more prevalent and the need for change seen as even more urgent [2]. Attitudes and insights have advanced, with more and more emphasis placed on shifting away from low-impact methods like downcycling, and more towards holistic approaches like cradle to cradle and the circular economy [3]. However, it is our experience that there has been relatively little change in the way undergraduate design and engineering students go about developing new product designs, and that outdated tendencies prevail. Students at level 5 and 6 seem to struggle to apply fundamental concepts such as life-cycle analysis

and the three pillars of sustainability within the context of a design project, where parameters can be less tangible or defined.

In 2020, a level 5 (second year) project brief was set to a cohort of Product Design students, requiring an expansion of traditional design thinking to tackle circularity as a design priority and to explore how design can moderate unsustainable user behaviour. This was a live project, developed in conjunction with an industrial partner, to emphasise that this matter is of concern to those with a commercial perspective as well as academia. The aim of the project was to inspire the students to think more laterally about the nature of human behaviour and the role consumption typically plays in fulfilling the wants and needs of society.

2 THE DESIGN PROJECT

2.1 Project Rationale

From the industrial partner's perspective, the inspiration that led to this project was a critical change of direction after many years of experience of working in the product design industry where commercial viability, efficiency and success were imperative. High volume/low-cost manufacture, a cycle of excess and waste, as well as a perception of low value for the finished goods are all prevalent. To challenge this issue, emphasis was placed on longevity and product lifecycle and how designing a product that can be repaired or re-used significantly alters the established approach to designing all kinds of consumer goods.

The primary aim was to provide a range of topics as a team-based design project. In recent times, the established approach to product design has moved beyond form and function to become more user centric. However, a design outcome may still result in a linear approach and use of materials and resources, i.e., what the Dame Ellen MacArthur Foundation describes as 'take, make, waste' [4]. This project was intended to introduce a more expansive way to think about solving design problems, along with the ideas of circularity, the reduction of waste and the total product life cycle.

Whilst technology can play a role in solving current and future problems [5], this project allowed more space to consider user behaviour. So rather than only taking a technology led approach, addressing the task encouraged the teams to consider bad habits and wasteful behaviours enabled by the way some existing products have been designed, what value the user places on the product and how they are used.

Although as a cohort most undergraduate students are accepting of the cause of climate change and the need to act more sustainably, this project put the need to innovate more expansively in relation to how and what they design, how a product is made, used and what happens at the end of its life.

2.2 Project Delivery

The students worked on this project in teams so that they could benefit from the distribution of labour during what would be a potentially complex project in a relatively short, 4-week period. They were split into teams of five or six, with guidance given regarding team dynamics, time and project management, skills, roles, and responsibilities.

In developing the project, it was considered important to provide the students with as much context and source material as possible, to help inspire and encourage their enquiry. Students were also introduced to publications and exemplars [3], [4] to broaden their frame of reference, including challenging orthodoxies of say ownership, or whether recycling is sufficient as a measure to mitigate its impact. Additional time was spent exploring the notion that in the developed world society currently thrives on employment and consumption, and that every industrial process has an impact, even recycling. To help frame the responsibilities faced by designers, the uncomfortable truth that designers might be part of the problem is addressed and, how solutions might be found through an informed view and creative thinking is considered [6].

The project briefing emphasised that the most successful projects should demonstrate a more expansive approach beyond the established physical attributes of product design such as form and function, materials, and processes. Evidence of consideration of how human behaviour will determine whether society will become more sustainable and how future design proposals will not simply be a technology led developments being required. However, the scope of the project was set with sufficient freedom to suit the different interests, knowledge, and skills of the respective teams.

As sustainability is a very pressing and complex issue, there are always new opinions and strategies emerging, such as those proposed in the book 'Expand: Stretching the Future by Design' [7]. One of the greatest challenges in becoming more sustainable as an industrial society is reconciling the commercial-economic challenges with the environmental-sustainable challenges. Despite the manufacturing, agriculture, transport, and construction sectors moving towards a more sustainable model, and recognising the environmental and economic benefits, there are competing forces to reconcile. It is important therefore that the contextual presentation made at the briefing stage is up to date with the latest thinking.

As the project progressed, each team met with their tutor to discuss and refine their proposed projects. During this time, key priorities were discussed for the teams' attention, typically around project scope, emphasis planning and team organization. To create a real-world experience, the industrial partner acted to some degree as a client would. The teams met with the client to present their preliminary concepts. This was a key milestone in the project as it offered a rare opportunity for students to experience a designer/client interaction first-hand. Teams that demonstrated particularly progressive ideas but that lacked out-right feasibility were not necessarily discouraged from pursuing their ideas in greater depth. The teams would go on to present their final concepts to their tutor, client, and peers, and at that point the robustness of their ideas would be scrutinised in more detail. This required the teams to work towards a clearly defined deliverable that would bring all their skills into play.

2.3 Project Outcomes

Since the project was first run in 2020, a tendency has been observed for some teams to initially identify rather conservative problems to address, including focusing on the design of packaging and cleaning products. This is indicative of the challenges students face in dealing with the complex nature of product design and comprehending that there is more to addressing sustainability than changing materials or facilitating recycling. In response, the project has been adjusted year on year to encourage greater aspiration while providing focus with issues such as problem scoping and ideation. A relatively diverse array of projects have subsequently been forthcoming, from re-thinking the humble kettle to more ambitious challenges such as packaging-free retail solutions, the reduction of waste created at festivals and reducing technological obsolescence associated with outmoded home entertainment equipment.

All teams involved have appreciated the experience of working in a team and with the shift of emphasis that comes with it, while the industrial input provided welcome impetus and focus. The success of the projects differ in every aspect and were invariably influenced by team dynamics and individual skill sets. In some cases, a team would be particularly well informed and engaged and present extremely thought-provoking ideas that were well executed. Invariably those teams lacking a critical mass of engaged team members tended to struggle the most to reach their full potential.

2.4 Follow-up Survey

In a follow-up survey, seventeen former students who had previously undertaken the project, completed a two-part questionnaire in which they were first asked to select their top five design issues from a list of fifteen. In practice, it is likely that the teams attempted to address more than just five design issues from the available list, but this restriction helped to provide a consistent breadth for comparison. Issues were selected against three different criteria, to indicate the students': Top priorities for the project at the time; The top strengths of their final concept; The most significant challenges designers face today. In the second part of the survey, the same students were asked to indicate how they were influenced by the project's philosophy via a series of questions (using a 5-point Likert, where 1 = Not at all, 2 = A little, 3 = Moderately, 4 = A lot and 5 = Totally).

3 DISCUSSION

3.1 Student Perspectives

The results of the follow-up survey provided a means of comparing students' perceptions at a glance. Overall, the results reflected tendencies that had been expected while also providing some unforeseen insights. In part 1 (Figure 1), many students reported prioritising eradication of disposable products (F: 50%), extending products' service life (G: 75%), Reducing waste going to landfill (L: 75%) and using sustainable/recyclable materials (O: 50%), all of which are typically associated with sustainable design

and so were mostly anticipated. However, 56% students also reported prioritising aesthetics (A), even though it was not emphasised as a critical dimension of the project. Optimised ergonomics/interaction (I: 31%), providing consumers more choice (J: 44%), USP (M: 50%) and user convenience (N: 38%) were judged by a significant number of students as successfully achieved, suggesting they considered themselves competent in these areas that feature regularly in the conventional design process.

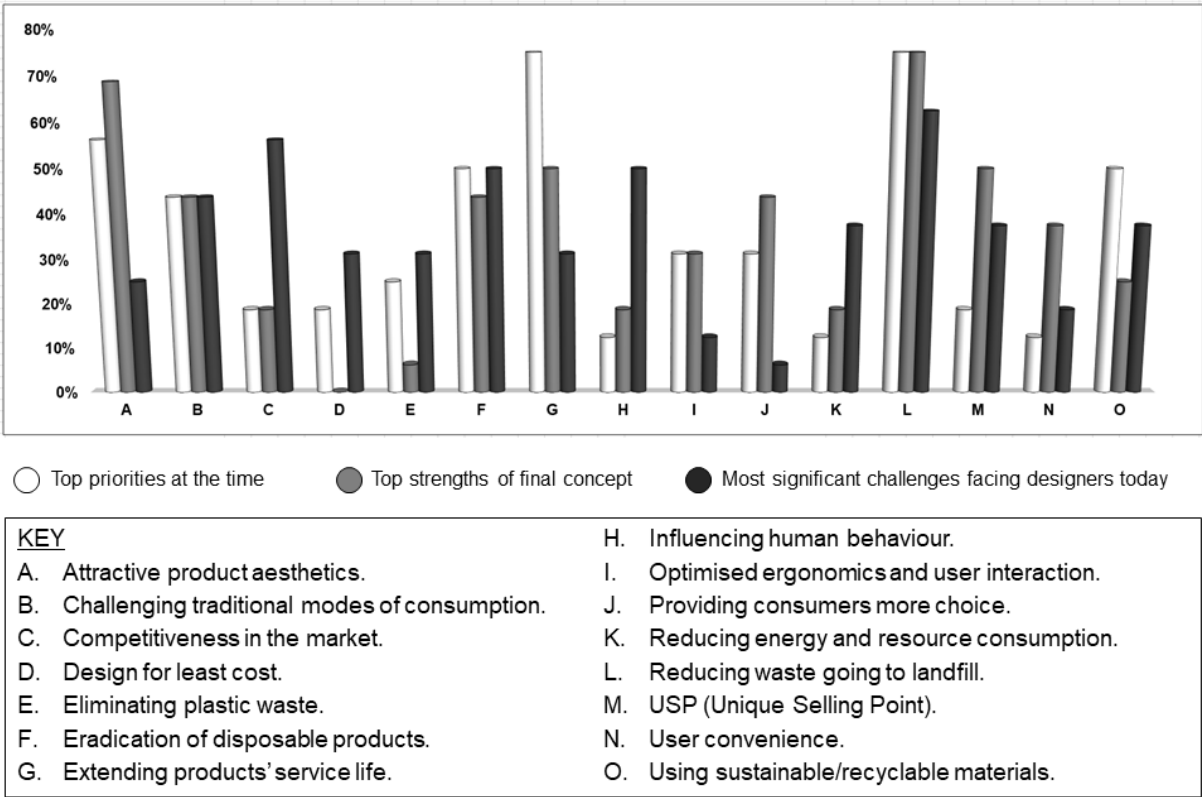


Figure 1. Follow-up survey results part 1

Conversely, it would appear that most students considered themselves less successful in achieving competitiveness in the market (C: 19%), design for least cost (D: 0%), elimination of plastic waste (E: 6%), influencing human behaviour (H: 19%), reducing energy/resource consumption (K: 19%) and using sustainable/recyclable materials (O: 25%). All areas worthy of attention in the context of the overall project's aims. The low number of students' perceiving success in eliminating plastic waste compares poorly to that of reducing waste going to landfill (L: 75%) which was the most frequently selected top strength overall. While these are clearly linked in certain contexts, this discrepancy probably reflects the fact that not all the projects were focused specifically on plastic products.

One of the most frequently selected challenges facing designers today was challenging traditional modes of consumption (B: 44%) which was selected by an equal number of students as a high project priority, top concept strength, and most significant challenge for designers today. On the other hand, influencing human behaviour (H) was considered a project priority and concept strength by far fewer students (13% and 19% respectively) while it was seen as a most significant challenge by 50%. Competitiveness in the market followed a similar trend (C: 19%; 19% and 56% respectively). Speaking with students at the time and subsequently, it is evident that some of them struggle to resolve the issue that human behaviour is largely influenced by cost and that (in their view) sustainable design is likely to raise acquisition costs rather than lower them, hence reducing market appeal. Eradication of disposable products (F: 50%) and reducing waste going to landfill (L: 63%) were also frequently selected as the most significant challenges for designers and represent some of the most tangible consequences of poor design and consumption choices prevalent today. Whilst most students considered their concepts addressed these issues successfully, it is clear that they envisage this problem will persist.

The results of part 2 of the survey (Figure 2) indicated that the majority of students moderately agreed or more with all five statements concerning design philosophy, indicating that most found the project

inspiring and influential. 88% of them acknowledged that the project had encouraged them to adopt a different approach to design, and 100% of students agreed that they aspire to apply a similar environmental philosophy to all their future work to at least some extent. The lowest level of agreement was with the statement concerning whether the students' final year projects had been influenced by the project. Although 59% indicates that there is scope to encourage more students to tackle these issues at a higher level, this is not altogether surprising when the complexities and conflicting requirements that students find themselves presented with for the first time by a final year design project are taken into consideration.

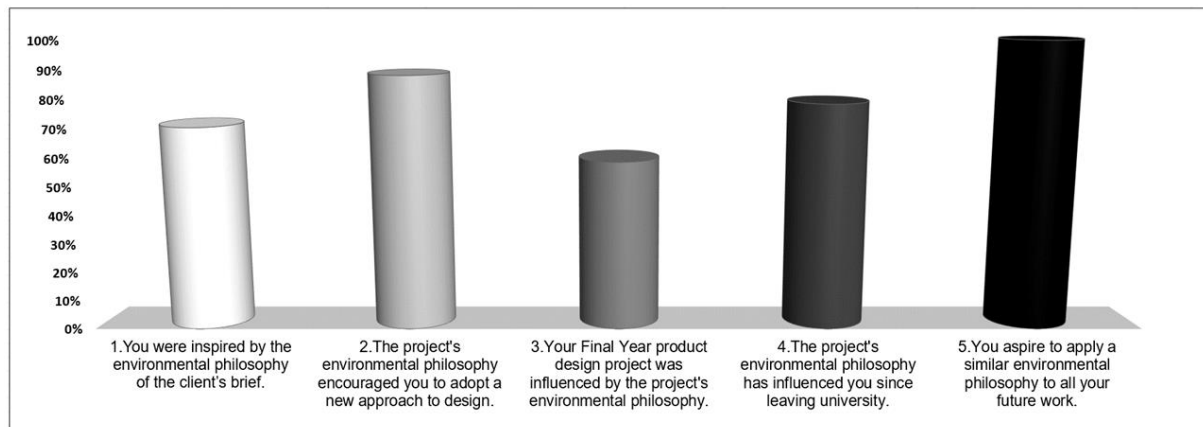


Figure 2. Follow-up survey results part 2

3.2 Staff Perspectives

Working in teams with an industrial partner usually creates excitement amongst students, as it offers the chance of a shared experience and opportunities to gain feedback from someone with alternative perspectives to their lecturer counterparts. It was hoped that by presenting the project in this way, the students would be encouraged to push themselves out of their comfort zones to deliver what was anticipated to be a particularly challenging project. Indeed, students generally engaged well and motivated each other to complete tasks. The involvement of an external design professional helped raise levels of performance and the cohesive nature of group projects helped to promote mutual engagement and team working. Teams were mostly self-selected and so would often coalesce from people who were already socially connected. This benefitted the experience for the team members and typically led to an early decision and a workable project schedule.

While team dynamics can bring significant benefits, they can also present complications. Working as a team applies different pressures and requirements in terms of personalities, opinions, skills, and commitment. If left unchecked, dealing with interpersonal issues eats into the time available and can lead to a rushed or ill-considered design proposal. This became a factor for some teams with the relatively short timescale available and the scale of the challenges they chose to take on. As a result, those teams' final concepts lacked the cohesiveness or depth required to tackle the more subtle downstream consequences of their proposals in substantial detail.

Undergraduate students can be reluctant to take risks that might result in failure. These cautious tendencies can stifle innovation and are emphasised in teams with a flat organisational structure (as tend to be favoured by most student groups) where direction is often determined more by consensus than vision. The teams were encouraged to think beyond the typical constraints of more familiar design projects, by responding to the brief beyond simply changing materials of an existing product. This required some of them to investigate related issues of distribution, logistics and user behaviour. They were encouraged to consider different models of acquisition and ownership and even whether the product is needed at all or if the solution may lie in a service instead. Their knowledge of these issues or ability to develop a meaningful understanding was recognised as a complexity within the duration of the project.

Across each team a broad range of design skills and use of CAD was evident and their effect on the outcome became very apparent when the final concept was presented. Highly developed skills are not always evenly distributed across all teams. This means that when assessing the work, it was important to see past the visual impact of the presentation resulting from visualisation tools.

Students demonstrated a range of abilities to construct a narrative to describe their proposal well enough to stand up to questioning. It is becoming increasingly essential that design graduates entering industry have developed their own views around sustainability and know how to apply them within the context of a design project. Progress in this area is by far the most beneficial aspect of the project. The reason for this is that qualified sustainability professionals are in demand across all manufacturing sectors to develop informed industrial strategies. The delivery of those strategies will require an appropriate design approach and therefore a design team that knows sustainability needs to be considered throughout a development project, from brief to delivery.

As these students embark on their final year level 6 projects, they go on to identify UN Sustainability Goals [8] that they will aim to address while undertaking their major project. We have seen that, given the opportunity, there is a tendency for students to superficially address these pledges rather than using them as driving forces for innovation. By actively encouraging students to take on these challenges through projects such as that described here and then following up with further support and incentives at level 6, it is hoped they will feel more inclined and able to solve these problems as willingly as they might tackle more typical dimensions such as aesthetics and ergonomics.

CONCLUSION

Overall, students accept the precarious nature of the current environmental situation. However, many find it difficult to comprehend ways in which they can contribute to solutions in a significant way. A common complaint is that industry places too much emphasis on keeping costs low to be able to pursue meaningful sustainable design solutions that they regard as more expensive. In many cases this view is supported by the commercially available products with which they are familiar and the acquisition cost of alternatives. Despite these current hurdles, the direction of travel appears to be correct and good. Given where undergraduate students are in their careers, it is important that they are given space to consider these issues and topics before they embark further on their professional careers. The project described here has the potential to introduce students to unfamiliar territory in a safe intellectual environment, where risk-taking is encouraged and rewarded rather than stifled in favour of what is deemed feasible in the here and now. It is our belief that only by encouraging design students to influence industry from within as it seeks to respond to and affect human behaviour traits, that we can hope to begin to bring about tangible, long-term changes.

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