ALIGNING TEACHING AND LEARNING APPROACHES AND ASSESSMENT METHODS TO ENHANCE THE QUALITY OF HIGHER DESIGN EDUCATION

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Abstract

The design of modern higher education programmes in the field of industrial and product design must strive to meet the career expectations of both employers and students. How educators attempt to match the expectations of both students and industry is of critical importance to the knowledge-driven UK economy.

Recent research indicates that skills, knowledge and creativity (SKC) are equally important for both seasoned designers and graduates alike (Guo, 2011). These attributes are important, but not enough; the ability to manage, liaise with clients and apply real-world experiences are required by most employers (Zerillo, 2005). There is, however, a mismatch between employer's expectations and the abilities of graduate students in a number of areas. In fact a staggering 21% of UK-based design consultancies said they were 'not at all satisfied' with the skills of the graduates they were employing in the areas of design skills, literacy, mathematical ability and, perhaps most importantly, business awareness.

Teaching is the delivery or transmission of information/knowledge to facilitate students' learning through growth or by changing their conceptions of the subject matter. This is done by a number of established teaching paradigms and learning models (Fox, 1983; Martin, 1990; Dall' Alba, 1990; Samuelowicz and Bain, 1992). The teaching and learning methods employed at university levels 4 and 5 (years 1 and 2) are often rote and peer-based communication models as delivered in most secondary schools. In the final year of a degree, the teaching and learning style is often more aligned with the self-directed method, giving students greater freedom to select their preferred direction and equipping themselves to meet the requirements and needs of industry.

The method of assessment plays a significant role in a student's education: many students tend to place great emphasis on passing a module without first seeking to understand the content. Intelligent selection of assessment method is therefore critical in ensuring students are strategically steered towards learning the new skills and knowledge laid out in the syllabus.

This paper shows that both the teaching and learning approach and the method of assessment are of equal importance in curriculum design. Furthermore a roadmap, an idealized "learners journey" is presented for studies at the higher educational level. This model considers student aspirations, the Higher Education Institute's (HEI) curriculum design, skills expected of students to fulfil career goals and the needs of the product and industrial design industries.

1. INTRODUCTION

Many believe that higher education (HE) should support students in becoming critical thinkers through research-led teaching in a safe environment, enabling freedom of thought and ensuring equal opportunity for all. Carey (2012) defines 5 models of HE in the UK: functionalist, Marxist, liberal, humanist and radial. The functionalist model focuses on education for work and workforce, sees education as preparation for the workplace, whereas the humanist model is concerned with education

for personal development. This places greater emphasis on individual, self-actualisation, the educational processes reflect the needs of individual students, and addresses effective as well as intellectual learning. For the creative industry however, the primary purpose of HE is not developing narrow skill sets, even though occupational skills are a necessary element in the education process (Crossick, 2010). A higher education nurtures and develops creative talent, and produces graduates with deep specialism and, increasingly, the ability to work in multidisciplinary teams. It is this talent that will innovate new products, processes and business models to drive the creative economy of the future.

2. CHALLENGES FOR HIGHER EDUCATION DESIGN PROGRAMMES

There is no doubt that one of the jewels in the UK's crown is that of the creative economy. It is a national success story and an area in which the UK can rightly claim to be a global leader. According to Cossick (2010), we have the largest creative industries sector in Europe, accounting for more than 7% of GDP compared to around 2.6% for the EU as a whole. It continues to show strong economic growth and commercial and cultural success around the world. HE tends to be a fundamental driver of the creative economy; this is where UK universities play a critical role in developing and fostering creative talent, providing an environment where creativity can flourish. Universities therefore, must continue to develop world-beating talent, but with increasing focus on industry exposure, employability and entrepreneurship (Crossick, 2010).

Williams and Guo (2006) echoed the findings of Zerillo (2005) and suggest that a contemporary higher education in design must strive to meet the career expectations of both employers and students: UK HEIs must serve two masters.

Figure 1 shows the relationship of four factors: government, industry, student and educator within the HE system. If viewed as a business model, the government plays the role of CEO and coordinates the (education) system. As such, the CEO consults with a client (industry) to determine their needs and then guides the manufacturer (educator) forming the raw material (student) into the desired product for the client.

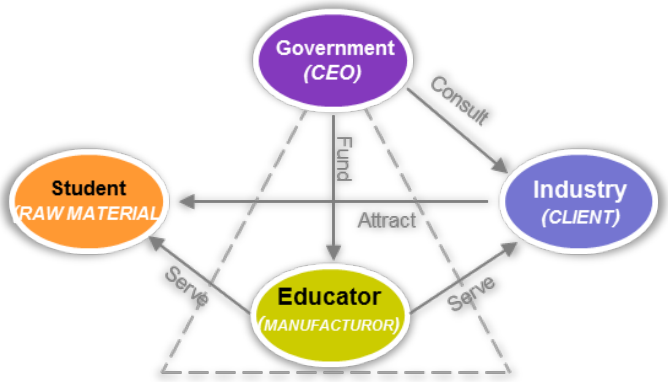


Figure 1: Four factors in higher education

A critical issue emerging from this arrangement is how educators (manufacturers in the above analogy) attempt to match the expectations of industry. Recent research indicates that skills, knowledge and creativity (SKC) are equally important for both seasoned designers and graduates alike (Guo, 2011). Design skills, in-depth knowledge and creativity are essential, but not enough. The ability to manage, liaise with clients and apply real-world experiences are required by most employers (Zerillo, 2005).

There is evidence that the growing relationship between HE and industry is essential at all stages of

the education process; from programme design and development to delivery. This is having a beneficial impact on students, industry and universities (Crossick, 2010). Universities are increasingly embedding opportunities for practical learning in industrial settings within their courses as a way of enhancing the employability of graduates and creating value for participating organisations.

However, a significant number - 21% - of the design consultancies, interviewed by the UK Department for Education and Skills in 2002, said they were 'not at all satisfied' with the skills of the graduates they were employing. Aside from a lack of design skills, literacy and mathematical ability, they pointed to a lack of business awareness. More use of visiting lecturers and studio-based activities, including the type of collaborative and team working common in consultancies have previously been suggested as ways in which undergraduate degree courses could improve (UK Design Council [3], 2005).

Furthermore, multi-disciplinary thinking skills have become increasingly important to designers, as they don't work in a vacuum (UK Design Council [1], 2005). To be successful they rely on skills and knowledge from beyond their own discipline. Indeed, Zerillo (2005) suggests that consultancies in the US seek technical skill sets that can add value to the team and produce fee-based hours of work. Companies generally look for someone who can quickly plug into a position on the team. Technical skills are a lever to open up the initial design experience. Chris van der Kuyl believes that communication and creativity are the most important skills in the creative industry. ‘Fostering relationships between business and academic institutions will ensure that graduates leave university with the necessary skills to make their mark on the business world.’(Cited by Crossick, 2010).

Functional specialism – the ability to work in teams and design-centred capabilities are valued and required by many industrial sectors (Cooper, 2004). Therefore, the industrial designer needs to be able to work in a team of different specialists, to coordinate, communicate, and navigate through a myriad of different disciplines.

There is, of course, a view that creativity is innate within some people but there is also a recognition of the role that the education system can play in helping young people to discover and nurture their own talent and that this can have a long term impact not just for the individual but also for society (UK Design Council [2], 2005).

Many believe that a creative education in a space that allows free expression should start prior to attending primary school and under parental supervision. This would elevate creative practice, rather than relegating it to the curriculum at primary and secondary school levels. Creativity in education should not limited to *what* is taught in the classrooms, rather it should extend to *how* creativity is delivered and by which pedagogic methods. Whilst this is an issue at every level within education, it is of particular importance between the ages of 11 and 14. Once a child has matured, attempting to teach creativity at the higher educational level is difficult, hence this author’s belief is that balancing skills and knowledge is crucial (Guo, 2011).

Educators also need to consider whether they exist to satisfy the needs and aspirations of the next generation of businesses or to add value to a students’ career sustainability or both. Skills-focussed courses tend to satisfy the existing needs of industry, paying scant regard for future business expectations and the students’ career development. The Knowledge-focussed programme however values student career sustainability, but does not fully satisfy industry’s immediate needs (see Figure 2).

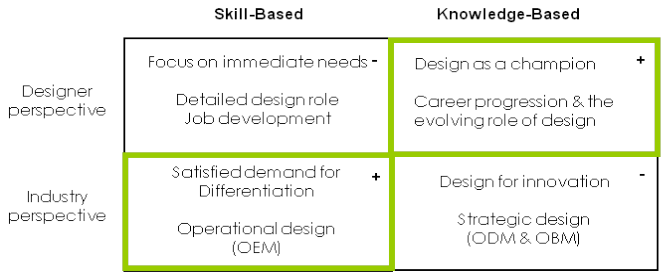


Figure 02: skills-focus education vs. knowledge-focus education

The teaching and learning approach adopted appears to be very important factor in raising the quality of a higher education. However, what determines the teaching and learning approach? Does subject tradition affect it?

There are two broadly held and different views of teaching and learning. The first perspective says that the conception of teaching and learning are strongly related and trying to change one in isolation from the other is unlikely to be successful. The second maintains that teaching and learning are relational (Ramsden, 1987). Thus, conceptions of teaching science may be different to conceptions of teaching history (Prosser and Taylor, 1994).

The delivery of a design-based programme in HE necessitates a teaching and learning method that tends to be more studio-based rather than lecture-based. However, this approach creates particular issues for learners who are expected to acquire skills and knowledge in equal measure.

Design-based programmes tend to differ from many others at the HE level in areas such as selection and admission of new students. Apart from general entrance requirements, design courses usually have an interview that aims to assess an applicant's creativity. Many institutions request potential students bring a portfolio of previous work with them to the interview. They also differ in terms of the breadth of learning outcomes. Product designers require many skills in addition to the more obvious ones of drawing, generating ideas and creating models (both virtual and physical). Product designers require skillsets in high demand in the knowledge economy such as problem solving, collaborative / group-based project work and experimental / experiential learning and analysis.

In addition to these pedagogic demands, design-based programmes tend to be expensive to run, requiring plenty of studio space (for sketching and sketch modelling), 2 and 3D design (CAD) and manufacturing facilities (laser cutting, 3D printing and CNC machining to name a few). To maintain a healthy design programme, significant investment must be forthcoming in order to provide students with a high quality, creative education (Crossick, 2010).

It is the above aspects of a product designer's education that often sets it apart from many other academic disciplines.

3. TEACHING

Figure 01 shows that the "Educator" plays a key role within the system; a tutors' knowledge and expectations will shape both the direction and quality of the teaching and learning approach.

Previous research (Fox, 1983; Martin, 1990; Dall' Alba, 1990; Samuelowicz and Bain, 1992) conducted in this field all report that conceptions about teaching range from a method of delivering, presenting or transmitting information/knowledge, to facilitating or helping students to grow or learn or change their conception of the subject matter. They describe that the conception of teaching tended

to be based on the students' conceptions, the teachers' conceptions or on the conceptions as defined in the syllabus or textbook.

In 1994 Prosser and Taylor identified six categories of description as follows:

Structural	Sysllabus/text concepts	Referential teachers' conceptions	Students' conceptions
Teacher:			
Transmitting information	**A**	**B**	
Helping students acquire concepts	**C**	**D**	
Helping students develop conceptions			**E**
Helping students change conceptions			**F**

Figure 03 Conceptions of Teaching. Prosser and Taylor, 1994

Figure 03 outlines the nature of the logical ordering of the categories, there is also a suggestion of hierarchy in that, for example, the conceptions A and B focus on teachers' own knowledge and/or the knowledge as described in textbook. Such methods somewhat dismiss what prior knowledge in the subject a student may already have and that all knowledge on a subject is transmitted during teaching. Modes C and D however see students' prior knowledge as being important and the role of the educator is to help students acquire and develop concepts further. Conception E precludes the transmission of information and suggests that there is more to teaching than just transmitting information whilst conception F places emphasis on encouraging students to change and expand their existing view of the subject matter rather than rely on simply absorbing those of the teacher or a textbook.

4. LEARNING

The conception of learning may underlie that of teaching, or at least be intrinsically related. The focus is on the information itself rather than on how the new information is related to the students' existing knowledge. Learning could be described as the ability of a student to recognise and use information to help them solve problems. (Prosser and Taylor, 1994).

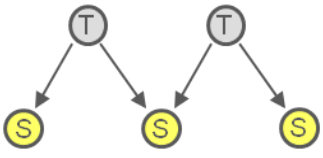
There exist a number of learning models as described below. Each one will likely be encountered throughout a design professional's educational lifetime.

4.1 Rote Leaning Model (Figure 04)

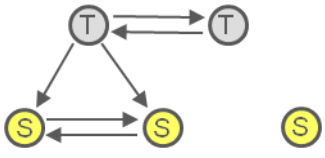
The rote learning model provides opportunities for feedback from students. Some communication may exist between teachers, but there is only a little communication between students.

4.2 Peer-Based Communication Model (Figure 05)

A peer-based communication is predominantly on teacher to teacher or student to student basis, with only a little communication between teachers and students. This teaching and learning approach focuses on teaching rather than learning.

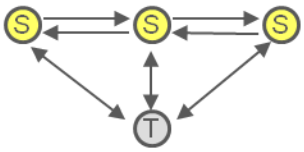


(Figure 04: Rote Leaning Model)

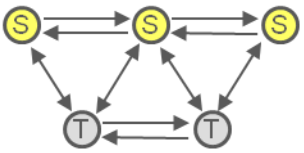


(Figure 05: Peer-Based Communication Model)

The two teaching and learning methods above tend to manifest themselves in ‘one-way-street’ lectures, during which the teacher ‘teaches’, and students listen and follow directions. Such methods are commonly used at HE levels four and five, which may be suitable for skills and certain knowledge learning in the early stages. However, Ann (2003) suggests that, as students are not encouraged to ask questions or to challenge opinions which is likely to stifle creative thinking.



(Figure 06: Self-Directed Model)



(Figure 07: An Ideal Model)

4.3 Self-Directed Model (Figure 06)

Self-directed projects are widely adopted in design-based programmes at the undergraduate level. Such projects provide students with an opportunity to undertake a self-initiated study. Students are encouraged to communicate with each other, and undertake consultation with their tutor. The model is often used at level 6, which plays student at the centre, and demonstrates greater interaction between the students and tutor.

4.4 Ideal Model (Figure 07)

An ideal model is perhaps a knowledge network, with dialogue between student and student, teacher and teacher, teacher and student. This approach is a purely self-directed learning centred one that typically is found in postgraduate masters-level design courses. (See Figure 07)

In general, the lecture-based approach focusses on teaching rather than learning; with little interaction between tutor and students (see Figure 04). Whereas a studio-based approach aims to maintain a balance between teaching and learning by placing greater emphasis on self-directed learning (see Figure 06).

“Design Visualisation” and “Design Presentation” are modules that this author (Guo) has delivered at levels four and five on an undergraduate degree programme. These are skill-based, training modules for students to learn skills in translating concepts into physical solutions. In delivering these modules, the rote-leaning method has been adopted to teach new skills and knowledge at the beginning of each session. Thereafter, a peer-based approach was employed when students start to practice their new-found skills and knowledge in the studio. This author believes that rote learning is a necessary and useful tool in teaching elementary skills and knowledge to help students build an initial foundation on which to launch their quest for a deeper understanding of the subject. Peer-based learning has a place in helping students to digest the knowledge and to apply it when undertaking subsequent projects.

In many cases, various methods may be employed at different stages within a module. For example “User-Centred Design” (UCD) is a module that the current author (Guo) delivers at level 6. This module operates at a higher level of design activity, which demands students have not only design foundation skills, such as research, concept generation/development and model making/ prototyping, but also leadership, decision making and multidisciplinary thinking abilities. Given the aforementioned, the approach adopted was the self-directed one that aimed to put students at the centre of the teaching/learning process – in other words students are encouraged to play a leading role in their own project. There still remained a certain degree of rote learning within the module, since each student needs to learn the vocabulary of the subject first as Prosser and Taylor (1994) suggested. In that work

the authors maintained that learning chemistry is like learning a language, you have to learn the vocabulary (using the rote learning approach) to be able to “speak” chemistry: writing chemical names and chemical formula, etc. Similarly, product semantics (taught in the UCD module) is like a new language to students entering level 6 and they need to learn the terminology (the new language in product semantics) in order to progress. Such an exercise is best achieved using the rote learning method.

5. ASSESSMENT METHOD

Educators understand that the chosen assessment method plays a significant role in either enhancing or detracting from the quality of teaching and learning. Additionally, most students tend to place ever-increasing emphasis passing the module irrespective of whether they achieve the stated learning outcomes or aims of the module. Hence, a good assessment method should push or guide students into learning new – relevant – skills and knowledge within a structured framework.

The assessment method should aim to satisfy a student’s pedagogic needs as well as reflect the SKCs required by industry (employers). Design is widely regarded as a team-based activity, hence designers need to possess communication, interpersonal and team-working skills so that they can effectively collaborate with different personnel, departments, clients and suppliers (Guo, 2011).

The aforementioned level 4 module “Design Visualisation” utilises an in-class assessment (exam) mode to evaluate students’ skills and knowledge. The net result of this assessment choice is positive in two respects: firstly, this group of students appear to value exams as an assessment method, despite it possibly not being perhaps the best assessment method for design programmes. In contrast, “Design Presentation” at level 5 appears to have a very negative response from students.

These two modules are similar, both being skills-based (one focuses on 2D software learning, the other 3D). Initially the author (Guo) assessed students’ skills and knowledge on this subject via a design process in a coursework-based project. However, an unwanted side-effect of this option was that of the students seeing this as an opportunity to plagiarise! Rather than undertake the work themselves, some students were able to download images from the internet or coerce someone else into doing the work for them. As a result an alternative approach was adopted. The assessment was changed from a coursework style assessment to an in-class exam, which allows students to show their own work and capabilities in a controlled environment whilst minimising the opportunity for plagiarism.

Whilst this new approach does work to an extent it removes the opportunity for formative assessment (effectively feedback before final submission) – a key ingredient in the teaching and learning process. Such practices not only have the effect of enhancing the quality of the final output they also reflect real-world scenarios.

With most design programmes having a project-based learning model, the majority of assessment tends to be coursework rather than examination. However, and in our experience, most students tend to leave working on their coursework until last minute, thus reducing the opportunity for formative assessment. Students usually work extremely hard when close to the deadline, but this leads to an over-reliance on any feedback given during the last tutorial/studio sessions. This “last chance saloon” approach really leaves very little time for effective feedback to be both given and synthesised by the student. The net result is often disappointing for both academic and student alike.

6. DISCUSSION

It should be no surprise that teaching, learning and assessment methods share equal importance in producing a high-quality programme of study. A good teaching and learning approach should attract or “pull” students into paying attention to the new skills and knowledge being taught, whist a

correspondingly good assessment method should “push” or guide students in the importance of understanding and possessing said skills and knowledge.
Skills, knowledge and creativity are required by industry / employers in equal measure too. However, the delivery of skills, knowledge and creativity should follow a specific sequence (Guo, 2011). Figure 08 below represents the journey of a student’s intellectual growth. This sequence has four stages: Pre-University, Levels 4 and 5 (year 1 and 2), Level 6 (year 3), and Employment. Four factors influence each stage: the student’s own aspirations, the university/HEIs’ curriculum design, skills expected of students to fulfil career goals and industrial needs / employment offer. The model also suggests the educational paradigm for the first three stages: rote, peer-based and self-directed learning.

Most students apply for a programme on the basis of their own career aspirations and have acquired skills and knowledge prior to attending university through the rote learning approach (in most cases) at a further education college or secondary school sixth form. The educator’s expectation will dominate during levels 4 and 5 (years 1 and 2), as the students have to satisfy the educator’s expectations (by passing modules) if they wish to progress and obtain an undergraduate degree. The traditional teaching and learning methods employed at university levels 4 and 5 are usually rote learning and peer-based models. It is only during the final year that the teaching and learning style becomes self-directed and more strongly influenced by the requirements and demands of industry and employers. The self-directed method gives students greater freedom to choose their own, preferred, learning direction; equipping themselves for the needs of their chosen industry.

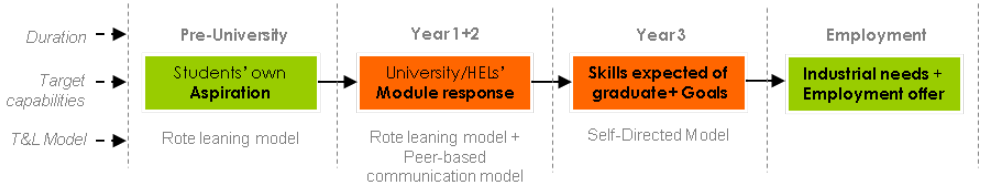


Figure 08. The Ideal Sequence in Higher Education

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