REIMAGINING DESIGN FUNDAMENTALS: DESCHOOLING 1ST YEAR PRODUCT DESIGN STUDENTS

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ABSTRACT
The transition from secondary education to higher education (HE) for many students can present several challenges. New university students not only have to prepare themselves to delve into the realms of HE, but they must also learn/adapt to living independently for the first time. New first year students are not only exploring their identity as young aspiring professionals, but within the product design (PD) sector, they are also getting explore for the first time what it means to be a designer. The skills gap between secondary and HE in product design (PD) widens yearly, and this is particularly evident within the past four years whereby students have been joining HE with at least one or two GCSE or A-Level years effected by COVID-19 resulting in increased distance/virtual learning thus diminishing practical skills development. This paper highlights the skills deficiency between secondary education and HE expectations. We discuss a module refresh and implementation of new schemes in a module entitled "Design Fundamentals" aimed at deschooling and upskilling students rapidly. This involves tailoring design studios, sketching, CAD, and projects accordingly. The paper presents student feedback via a survey (n=34), where students feedback on their overall satisfaction, module teaching, assessment and feedback considerations and module organisation and resources. Recommendations are provided for HE providers to focus on key areas for upskilling students, establishing a platform for further development.

Keywords: Deschooling, design education, design & technology, secondary education, upskilling

1 INTRODUCTION & CONTEXT
Regardless of the route taken before joining HE, recent observations have demonstrated that the majority of first year PD students have significant skill deficiencies due to the current structure of Design and Technology (D&T) education within secondary education in the UK. This is due to a lack of clarity and direction the subject currently faces coupled with a significant funding crisis in the D&T education sector [1]. This is also having an impact on the funding and recruitment of D&T teachers [2]. As such HE PD courses are facing significant challenges with student recruitment numbers falling rapidly, but also the type of student being recruited. Students often lack autonomy, self-directed learning, and deep learning skills. The varying educational backgrounds, learner expectations, spoon-feeding tendencies of teachers, limited teacher autonomy and large classes are some of the many factors that often result in struggles transitioning into HE [3]. The transition shock from a highly structured and teacher-centred learning environment compared to a more independent self-driven approach often surprises new students, many of which struggle when required to move away from a ‘spoon fed education culture’.
This paper presents the approach taken to reimagine a ten-week module entitled ‘Design Fundamentals’ for BSc Product Design (BSc PD) by taking a deschooling and rapid upskilling approach to allow students to become better prepared for the remainder of the HE journey. The module seeks to not only deschool students but also help them embrace their chosen course but also the course identity. An overview of the refreshed module focuses on the approaches taken to enhance student experience. The guidance, mentorship, and support systems implemented help students transition towards self-directed/independent learning. Student feedback seeks to identify how several educational schemes/projects conducted within the module help improve their skills, ranging from debates, team bonding away days, CAD Bash, design sketching, 3D printing sessions, design projects, amongst others.

2 POINTS OF ENTRY

In the product design/industrial design sector, the shift from secondary education to HE in the UK was traditionally facilitated by enrolling in a preparatory year at a foundation education institution, like an art college; alternatively talented students could directly enter HE with grades above the required threshold subject to an interview. Both processes allowed students to develop/showcase their creative passion to explore diverse specialties. More recently students often directly enter HE with universities looking to offer places to as many students as possible subject to several basic requirements, with additional students accepted through clearing who often fall below course entry requirements. Thus, the importance of early deschooling and upskilling is critical. The Higher Education Statistics Agency (HESA) notes a rising trend in students directly enrolling in degree-level courses, coupled with a decline in foundation degree-level entries [4]. Recent recruitment of PD students has been challenging; this is evidenced by the decline in students studying D&T at school/college. A report by the Education Policy Institute identified that the number of students entering D&T qualifications has declined with just 22% of GCSE students having at least one D&T qualification in 2020, compared to 44% in 2009 [5].

The barriers put in place by examination boards and the contradictory guidance provided results in many students arriving in HE unprepared. An example of this can be evidenced in the form of design sketching assessment. The OCR GCSE guidance identifies that students should be given the opportunity to cultivate confidence through communication/drawing skills as designers, not artists and promotes the use of quick sketching for conveying initial design ideas. However, the guidance later states that learners are not assessed on their sketching proficiency [6]. Similarly, AQA sets maximum page parameters for assessment [7] which means that with such a tightly controlled portfolio the time and space to develop/showcase a wide range of skills is limited. The limitations placed on creativity and exploration by exam boards coupled with the contradictory guidance inevitably results in significant disparity in student skill sets entering PD at HE, hence the need for subject specific syllabuses exploring the individual specialisms/disciplines. When considering prospective students applying and entering Nottingham Trent University (NTU) and our BSc PD course, students are required to attain a UCAS points tariff of 112pts (Grades: B, B, C). There is no explicit requirement for design and technology (D&T), sciences or maths as prior subjects studied, but these are beneficial. The breadth of students recruited, and the skills presented often requires all students to de-schooled and upskilled quickly.

3 RE-DESIGN OF DESIGN FUNDAMENTALS

The module Design Fundamentals was first initiated in 2018 with the goal of engaging students more in the principles of PD in an engaging design studio environment, moving away from the more traditional lecture, seminar, and workshop approach. This core module aimed to provide the fundamental skills and knowledge to aspiring product designers to allow them to understand the core practices required as young professionals, in both practical and contextual subjects. The distinctive features of the module focus on the initial stages of developing as a designer, providing opportunities to reflect on the journey taken thus far, considering the skills, knowledge and experiences developed and what further skills need to be developed linked to the relevant professional practice ambitions. The module seeks to provide a process of exploration based on a student's own experience as well as facts, opinions, and case studies from the world of design. Students develop key design research techniques and contextual thinking allowing them to promote their development, thinking and critical debate around art and design. The original module timetable consisted of two full days of design studio, supported by weekly design sketching and 2D Computer Aided Design (CAD) vocational sessions in addition to a weekly design theory/context lecture and workshop. Students were provided with the opportunity to complete an online and practical workshop induction as well as take part in several team building activities including an out of bounds experience at Lea Green Learning and Development Centre in Derbyshire.

The set up of the assessment within the module initially focused on completing four formative assessments whereby weekly design challenges were set including an infographic poster, an ideation project, a set of modelling workshops, and a social media focused set of activities based on "Why I Design". This was then followed by a six-week summative project entitled *"Design In The Manner Of"* which focused on the designing of a piece of homeware in the manner of a specific company/designer.

Upon reviewing and reflecting on the module post COVID-19 pandemic, upon returning to campus and reviewing a wide range of student feedback, it was discovered that the module needed to be refreshed; several factors can be attributed to this. Firstly, due to the COVID-19 pandemic the skills that the incoming first years possessed were significantly lower than expected, mainly due to the lack of practical

experiences undertaken at school/college. Second, it was deemed necessary to "Deschool" students away from a system of consistent hand holding and instead work towards providing students with a framework/approach of creative freedom and autonomy. Thirdly, student feedback identified that the module needed more course identity and specifically for the BSc PD course students identified that earlier introduction to 3D CAD and the practical/technical skills was essential to help them progress and not become overwhelmed later in the first year. Finally, students identified that the initial weeks of one week or one day mini briefs were less engaging and deemed 'too easy'. They wanted to get hands on with a project earlier within the course. Staff also noted that the reliance on mini projects gave the perception that the course workload was minimal resulting in issues with time/project management when the workload expectations suddenly/rapidly increased. As a result of this, a course specific refresh of the module was conducted focusing on skills required specifically for the BSc PD course.

3.1 Refreshed Design Fundamentals Structure

To begin, the refresh of the module focused on creating a structure that provides opportunities for rapid upskilling of core competencies whilst creating a highly engaged studio environment. To facilitate this, rotations of breakout groups/activities delivered by various academics ensured students were engaged and proactive with project-based learning. Key vocational skills such as design sketching and 2D/3D CAD were integrated further whilst focusing was also place on project specific skills such as research methods, ideation, concept generation, sketch modelling, visualisation, amongst others. Critically it was necessary to address key areas of knowledge generation as well as core skills, qualities, and attributes. As such it was determined that students should demonstrate, through design activities, an understanding of the basic concepts of form, balance, and proportion in 2D and 3D design as well as understanding of design processes that encompasses marketing, aesthetics, ergonomics, manufacturing, materials, commercial and technical aspects. Students needed to be capable of evaluating and applying complex solutions that consider conceptual, aesthetic, and practical considerations as well as conflicting constraints in design whilst learning to evaluate and compare historical and latest trends in design thinking. To do this, it was decided that the module should commence with two weeks of core skills being taught in an accelerated format before delving into project-based learning.

3.1.1 Early Intervention & Upskilling

The first week of the term focused on a debates project, where students learn to utilize university facilities/resources to quickly research a topic, comprehend and understand the topic in detail, before delivering a short presentation and then defending their argument in a live debate. Subject specific topics are assigned to groups randomly exploring perceived controversial topics such as "plastic is good", "AI will replace designers", "anyone can be a designer" etc. The second week of the term focuses on an accelerated program of 3D CAD entitled CAD Bash, focussed on teaching SolidWorks. CAD Bash is an accelerated program of eight 1.5/2-hour engineering CAD sessions, held over a five-day period that seeks to give a broad overview of essential approaches/practices. The premise of CAD Bash was to employ a new strategy for up skilling first year PD students, to enable rapid progression and positive association within engineering CAD. CAD Bash was designed to complement a weekly design sketching syllabus that introduces engineering drawing principals whilst supporting studio sessions where engineering drawing interpretation is taught [8]. After the first two weeks, students are introduced to their first mini design project set for a period of two and half weeks and based on design iteration. The project focuses on the ethos that *"your first ideas will never be your final idea"*. In this project students are required to redesign a power tool using iterative design processes. Utilizing a breakout session rotation approach, research and ideation activities are delivered in a rapid manner to help facilitate the early parts of the design process. This is also complemented by key reverse engineering principles such as product teardowns. The project focuses on the front end of the design process up until the final design stage. Students are required to emphasize with a user persona from a demographic that they are not used to designing for; they also select to redesigning a power tool from the list provided.

3.1.2 Developing & Applying Core Skills Within Projects

After completing their first design project where various ideation and iteration techniques are taught, a second project is set immediately building on the momentum from the previous project. The second project is a five-week lighting project focusing on applying the double diamond process, thus exposing the students to new skills such as sketch modelling, concept reviews, final modelling etc. In this project

students are required to design a light through iterative design, following the Double Diamond design process. The process covers research, design, development through sketching and modelling, and production of a fully resolved final model. To inspire the students to produce a high-quality output, students are given the opportunity to be selected for the Nottingham Light Night exhibition (Figure 1).

Figure 1. Nottingham Light Night 2024 Student Outputs (Student Work Credit: Hugo Andersson, Gavin Jones, Tom Evans & Olly Lendrum; Photographers: Charlotte Bradford & Ellen Burke)

Students are tasked through research to identify the type of light they intend to design, but also to choose a location within the home where the light would be used. Students are taught how to conduct primary research and expected to visit several homeware and lighting stores to explore the current scope of the market. To set some basic parameters students are given a standard light fitting and light bulb which can be manipulated in any way deemed safe, whilst also managing a material restriction of using cardboard for construction. Key requirements cover initial and developmental sketching and sketch modelling to better understand 3D form and construction before producing the final high quality cardboard model.

3.1.3 Developing Fundamental Skills & Competencies

To complement the design projects and encourage good time management, students are also set a concurrent contextual project that runs for the entirety of the ten-week module. This project entitled "Perceptions on Design" is a visual essay which focusses on design history and the critical context of the design field. This brief encourages students to explore their passion for design as a subject by gaining a greater understanding of key designers and products and their influence on design today. Weekly mini lectures are supported by workshops ranging from reflective writing, exploring what it means to be a designer, exploring what design is, and exploring what the future holds for design. The visual essay is an opportunity for students to become inspired by piece of design and designers by gaining a greater awareness of past designers, icons, iconic designs, and ideologies/processes. As such students are required to track a product, product type or product category of their choosing over time/history. To complement the accelerated projects/workshops and the critical context of design, students are also provided with weekly CAD and design sketching classes, five weeks of 3D printing classes, and specialist one to one and group-based inductions on laser cutting, metal/woodworking workshop inductions and photography studio inductions. As such by the end of the first ten-week module students can not only research and design, but also sketch model, model, fabricate and photograph their produced outcomes. Student engagement and attendance remained high throughout the entire module resulting in minimal progression issues. High engagement can be attributed to the use of the breakout group rotations and critically by subconsciously structuring the module so that all workshops, activities, and inductions complement taught content, this ensures all students are upskilled on a wide range of core competencies.

4 MODULE SURVEY FEEDBACK & REVIEW

To review the success or failure of the module refresh, fifty-six first year BSc PD students studying across the full time and sandwich routes were given the opportunity to complete a module feedback survey covering overall satisfaction, feedback on module teaching, assessment and feedback considerations and module organisation and resources. Thirty-four students voluntarily provided feedback (response rate of 60.7%); responses captured feedback from twenty-four SW students and ten FT students. The anonymised survey was distributed via an in-person studio briefing and powered by the MySay survey platform. Five-point Likert scale questions were utilised with students asked to give testimonials and written feedback via open ended questions. These questions focus on "What things do

you like about this module and why? Which aspects of the teaching do you particularly value and why??" and "What do you feel could be improved about this module and why?
The average student satisfaction scores for the module were 3.8/5.0 (FT) and 4.7/5.0 (SW) with 80% of FT students stating that they "Overall Agree" that they are satisfied with the module; 100% of SW students providing an "Overall Agree" response. Students identified that module teaching staff made the subject interesting with 90% of FT students and 100% of SW students providing an "Overall Agree" response. Students also identified that the teaching methods used on this module helped their learning, with 100% of FT students and 91.7% of SW students providing an "Overall Agree" response to this question; no student provided a response of "overall disagree" with only 8.3% of SW students providing a "Neither Agree nor Disagree" response. Students also identified that the module challenged them to achieve their best work, with 100% of FT and 91.7% of SW student providing an "overall agree" response to this question; the remaining 8.3% of SW students provided a "Neither Agree nor Disagree" response. All student respondents provided an "Overall Agree" response when asked if they were satisfied with the teaching quality on this module, if they understood how the module helps develop skills and knowledge relevant to the subject discipline and if they under understood the importance of attendance and engagement in the context of their studies and future professional career.
The design iteration and design intervention project outputs showed a marked improvement from the previous years with several students producing more work beyond the requirements of the brief and to a higher standard. Numerically the average module student grades for the module increased yearly when aligned to NTU's 16-point scale assessment scheme with 20/21 averaging a Mid 2:2 (7.61/16), 21/22 a Mid 2:2 (8.28/16), 22/23 a High 2:2 (8.69/16) and 23/24 a High 2:2 (8.76/16). Specific/tailored breakout sessions delivered throughout the module aided student progression with students highlighting how the sessions fed into their assignments. When reviewing key aspects of the redesign, it was identified that 85% of students maintained an attendance average for the module greater than 75% of a total 88 sessions (excluding authorised absences). Additional sketching sessions aligned with each brief were beneficial, as acknowledged by the students. CAD Bash went very well with excellent attendance throughout.
A key aspect to the success of the reimagining of the module was the attendance/engagement of the students which was generally very good. For BSc PD students, early engagement with technology was positively received benefitting from 3D printing, laser cutter, photography sessions etc., all of which were well attended. To cultivate a supportive studio culture, students valued the team bonding experiences that were organised at the department and school level with "out of bounds" experiences such as Lea Green, pizza and board game events, crazy golf and bowling socials all integrated.

4.1 Observations & Feedback on Skills Development

A key area for consideration moving forward highlighted that the weekly sketching sessions although well attended and effective at teaching the core skills would benefit from some more engaging and varied mini briefs that are course specific. Interestingly holistic observations by the tutor team identified that the sketching classes were often the first to be sacrificed if deadlines were approaching. Although attendance and engagement were generally high across the module, this was always not consistent for the design in context element of the module delivered on Wednesday mornings where focus on research skills and the contextual outlook on design as a subject was examined. With this being the written element of the module, students often cited that they *"enrolled onto a design course to design, not to write".* A clear trend observed was if the students found the critical context aspect of the module less engaging, they were more likely to disengage with this session or not attend and as such this aspect of the module still requires further refinement to use a greater variety of activities and less lectures.
Student feedback identified that they also wanted an Adobe Bash, an accelerated upskilling syllabus on Adobe software packages, like CAD Bash which focuses on SolidWorks. An accelerated Adobe teaching approach may help upskill students quicker and provide greater confidence in producing process documents with higher quality visual outputs. A key challenge that students continue to cite is the pressures of dealing with/completing two projects (practice and context) at once, however this is a key skill that needs to be developed for the rest of the course, placements and ultimately in industry. Student testimonials identify how the integrated approach to taught content with the studio sessions, supported by vocational classes and accelerated programs complement their learning experiences.

"I like how each teaching session is relevant and important to the development of our projects. I would say I like the tutorials the most and appreciate the 1 on 1 time I get to spend with the tutors. It is moments like this that I can develop my ideas with them more."

"I like the structure of the module and how it builds up your skills. Classes allowed me to think deeper about my work and gave me insight into my field. The tutors are very supportive and helped to direct me in the right direction".

"I like the way the inductions and the sketching and CAD classes are timed alongside the projects forcing us to work on them and gain hands on experience".

5 CONCLUSION & RECOMMENDATIONS

The redesign of the 'Design Fundamentals' has been successful; within ten weeks incoming students are now able to receive an intense de-schooling/upskilling program which results in high quality outputs. The rapid de-schooling process has allowed for a personalized student-centred learning approach to be tailored to the individual needs, interests, and learning styles for the BSc PD cohort. By setting early standards/expectations in combination with providing an interactive and engaging learning environment through the implementation of breakout group rotations and rapid upskilling/intense delivery methods, students are now in a better position to succeed in their first-year studies but also push on and further develop their skills. With an emphasis placed on real-world applications of knowledge and skills from both a theoretical and practical viewpoint, this has ensured that the student group can apply the taught/learnt skills throughout all their modules. Furthermore, the emphasis on deschooling has also facilitated students taking greater pride in their academic achievements whilst also ensuring as a cohort of designers that they have become more socially engaged with each other. Although the rapid deschooling and upskilling of students does have many benefits, an important factor to consider is how the first few weeks of this process can also be applied to any student that may be late arriving for their first-year studies due to international visa delays; this a point for future consideration. Additionally, it must be noted that the use of this approach must be done so with an element of caution, with the methods needing to be tailored for each individual year group needs. It's important to highlight that with the high number of creative students that have additional learning support requirements, whether this be for dyslexia, ADHD, autism etc, the teaching mechanism employed must be flexible and adaptable for everyone's preferences and learning styles regardless of the level of support available. Moving forward, the approaches discussed will be applied to other modules within the course where the rapid upskilling of specific content is required, whether this is for software teaching, projects that may need to be taught in a design sprint format, or for the teaching of practical model making/prototyping skills.

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