EMBEDDING ENTERPRISE FOCUSSED SUSTAINABILITY TEACHING WITHIN THE PRODUCT DESIGN CURRICULUM

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Introduction

The demand for sustainability to be fully integrated as a core topic within design and engineering education has continued to grow globally (Ramirez, 2006; Ramirez, 2007; Watkins & Lofthouse, 2010; Seay, 2015; Ashour, 2020) with some recognising that sustainable product designers need additional knowledge and skills beyond traditional design education.

Sustainability must be integrated in the core curriculum to influence product design education (Watkins et al., 2021). Oehlberg et al., (2010), identified that future designers and engineers must address sustainability's triple bottom line, addressing financial, environmental, and social goals.

Nottingham Trent University is committed to creating the university of the future and in doing so, one of the six key strategies is to "Embrace Sustainability" (NTU, 2022a) where the aim is to bring academics and industry together to explore/influence low carbon technologies, sustainable consumption, green mobility, and government policy to improve the future of our planet (NTU, 2022b).

Following the UK QAA 2018 guidance, NTU has identified that all students should have an opportunity to engage with enterprise and entrepreneurship within their subject of choice (Advance HE, 2019).

This research aims to provide BSc Product Design students at NTU the opportunity to engage with a sustainability week embedded with enterprise focussed learning.

Research Question

How might we create an intense, rapid, social and dynamic learning by doing experience for product design students when exploring sustainability within the product development sector ? How can we embed enterprise experiences at the core of teaching and learning as directed by the UK QAA 2018 guidance?

Research Objectives

1) Develop a sprint inspired, practical, hands on, experiential learning experience for BSc Product Design students focussed on sustainability in enterprise.

2) Embed enhanced enterprise focussed experiences in to the curriculum supported by subject specific experts aligning to the UK QAA 2018 guidance (Advance HE, 2019).

3) Collect, test and examine student feedback on the developed sustainability week utilising methods conducted by scholars on learning and teaching for sustainability in higher education (Sandri, 2014).

Methods

Students were split into ten groups consisting of three to five members (n = 37) and were set the design challenge of redesigning an existing packaging solution for a female-led chocolate shop and bakery based in Nottingham, UK. The outcome needed to be a more sustainable and carbon neutral packaging solution.

The student groups were required to explore the materials used for the existing packaging solutions, the ease of use and assembly of the packaging and capabilities of the mass manufacturability of packaging solutions. A key aspect of the design challenge was to adjust the packaging design and materials whilst also maintaining the elegance and personalisation of the company's brand.

The student groups were required to navigate the sustainability week activities utilising a design sprint methodology (Knapp et al., 2016). A twenty-one-question online survey utilising open and close-ended questions was created to ascertain the learning and success of sustainability week. The survey was created based on previous work on learning and teaching for sustainability in higher education (Sandri, 2014).

PRODUCT DESIGN SUSTAINABILITY WEEK

- **MON** Mapping & Research
- **TUE** Sketch Solutions & CAD LCA
- **WED** Decide On Designs & Material Selection
- **THU** Prototype
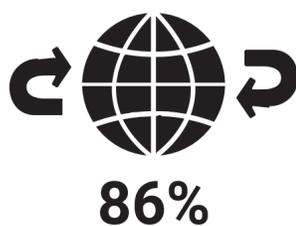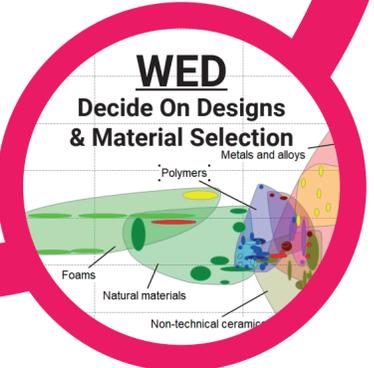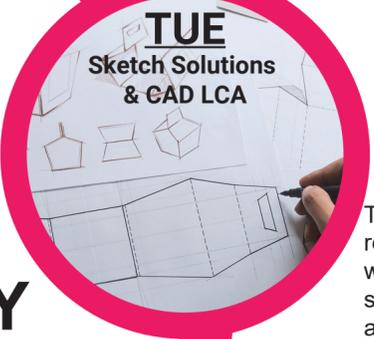- **FRI** Test & Present

Research Results

The end of week survey received a 59% response rate. Male to female responses were M = 91% and F = 9%; however, the student demographic for the 2021/22 academic year is predominantly male representing 84% of the student cohort.

The average age of respondents was 20.3 years of age, with the student cohort age range consisting of students aged 18 – 30. Among the quantitative results, it is noted that the higher the student age, the more interested they are in learning about sustainability and sustainable design.

Students who appear to be more interested in learning about sustainability and sustainable design typically haven't studied or had previous experience with sustainability and sustainable design approaches before sustainability week. Key findings from the survey results are summarised in the info-graphics below:

Conclusions & Reflections

Sustainability week has provided a platform for enterprise driven sustainability focused projects to be embedded into product design. The use of design sprint methodologies encourages students to work quickly, enabling design solutions to be produced rapidly whilst applying sustainability principles.

Suitable product design solutions have been produced by students for real life clients ensuring effective collaboration with enterprise. Adoption of sustainability and enterprise focussed teaching across different settings has demonstrated how an institutionally driven approach can benefit academics, students, and industry partners to work collaboratively regardless of the setting. The challenges faced during the development of sustainability week were also identified by Watkins et al., (2021), however these were mitigated where possible by ensuring subject specialists ran focussed subject specific sessions.

86% Identified that sustainability week helped them understand sustainability concepts related to product design.
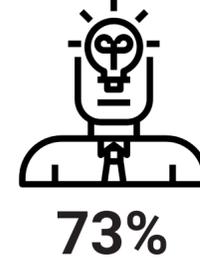
81% Would engage in more initiatives like sustainability week in the future.

86% Identified that sustainability week is very relevant / extremely relevant to their future professional practice.

81% Agreed / strongly agreed that they would engage in future sustainability initiatives.

73% Suggested that sustainability week had changed their thinking regarding the topic.

81% Agreed or strongly agreed that they believe sustainability is relevant to them personally.

Student Feedback & Insights

" The presentations from all of the guest lecturers were insightful, and the sustainability week project was beneficial as it improved my knowledge on sustainable materials through research. "
BSc Product Design Student (P4)

" The CES [materials database] session was useful because it is such an important and useful piece of equipment. Also, the storyboard tools helped because they are also applicable to other projects we do. The talks given by guests were interesting to give an insight into what they do. "
BSc Product Design Student (P12)

" The CAD session gave a practical way to learn about sustainability and how to achieve it in modelling. "
BSc Product Design Student (P14)

References

Advance, H. E. (2019). Essential frameworks for enhancing student success.
Ashour, A.F., 2020. Design responsibility and sustainability in education. International Journal of Design & Nature and Ecodynamics, 15(1), pp.129-133.
Knapp, J., Zeratsky, J. and Kowitz, B., 2016. Sprint: How to solve big problems and test new ideas in just five days. Simon and Schuster.
NTU. (2022a) University, reimagined. [Online] Available at: https://www.ntu.ac.uk/about-us/university-reimagined [Accessed 8 May 2022]
NTU. (2022b). Research themes. [Online] Available at: https://www.ntu.ac.uk/research/research-and-impact/research-themes [Accessed 8 May 2022]
Oehlberg, L., Shelby, R. and Agogino, A., 2010. Sustainable product design: Designing for diversity in engineering education. International Journal of Engineering Education, 26(2), p.489.
Ramirez, M., 2006. Sustainability in the education of industrial designers: the case for Australia. International Journal of Sustainability in Higher Education, 7(2), pp.189-202.
Ramirez Jr, M., 2007. Sustainability integration in industrial design education: a worldwide survey. In ConnectED International Conference on Design Education. University of New South Wales.
Sandri, O., 2014. Good practice learning and teaching for sustainability in higher education (Doctoral dissertation, RMIT University).
Seay, J.R., 2015. Education for sustainability: Developing a taxonomy of the key principles for sustainable process and product design. Computers & Chemical Engineering, 81, pp.147-152.
Watkins, M., Casamayor, J.L., Ramirez, M., Moreno, M., Faludi, J. and Pigosso, D.C., 2021. Sustainable product design education: current practice. She Ji: The Journal of Design, Economics, and Innovation, 7(4), pp.611-637.
Watkins, M.A. and Lofthouse, V., 2010. A review of sustainability within product and industrial design courses in British universities. In DS 62: Proceedings of E&PDE 2010, the 12th International Conference on Engineering and Product Design Education-When Design Education and Design Research meet..., Trondheim, Norway, 02.-03.09. 2010.

Further Information