

2018

## Towards a Truly Interdisciplinary Approach to Product Design Education

Colm O'Kane

*Technological University Dublin, colm.okane@tudublin.ie*

Robert Tully

*Technological University Dublin, robert.tully@tudublin.ie*

Follow this and additional works at: <https://arrow.tudublin.ie/ltccon>



Part of the [Education Commons](#)

---

### Recommended Citation

O'Kane, C. & Tully, R. (2018). Towards a Truly Interdisciplinary Approach to Product Design Education. *International Conference on Engineering and Product Design Education*, London, United Kingdom, 6 & 7 September 2018.

This Conference Paper is brought to you for free and open access by the Learning, Teaching & Technology Centre at ARROW@TU Dublin. It has been accepted for inclusion in Conference papers by an authorized administrator of ARROW@TU Dublin. For more information, please contact [arrow.admin@tudublin.ie](mailto:arrow.admin@tudublin.ie), [aisling.coyne@tudublin.ie](mailto:aisling.coyne@tudublin.ie).



This work is licensed under a [Creative Commons Attribution-NonCommercial-Share Alike 4.0 License](#)

# TOWARDS A TRULY INTERDISCIPLINARY APPROACH TO PRODUCT DESIGN EDUCATION

**Colm O’KANE and Robert TULLY**

Dublin Institute of Technology

## **ABSTRACT**

The education of new designers and innovators who can develop new product and service interventions to meet society’s challenges in the 21<sup>st</sup> century is a complex task. Design itself lies at the intersection of technology, art and science [1]. Dublin Institute of Technology (DIT)’s BSc (Hons) Product Design programme was developed to reflect this reality and was uniquely designed to operate across three distinct Colleges (Engineering, Creative Arts and Business) within DIT. Its key objective is to give students a firm grounding in these three areas and to produce graduates capable of understanding and executing all stages of the design process with a distinct focus on producing products and interventions which are technically feasible, consumer appropriate and commercially credible. While still a relatively new programme, it has continued to innovate in both structure [2] [3] and pedagogy [4] [5] [6] to ensure a clear focus on the needs of society and of industry. Students of the programme have repeatedly won awards in a wide variety of design areas including creative, technical and business innovation, while graduates have gone on to successful careers in a number of fields and industry sectors. The authors believe that the model employed in this programme could be fruitfully applied to the development of cross-disciplinary programmes in a variety of settings within the education of product designers and engineers.

*Keywords: Product Design Education, Cross-disciplinary, Programme Development, Design Cultures*

## 1 INTRODUCTION AND BACKGROUND

### **1.1 Historical Context – Institute Background**

Established in its present form by legislation in 1992, the Dublin Institute of Technology (DIT) has a continuous unbroken history stretching back to 1887 with the establishment of the first technical education institution in Ireland. The 1992 amalgamation of six separate colleges previously operated under the City of Dublin Vocational Education Committee (CDVEC) provided a new impetus for the development of existing educational programmes and the opportunity to develop new programmes. Given the resource implications of adding new programmes in higher education there must be a clear and identifiable need to enable appropriate discourse to begin as well as a justification for resources to underpin them. Appropriate context is an important reference point for the development of an effective educational intervention and one which reflects real needs. From as far back as the late 1940s successive reports had identified both educational and industrial needs that were still deficient and mirrored in reports produced in the 1990s. In November 1993, the National Economic and Social Committee (in Ireland) indicated that, the future growth of Irish industry requires ... improvement in “intangible” areas such as management, marketing, innovation, technology and design. In May 1999 another report, entitled “Opportunities in Design – Strategies for Growth in the Irish Design Sector” was critical of the “apparent lack of dialogue and collaboration both between colleges and within colleges (i.e. inter-design department).” and suggested that a “Greater emphasis needs to be placed on - innovation and creativity in design, business and the commercial aspects of design, marketing, communication and strategic planning skills” [2].

At this time, DIT was actively engaged in the area of research and training focused on the needs of industry. In 1995 financial support was received under an EU ADAPT Project for piloting a national programme entitled Innovation and re-engineering in Furniture SME’s [8], under which a programme of research, development and delivery was piloted which focused on content delivery for management

development in the critically identified areas of Design, Business and Manufacturing for SMEs. A further iteration of this initiative received Interreg funding and delivered training and consultancy into companies along the border between the Republic and Northern Ireland. In addition DIT was involved in developing and delivering a national programme to the furniture and timber processing sectors entitled Furncert [9] which was modelled on the EU Adapt programme. This DIT accredited management development programme was funded by enterprise Ireland and delivered by DIT in collaboration with GMIT and the University of Limerick. This work between 1995 and 2003 provided a critical resource of insight and experience which informed the development of product design and enabled a formative discourse between the educational resources of business, engineering and design.

## 1.2 Programme Origin

In response, The College of Engineering & Built Environment, the College of Arts & Tourism and the College of Business collaborated to develop and deliver the BSc Product Design at the Dublin Institute of Technology. The programme is managed and administered from the School of Engineering but delivered from departments across the three colleges. This programme, which started with its first cohort in 2003, was developed with the objective of delivering a unique and comprehensive undergraduate Product Design programme that could draw on well-established and existing discipline strengths in Engineering, Design and Business.

However success does not automatically manifest itself from the intention, or the recognition of a particular need. Success manifests itself from bringing the right constituent elements together and managing them through the process [2]. Creating a clear framework and constructing a philosophical and practical alignment between intention and delivery have been central in the practice of structuring the BSc Product Design. Previous research on the BSc Product Design made the following observations:

*Central to creating a programme like the BSc Product Design is understanding the nature of the changes that occur as a result of disciplines or ‘tribes’ cohabitating on interdisciplinary activity. These changes are subtle and incremental in character.... A reinterpretation and renegotiation of boundaries is a characteristic of building successful interdisciplinary educational interventions. Interdisciplinary higher education interventions like the BSc Product Design require considerable investment in time, management and relationship building to achieve appropriate collaborative and integrative actions. The experiences and assumptions that might prevail from within traditional discipline or department experiences do not translate into similar conditions that can be applied to Interdisciplinary educational interventions [10].*

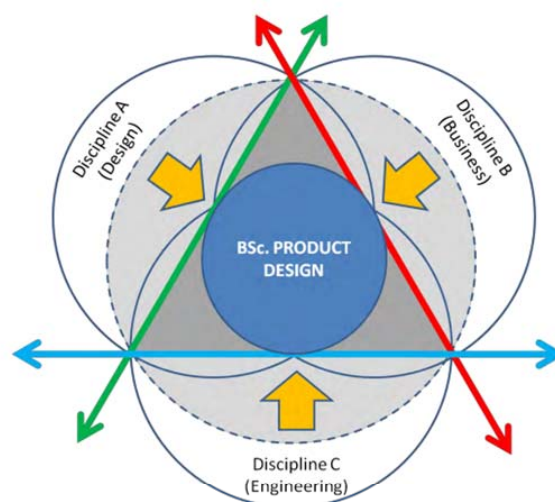


Figure 1. Development of the DIT Product Design programme

Figure 1 illustrates the way in which the BSc Product Design sits at the intersection of the disciplines and their cultures but engages in an interdisciplinary discourse that respects each but focuses on collaborative engagement at the intersections and boundaries. It is evident when comparing this to the Design Thinking model developed in the D:School in Stanford that the disciplines echo those

described in that model. What distinguishes the DIT approach from that taken in many other institutions is that these disciplines embrace the diversity of approaches from individuals centred in these different backgrounds with this reflected in both the management and delivery of the programme.

## 2 THE DIT PRODUCT DESIGN PROGRAMME

### 2.1 Programme Overview

As students progress through the programme, they transition from studying distinct areas to working on comprehensive interdisciplinary design briefs. Basic principles are taught using a didactic approach in the early stages, moving towards almost exclusively problem- and project-based learning in the latter stages. The capstone of the programme is a 20-credit individual final year project in which students are tasked with conceptualising and developing a comprehensive project which showcases their professional capacities.

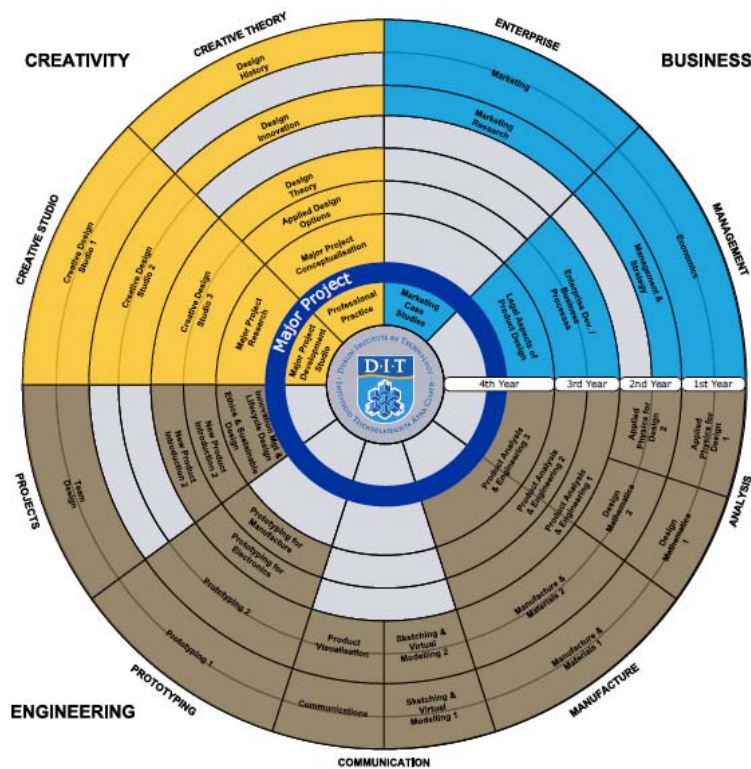


Figure 2. DIT Product Design programme structure

### 2.2 Cohabiting Disciplines

We have learned to respect the integrity of the individual disciplines and their ways of viewing and solving problems while exploiting their potential in new collaborative interventions. We also need to acknowledge that each of these interventions breaks new knowledge ground and consequently we need to be patient and reflective in each endeavour. In education terms interdisciplinary activity can manifest itself in a diversity of different ways including enhanced integration, synthesis and synergy [11] and consequently be greater than the disciplinary parts. In addition interdisciplinary activity makes integrated use of problem-solving from different discipline contexts and aims to develop the students' understanding of the nature of each discipline, in terms of its methodological assumptions and limitations [12] providing the opportunity to develop both breadth and depth of comprehension and application. Interdisciplinary course content crossing Business, Engineering and Design, encourages students to make connections between these different disciplines within their programme and help them to recognise the different insights that emerge from different disciplines [13]. They learn how to negotiate between disciplines as well as the valuable experience of working in an interdisciplinary context.

Evolving integrated content that crosses discipline boundaries becomes more fluid and fluent as academics collaborate within and between modules. This requires time and ownership of the module content and structures. The programme management have facilitated both and enabled an open discourse to occur. Perhaps one of the lessons learned through the development of this degree programme is that to do new things you have to be able to think differently about the content and relationships. Strong pedagogies no matter how much we aspire to radicalisation of the curriculum are more evolution than revolution which results in changes and improvements over a period of time.

In a research project funded through a Teaching Fellowship awarded by DIT's Learning, Teaching and Technology Centre, programme aims were developed in the form of Vision and Mission statements, through a process which involved multiple stakeholders [14]. Staff acknowledged that the process helped them to view their work as a team effort towards a common goal, something not always evident in an academic environment.

### **2.3 Transformative pedagogies and identity construction**

Teachers in classroom environments can, through the use of transformative pedagogies, influence the development of identities [15]. The extent and nature of the curriculum envisioned and constructed for the BSc Product Design is underpinned by a balance between structured content and transformative content. The intention is to lay down strong foundations and enable the student to build a strong professional and personal identity on these foundations, an identity that enables them to differentiate themselves within and beyond the profession of design. Donnell [16], indicates that "transformative pedagogy refers to teaching that fosters collaborative learning and empowers students to think creatively and critically". Teachers in higher education can influence, through the nature of their pedagogical approach, the identity formation of their students. Perhaps more significantly is the possibility that the teacher will influence the development of the student identity in any case and consequently give greater consideration to the formative nature of their discipline context. The intentionality of the pedagogical framework is to guide students through a transformative process which by its very nature will assist in the formation or transformation of identity. This transformation will be contextualised in both social and knowledge related identity development and contribute to the development of both discipline identity and professional identity.

#### **2.3.1 Transformative pedagogies: connections between disciplines**

Links between modules in early stages have been emphasised by the programme team throughout the development of the programme. Issues including the link between conceptual design and CAD activities have been explored and addressed with programme level interventions [5]. In a recent development, a cross-module project is undertaken in the second year of the programme. This module, spans over the entire academic year with contributions from several other modules. Deliverables and assessments for this project are scheduled on a phased basis throughout the year. Modules contributing to this project are based in all three discipline areas and Schools contributing to the programme (Management & Strategy, Applied Creativity in Design, Design Tools & Technology, Rapid Product Development, Product Visualisation, Applied Physics for Design and Mathematics for Design). This project is designed to demonstrate the connections and interactions between topics covered in the various modules and to help the student appreciate the overall process of product design from needs analysis to final design resolution.

#### **2.3.2 Transformative pedagogies applied to complex problems**

In the latter stages of the programme, complex design problems are presented which test the students' ability to trade off multiple conflicting requirements. Students enter and have had considerable success in a variety of national and international competitions in a number of distinct disciplines, including product design engineering, business planning, service innovation, and sustainable design. Examples of these include Enterprise Ireland National Enterprise Award, iom3's Design Innovation in Plastics competition, James Dyson Award, Network of International Business Schools Business Plan competition, Engineers Without Borders Where there is no Engineer competition.

An example of this is the Ethical and Sustainable Design module, part of which involves students taking a project-based experimental design approach to product development for the developing world. In the module, a human-centred design process is emphasised which enables the students to establish empathy with their user base. This work is undertaken in collaboration with Irish chapter of

Engineers Without Borders in the Community research group which resulted in guests from national and international aid and advocacy organisations giving workshops to the students. In 2016 Team Charco were overall winners of the national “Where there is no Engineer” competition. Team Vikasa were winners of the Alltech National Innovation Competition.

### 3 CONTINUOUS DEVELOPMENT AND FUTURE PLANS

#### 3.1 Monitoring as a tool for continuous development

Internal monitoring is an ongoing process of discussion and development within and between modules. Engagement with management, staff and students on course committees and through course teams enables a regular structured dialogue to occur. Quality assurance processes and procedures enable monitoring of content, delivery and examination to be formalised and documented in a manner that provides rigor and transparency to the overall educational process.

External monitoring of the programme informs the programme’s overall substance and drives the progression of content. Three external channels influence the content integrity and include (a) the Institution of Engineering Designers which provides professional accreditation and in doing so provides oversight and insight into the on-going monitoring of the programme. (b) external examiners who take an overview of the examination process and student delivery on an annual basis, (c) an industry board which enables engagement with appropriate external business interests, and provides an advisory influence over strategic direction.

#### 3.2 Broadening Horizons and Future Plans

The BSc Product Design has successfully negotiated many of the challenges that face a multidisciplinary educational intervention. Maintaining a strong centre of intention has enabled it to manage this negotiation. Future developments can now negotiate the transition to collaborative new knowledge construction within the field in both theoretical and practical fields. From a teaching perspective the intention is to increasingly innovate in the development of content and delivery methods. The programme has been connected to commercialisation activities in DIT’s Hothouse Commercialisation Centre through a number of different programmes. In recent years graduates have embarked upon the iCubed enterprise development programme to further develop the commercialisation of their capstone projects. Another recent development is the establishment of CreateLab, a vehicle for consultancy activities within the product design area.

The centre is in the process of establishing a research group centred on this area. Current projects in examination of design cultures, design for mass customisation, and design for sustainable behaviour change are strongly aligned with the themes of the undergraduate programme. A research internship programme is to be piloted in Summer 2018 under which students will undertake short internships in summer period in various research projects. From a research perspective, we can now move forward with an informed perspective on what is achievable within the broader institutional resource with the capacity to negotiate across existing and evolving discipline cultures to create new opportunities that are outside traditional definition.

#### REFERENCES

- [1] Findeli, A., Design History and Design Studies. *Design Issues*, 11(1), 43-65, 1995.
- [2] Tully R., Old Tribes, New Tribes: the Extent to which Discipline Cultures Impact on the Development and Delivery of Cross-Disciplinary Undergraduate Degree Programmes? Dissertation, Dublin Institute of Technology, 2011.
- [3] O’Kane, C., O’Rourke, P.: Developing Identities for Undergraduate Design Programmes. Faultlines Irish Design Research Conference, Carlow, June 2015.
- [4] O’Kane C, McDonnell J, Mooney E, Tierney D: Designing Enterprise: Merging Technical and Business Considerations in New Product Development. ICSB World Congress on Entrepreneurship, June 2014.
- [5] O’Rourke P, O’Kane C, Smith L, Ring M.: Merging Creative Design and CAD learning activities in a Product Design programme, International Conference of Engineering and Product Design Education, Dublin, September 2013.
- [6] O’Kane C, McDonnell J: Use of Collaborative Learning Technology to Support Cross-Faculty Group Learning. Proceedings of EDULEARN11: International Conference on Education and

- New Learning Technologies, Barcelona, 4th - 6th July, 2011, pp. 925-933.
- [7] O'Kane C: Bridging the Gap between Academics and Industry – Collaboration on an Undergraduate Design Project. INTED2010 Proceedings. (2010). Valencia, Spain. 8-10 March.
  - [8] Dublin Institute of Technology, "Annual Report 1 September 1996- 31 August, 1997" (1997). DIT Annual Reports. 7. <http://arrow.dit.ie/ditrep/7>.
  - [9] "Innovation, vol. 1, issue 3, Autumn 2002" . Issues. 9. (2002) <http://arrow.dit.ie/jouinniss/9>.
  - [10] Tully, R., Design Education; At The Cross Roads Of Different Disciplines, Proceedings of E&PDE 2013, the 15th International Conference on Engineering and Product Design Education, Dublin, Ireland, 05-06.09.2013.
  - [11] Caruana, V., & Oakey, D., Negotiating the Boundaries of 'Discipline': Interdisciplinarity, Multi-disciplinarity and Curriculum Design. Conference proceedings: Education in a Changing Environment 13-14 September. 2014.
  - [12] Toyne, P., Environmental Responsibility: An Agenda for Further and Higher Education, The Toyne Report, London: HMSO. 1993.
  - [13] Szostak, R., How and Why to Teach Interdisciplinary Research Practice. Journal of Research Practice, 3(2), Article M17, 2007.
  - [14] O'Kane, Colm, "Stakeholder Involvement for Programme Development" (2013). Teaching Fellowships. 35.
  - [15] Harrell-Levy, M.K., & Kerpelman, J.L., Identity Process and Transformative Pedagogy: Teachers as Agents of Identity Formation, Identity: An International Journal of Theory and Research, 10, 76-91, 2010 accessed on 16-5-2011.
  - [16] Donnell, K., Developing a Transformative Urban Teaching Practice, Urban Education, 42(3), 223-249. (2007).