

## DESIGN EDUCATION AND ITS RELEVANCE TO CAREER PROGRESSION

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Date Received: 07/07/2017

Date Revised: 10/07/2017

Date Accepted: 26/07/2017

### ABSTRACT

A survey was carried out to determine whether the way Design is taught at secondary and university level in the UK, adequately prepares pupils who choose to pursue a career in design and then to determine ways that it could be improved. A survey was completed with 13 participants, studying design at university, to discover from their perspective what skills were being taught and what skills they thought would benefit them to learn in more depth prior to university. The survey, moreover, contained a couple of questions targeted at participants who had undertaken some time out in industry to determine what advance information they felt would have been of benefit before their time in industry. This information combined with 3 interviews with current design graduates working in industry, was aimed at providing a view of what was required from the design industry. Of the participants who had spent time in industry, 100% of them felt better communication between industry and the education system would lead to better designers. 85% felt that design specific skills and the process of how to design needed to be taught in more depth. The major areas included in this were the ability to sketch and therefore express ideas better, CAD skills, and the ability to use programs such as Photoshop and Illustrator to display ideas. These were all areas that students felt had they learnt them at secondary school in more depth, or at all, would have aided them during study for their university degree. Next were the additional skills that the 3 design graduates and 12 placement students felt would have been beneficial to learn. It was also felt that enhanced experience of Photoshop and Illustrator at university would have made the introduction to some jobs easier, and that rather than it be taught as part of the syllabus currently they had to learn it themselves. The other main point was that better overall business skills and business understanding would have been highly beneficial. This included the ability to present ideas, both orally and on paper, brainstorming skills, teamwork and the ability to cost ideas.

Keywords: Design Education, Career, Students, Research Study.

### INTRODUCTION

The aim of this research is to discuss the design skills that are taught in design education today and what industry professionals look for in employees. It will then evaluate these skills to decide whether pupils who choose to pursue a career in design are prepared for working life in the design industry, or alternatively whether and how they could have been better prepared.

All three of these areas of research will enable a comparison to be made between what is currently taught and what is looked for in a future design employee,

therefore helping to determine whether what is taught in secondary school, and university education is actually beneficial to a person wanting to pursue a career in design or whether or not it needs improving. It will also help to see whether in fact teaching a student design at secondary school, up to A-Level standard, is actually about preparing them for a career in the subject or providing them with life skills.

### 1. Research Questions

The objectives aim to answer the three main research questions below and the overall aim of the study.

1. What do industry professionals look for in design employees and what do they feel is lacking or could be improved on?
2. What is the current pupils' perspective of design education and how do they think it could be improved?
3. What is the design employee/graduates perspective of design education and how do they think it could be improved?

The paper firstly looks at the literature of Design Education. Secondly it explains the methodology of the study and finally results are discussed and conclusions drawn.

## 2. Literature Review

### 2.1 Employers Expectations

The Department of Design Education and Science (1987) report on Design Education and Industry raises a number of key points regarding design education and what potential employers are looking for in their employees. One point made is that current subjects in design may focus too much on the aesthetics of products and not enough on the fundamentals of designing a viable solution to a design problem. Another is that teachers may be focusing too heavily on the individual creativity of their pupils and not enough time is spent on the key skills required in business, including team based activities and management skills with respect to time and people. The counter argument, and indeed a possible solution to these points, is that industry professionals themselves need to have input with regards to what they think should be included in the school taught design curriculum. This could be a solution; however design in education is about providing pupils with the fundamentals and basics of the subject. It should be the company's responsibility to train its junior designers in specific skills required. There are many courses in design available at university level and that they are in high demand. The Department of Education and Sciences report views this as a result of two factors. One; there is a weakness in design related education in secondary schools resulting in a desire to explore this subject in greater depth as a higher level and two; there are positive signals being received from industry and commerce about career prospects.

An interesting and contrasting view made by Carter (1983) is that what neither designer or manufacturer understand is that the way a designer approaches a design is not just based on their ability to draw, be creative or even deal with technological aspects, but is also a reflection of their emotional and social outlook. The more a person sees, feels, touches and experiences; the more inspiration and knowledge they have to draw design ideas from. This is something that only comes with time and experience. Design by experience: Putting industry and design education on the same path (McLachlan, 1985). McLachlan mentions in his book that design courses have improved wherever they can to make their design course more relevant to industry. However, he stresses that there must be reciprocal links between educational establishments and industry. What he means is that industries must do their part to help and this could be in the form of offering short term placements. He feels that placing students in industrial placements even for short periods of time, is not only a great way for them to gain experience, but a good way of ensuring teachers keep up to date with current trends and techniques. Otherwise, students could return having realized their school had lost touch with the needs of the design industry.

McLachlan (1985) also mentions the problems that come with trying to find suitable placement opportunities for students in order for them to gain their initial experience. The first of these problems is that some companies feel that they do not actually have a department directly related to design and as a result doesn't think they have a place for a student. This is often not the case and there are pockets of design being undertaken across the business. Another issue encountered is that some companies feel they don't have the time to instruct the students on what to do and that is far more efficient for them to undertake the task themselves. He goes on to say that this is not always the case and some companies are very happy to offer placements as they feel they are shaping the kind of designer that they require for their specific needs, because of this they like to take the students on early in their studies.

### 2.2 Design Education in the Context of Creativity

Nicholl (2004) talks about how important creativity is in

design and how best to teach it to pupils. He focussed on one main theory of creativity by Csikszentmihalyi (1999) and how it is transferable to design. Csikszentmihalyi's view is that creativity is made up of three main parts. Firstly the domain, which is the subject itself and all the parts and knowledge that make up the subject, in this case Design and Technology. The second part is the field consists of the people who make the decisions as to what is considered acceptable within the domain. In the case of design education, these are the teachers. Therefore the teacher controls what is considered to be creative and acceptable within the domain. 'D&T teachers' interpretation of the domain is shaped by, among other things, their values, beliefs, attitudes and understanding of designing and creativity' (Nicholl, 2004). 'Teachers literally hold the creative key to the creative door' (Nicholl, 2004). The third and final part is the individual, this is the pupil, the person who must in order to be deemed creative, be accepted into the domain by the field. What this theory points out is something mentioned by Csikszentmihalyi (1999) and that is that in order to create creative pupils, first you must educate the teachers on what creativity is and inspire them, giving them techniques to be more creative. Some companies may feel that too much time is spent focused on individual creativity, however this may be a result of pupils struggling to be able to express their creativity.

In Nicholl's case study carried out in an unnamed school, it became clear that pupils were lacking basic skills such as the ability to draw, and as a result struggled to express their ideas (Nicholl, 2004). This was coupled with a lack of understanding of how to generate ideas, for example, in the use of mood boards, which are 'assemblages of images and less frequently, objects which are used to assist activity,' (Garner and McDonagh, 2001). Instead they tended to look at sources such as the Argos catalogue and used cliché imagery, which they would see in everyday life. Instead they should be encouraged to seek out new shapes and forms from different sources under the instruction of their teacher, enforcing the point made by Csikszentmihalyi (1999) that creativity starts with the field (the teacher). In a Stanley Lecture on: Design in education versus design in industry: are the objectives totally incompatible, David Carter (1983) talks about how

teachers tend to teach heavily the disciplines that they are proficient in rather than teach a spectrum of skills. To create a good designer, they must have a broad spectrum of skills in different areas, including drawing and the ability to generate ideas. This backs up the point made by Csikszentmihalyi (1999) that a student is the reflection of their teacher. David Carter mentions that the design profession seems to attract a very high proportion of very intelligent, but inarticulate and semi-literate creative geniuses who find it difficult to express themselves other than through the medium of 'bits and pieces of hardware - or the systems - which they are creating' (Carter, 1983). What this means is that these students find it easier to express themselves through hands on modelling and creating, in order to demonstrate what they are thinking. As a result, teachers will need to focus more on teaching these students the skills used more in industry to express ideas quickly, the main example of this is sketching (Thistlewood, 1990).

### ***2.3 Prima Donnas or Practically Trained Students***

Carter (1983) also states that academically bright students should not be deterred from entering the design profession as they are sought after by industry professionals. However, in order to best stimulate these individuals you need also to encourage bright individuals to become teachers. One unnamed speaker from McLachlan, (1985) has a similar view to that of David Carter with respect to those attracted to design. He argues that design education produces too many 'prima donnas' (McLachlan, 1985) for too few jobs, and not enough designers are trained in more practical skills which will enable them to fit into a team quickly and easily. The school retort is likely to be that they do no such thing and that practical skills and creative awareness must both be taught simultaneously.

Nicholl and McLellan (2007) look at how product analysis, a requirement on most curriculums, can lead to un-inventive and very fixated design solutions. Ward (1994) stated that people, when asked to come up with new ideas, will often draw ideas from memory. They will use objects they have already seen that are close to the brief to generate their idea. This is referred to as the 'path of least resistance' (Ward 1995), they will subconsciously use what they already know

to generate the quickest and easiest solution. Nicholl and McLellan (2007) carried out a study in schools to answer their question of product analysis and fixation and it discovered a number of relevant issues with design education. One of these was that students were asked to research images of existing products in order to gauge the market and what solutions are already out there. This is a good practice for designers and a requirement in design education, however the issue was that they were not actually taught how to research the images and where good sources could be found, leading to a tendency to search the same things on Google images, often with poor results.

As well as this they need to be taught how these images are useful in helping them to come up with new solutions, taking good aspects of existing design, and incorporating them in their own. They do not necessarily need to redesign an entire product. If these skills were taught properly rather than just being seen as an exercise, it could make the pupils more readily prepared for careers in design later in life as well as providing them with good analytical skills, transferable to other subjects.

Nicholl and McLellan's study also revealed that teachers would show past examples of work to their students, 'she (the teacher) showed us designs that other students had made like a couple of years ago to give us ideas'. As a result pupils designs would look very similar and even when design work was not shown, often it was on display boards on the wall and was still copied 'I got my ideas from that (pointing to display of previous groups work) cos I copied the base and then added some bits'. Because of the functionality of the human brain, people will draw on the easiest accessible information, 'the path of least resistance' and will find it hard to think of new ideas once they have been shown an existing design. As a result, by showing existing designs, teachers are restricting the imagination of the students. By showing existing examples they are also encouraging students to copy it with the view that they want to get a similar mark in the project, it encourages the thought process of just trying to meet the requirements, rather than generating something new and interesting. An alternative approach to this could be to show the students'

particular aspects of existing designs, for example showing the aesthetics of one product to the students, but not explaining its functionality. They could then show the cleverness and mechanics behind another product without revealing how it looks. This could potentially combat the issue of 'the path of least resistance'. This technique, coupled with a better understanding of how to interpret images of existing products, and using aspects of them may lead to more innovative designs (Thorsteinsson, 2008).

## *2.4 Different Types of Designers*

Carter (1983) mentions that there are two main types of designer. Those who are objective and respond to factual criteria, performance, figures, safety specifications, market surveys and other peoples experience. Alternatively there are those that are subjective. These people are more artistic; they are convinced through creative experience that their designs are right. Students need to be taught how to become a mix of these two and not just stick to the one they know in order to meet requirements in education. This will make them better designers as a whole and more valuable and attractive to industry (Sislian, 1988).

A point is made that some students tend to be stronger with a hands on approach whilst others are stronger with a more reflective approach, being better at putting ideas down on paper. The learning experience is designed to allow students to explore and learn new ways of working. The aim of a teacher is to work from the learners strengths to help strengthen their weaknesses (Kimbell and Stables, 2007). This is a point that is transferable throughout the whole education process and is designed to give students a broad range of techniques and ways they can approach problems. It could be argued that learning is approached in this way at secondary level because it is more important than learning specific skills in depth, for example, the use of one particular piece of software or the ability to sketch perfectly in two point perspective.

Carter (1983) makes the point that design is very subjective and as a result it is hard to teach a student how to create the perfect design. Designers pick up influences that are not always liked by their employers or their clients. As such it is hard to create a designer that is perfect for one specific job. Designers will learn and adapt to design products

suiting to the market and the industry they are working in. This is not something that can be taught in design education, but instead something that is learnt through experience. This enforces the point that it may be more beneficial to teach students generalized design skills and techniques while allowing them to develop their own style in this way. The students will learn exactly what and expect the student to already know the way that they operate.

This is not to say it is not beneficial to make students aware of what to expect in industry. Carter (1983) discusses how some schools may teach design with commercial viability being the main focus, and financial gain being a leading factor where as others may teach students to produce worthwhile and socially contributively products. The latter should be encouraged in design education to allow students to develop key skills, including critical thinking, analysis of basic human requirements, and needs and creativity.

The problem with this approach is that in industry in most cases it is about producing a product that will sell and produce the most profit. If a student chooses to pursue a career in design it is likely their ideas will be guided by commercial rather than social constraints and controlled and manipulated by financial projections and marketing. This is something that students in most cases are not currently made aware of in design education. It is an important point and it may be beneficial to give students a better understanding of what the design industry actually expect in order to create a better link between the two. This is not to say that this is the approach that should be taken and that design education should become commercial but it could give students a better idea of what to expect should they pursue a career in design while also providing employers with graduates who are better prepared and not naïve to the business world.

## **2.5 Preparing Pupils for the Industry**

### *2.5.1 Design by Experience*

Putting industry and design education on the same path (McLachlan, 1985). Mr. Robert Heller a guest speaker from a publication called 'Management Today' put this point quite simply when talking about his business, 'I do not think design played a part any different from that which it can

play and should play in industry at large. That is, you seek the best design which will accomplish your commercial purpose and do so in the most economic manner' (Heller, 1985). This is what he believed students should be taught to put into practice when they start work in industry (Ward, 1995).

Overall, there are flaws in both what certain industries look for in terms of employee skills, and the way in which design education is taught. The literature reveals that there needs to be better communication between the two parties, and better training given to teachers, with regards to methods used to teach the skills required by industry, to the pupils in an effective way. It may also be beneficial to teach students in the higher levels of design education, mainly at university level, what to expect in industry to help them become better prepared. McLachlan, (1985) makes the point that there are most certainly arguments about whether schools do keep themselves on top of industry requirements. However it is also clear that many people in industry do not keep up to date with the ever changing nature of design education. As a result they are not aware of the advances that have been made in the hands on approach to experience (Baynes, 1983).

Dahncke, (1993) reiterated the point that the school curriculum should prepare pupils for the industry they are going to live and work in. He also stated that he does not believe that the traditional student teacher education prepares the student teacher with the knowledge and experience to teach this. Although the paper is not directly related to design, the project is put in place to try and improve teacher education and therefore produce better students (Page, Thorsteinsson. and Ha, 2007). The 'Kiel Project' (Dahncke, 1993) as it is known, involves two placements in industry for the teacher, thereby giving them hands on experience and the ability to use the skills they learnt prior to teaching in industry, before becoming a teacher. The idea is that this will overall produce better secondary school teachers with more experience and in turn produce better students who have some idea of what the industry in their particular subject is about through interaction with the teacher (Knight, 2010).

There seems to be an ongoing theme throughout areas of



the literature that a student is only as good as their teacher, and in order to improve the student and their experience, you must first improve the teacher. Rogers and Clare (1992) discussed a technique whereby the student teacher has to liaise with industry, to discover as much as they can about that area of industry, in order for them to write a paper on it relating to a subject of their choice. This technique produced results that could benefit the students that they teach and their awareness of industry. These included; 'more confidence engaging in industry links in the classroom', 'A willingness and enthusiasm for developing links with industry on teaching practice' and 'discovery that there are many different routes to gaining information'. These are skills that are all transferable to the students being taught and could better prepare them for university education and eventual employment.

## 2.6 Summary from the Literary Review

To conclude the literature survey section a number of points need to be stated and reiterated. One thing that is clear is that the link between education and industry is vital and in order for students to be better prepared for industry, communication between companies and schools needs to be frequent. Industry professionals expect a lot from design students and it is their job to inform schools and universities what skills they are looking for in order to improve the curriculum. Industry must also understand that secondary education is largely about providing the fundamentals and if they wish students to learn more about the way industry works, they should help to do so by offering short term placements by way of work experience for younger students and offer visits to schools to give talks on their companies. A second point is that in order to create better design students, you must have better teachers. Students are a reflection of their teachers and improvements in teacher education and experience must be made in order for teachers to have the necessary skills and knowledge of the current design industry in order to pass it on to their students. Ensuring design teachers keep on top of modern skills and methods being used will ensure students are given the best education available. The final point is that the vast majority of the relevant literature is from the 1980-90s and so with the ever changing developments

and techniques used within the design industry and education system its relevance could be questioned. Therefore it is interesting to see the comparison with the primary research carried out. This research shows what current university design students feel could have better prepared them at secondary school prior to a degree in design. It also looks at what skills and experience current design employees feel would have better prepared them for the first steps in design careers had they learnt them at university.

## 3. A Summary of the Research Data

### 3.1 Online Survey Participant Results

An online survey was carried out with 13 participants currently studying design at university who had previously studied design at a secondary school level. A summary of the main results can be seen in Figures 1 & 2. The aim of the survey was to help answer research question 2.

### 3.2 Design Employee Interviews

Three interviews were carried out with current design employees who had studied design at secondary and university level. The aim of these interviews was to gauge

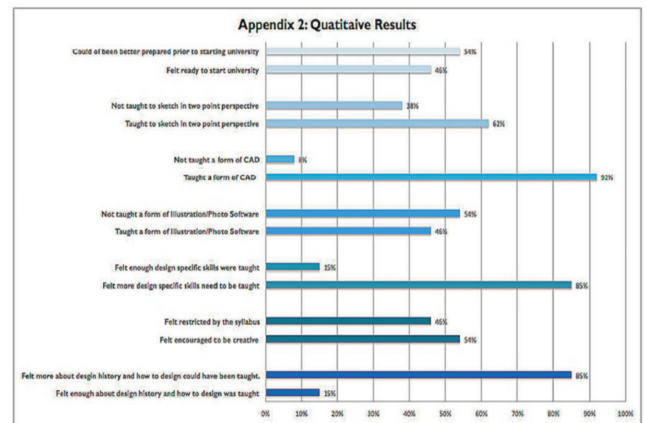


Figure 1. The Main Quantifiable Results (Source: James Blackman)

Designs skills taught at secondary School	Sketching In Two Point Perspective	Computer Aided Design	Illustration and Photo Editing Software							
Yes I was taught it	62%	92%	46%							
No I wasn't taught it	38%	8%	54%							
What software did you use?	N/A	Pro/Desktop 85%	Solidworks 15%	Photoshop 90%	Illustrator 10%					
Do you feel it gave you an advantage or would of done learning it in more depth before university?	YES 60%	NO 40%	YES 92%	NO 8%	YES 100%	NO 0%	YES 90%	NO 10%	YES 100%	NO 0%

Figure 2. The qualitative responses to the main design skills researched in a quantifiable summary (Source: James Blackman)

Placement Students View (More instruction required prior to placement)	Graduate Employees View (more instruction required prior to permanent employment)
CAD skills	Number crunching and the ability to cost products better
Visualisation and concept generation	A better overall business knowledge and acumen
The process of design development and evolution	A better knowledge and understanding of using Illustrator.
Brainstorming and creative thinking	
Researching techniques	
Knowledge of fabrication and manufacturing techniques	
Illustrator and Photoshop skills	

Figure 3. A Table of the Main Skills of the Students who had undertaken a Placement and the three Graduates thought they required more Instruction in prior to Starting a Job

Graduate Employees View (skills learnt that aided them prior to employment)
Team working skills
The ability to work to tight deadlines
Confidence in themselves and ability to discuss ideas as a group
Presentation skills
Sketching ability
Time management
Illustrator and Photoshop skills

Figure 4. A Table of the Main Skills the Graduates thought their Education and Placement provided them with which Aided them when Starting Full Time Employment.  
Graduate Employees View

the employee's perspective to help answer research question 3.

Question 9 was designed to gauge an understanding of the student's perspective as a design employee, if they had undertaken a placement year in industry. The objective was to discover what skills they felt would have been beneficial to know or have known in more depth prior to working in industry. Question 10 was simply to see if having worked in industry they felt the education system would benefit from more input from the design industry. Both these questions were designed to gather added information to help answer research question 3. Figures 3 and 4 shows the summary of main skills.

## 4. Discussing the Findings

This section provides the results and evaluation of the first area of primary research conducted using an online survey. The survey was carried out to gather data on the pupil's perspective as to whether the skills currently taught in secondary school design subjects prepared them for starting university design education and the path to a career in design. It will also provide insights into how the participants feel they could have been better prepared prior to starting university, thereby providing potential ways of improving secondary design education.

Thirteen participants completed the survey. They were from a number of different schools and educational facilities studying a variety of different design and technology focused subjects before studying Industrial/Product Design at university.

Each of the participants were asked a variety of questions varying from how prepared they felt for their design course upon entering university education, to how they feel they could have been better prepared. This included questions about their knowledge of design specific skills such as two point perspective sketching and Computer Aided Design (CAD) to name but a couple. Additionally they were also asked whether or not they thought these areas were beneficial to learn prior to university.

From Figure 1 it can be seen that there was almost a 50/50 split as to who felt they were best prepared skill wise to start their university design degree and who thought they could have been better prepared. However there were marginally more participants who thought they could have been better prepared with 54% of people saying this was the case. At a first glance this seems to show an almost equal split in terms of educational facilities that students feel teaching a standard of design high enough to prepare them for university and those that do not.

The students were asked what skills they learnt at secondary school that they thought prepared them for their design course at university. There were mixed responses to this question but there were several common areas that pupils felt were important. The main areas students said they found useful were; basic knowledge of Computer Aided Design (CAD) skills; the ability to sketch at a basic level to

communicate their ideas, and basic workshop and modelling skills. Another area that some felt helped them was their basic knowledge of manufacturing skills and materials. These are all areas that are commonly taught in more depth at a university level and valuable in the design industry, so the fact that students are getting some grasp at a secondary level is promising.

When asked if they had been taught to sketch in two point perspective, a skill used heavily to express ideas in industry, 62% of people said yes. This is a relatively large proportion of the participants. However when asked if they felt this gave them an advantage at university, or whether they thought it would have done, had they been taught the skill, there were mixed responses. All apart from two of the participants thought that it was beneficial or that it would have been beneficial to have learnt prior to university. The general theme of responses was that they had only been taught it at a very basic level and although useful wasn't of any real advantage because of this. Of the two participants that didn't feel it was beneficial, one simply thought that due to lack of time spent learning it at secondary school, it gave them no advantage. The other participant's view was that sketching wasn't a skill that was imperative in the design world, although it is a good way of communicating ideas quickly and effectively. There was only one participant who had good experience of sketching prior to university and they stated that they thought it was of a real advantage to them. 'Yes I do feel this gave me an advantage as even after a few months on our course, when we were taught perspective drawing techniques, there were still many students who's perspective were too extreme/exaggerated (fish bowl effect) where as I felt my sketches had a more realistic feel to them due to the subtlety of the perspective I used.' Overall it seems clear that teaching students how to sketch in greater depth throughout design education at secondary schools would greatly benefit them during higher education. This is supported by Bill Nicholl (2004) *Teaching and Learning Creativity*, who in his case study in an unnamed school discovered that students had trouble expressing themselves due to a lack of basic drawing skills.

The next question asked was whether they had been taught

any Computer Aided Design (CAD). Many design companies use CAD software to illustrate final design proposals and also to aid prototyping and manufacture. The issue with this being taught prior to industry is that there are a handful of software packages used and different companies use different ones. However having knowledge in one can provide students with skills that can be transferable between packages. 92% of the participants said that they had used some form of CAD prior to university, with the majority using Pro/Desktop. A couple of participants mentioned that they had also had some instruction on Solidworks and Google Sketchup. Although a large 92% had some experience using CAD. When asked its usefulness when progressing to university, there was an almost unanimous response that yes they did feel it provided them with some form of foundation and a slight advantage, but that really they had very little experience in using the package and it was almost negligible. The participants in the survey all study Industrial/Product Design at Loughborough University where Pro Engineer now renamed Creo is taught as a CAD package. The ones that learnt Pro/Desktop believed that there were certain similarities between Pro/Desktop and Pro Engineer and it did give them a basic understanding. The couple that had learnt Solidworks, one who had self-taught it, stated that this definitely gave them an advantage when starting university. This is most likely due to the very similar nature of the Pro Engineer and Solidworks with Solidworks almost being a simplified version with very similar features.

The fact that it was a unanimous decision that even a small amount of instruction on a CAD software package provided some help prior to university is an indication that in our ever increasing technological society it could be very beneficial to teach a package earlier in design education. It became apparent from the literature review that there needs to be better links and communication between design education and industry. As a result before implementing a program that includes a CAD package it would be worth speaking to companies to determine what program is used most widely and which the best all-rounder is. One reason why CAD may not feature heavily prior to university is because it is a very time consuming process to learn and a very expensive piece of software to purchase.



It could be very difficult for schools to purchase a package with the already low funding that they receive.

Another valuable skill within the design industry is the use of illustration/photo editing software to display ideas. When asked if they were taught any prior to university 46% answered yes and 54% answered no, this is fairly even split. The vast majority of students who had learnt a package had learnt Photoshop but had only done it on a very basic level and although it gave them the fundamentals at the time it was easily forgotten. Some of the students who hadn't been taught it at school self-taught themselves Photoshop or Illustrator either prior to university or during university. The overall opinion was that the university course requires a lot of use of an illustration package and that it would be a skill well worth knowing prior to starting the university course. Another point made is that there is little teaching of illustration packages even at a university level and in fact they often have to be self-taught. The one participant who had taught themselves Photoshop and Illustrator prior to university said 'This definitely gave me an advantage as it enabled me to produce graphics more quickly and of a higher quality'. Another point made was that one student was taught Corel Draw, a 2D graphics package used in conjunction with laser cutters and so far throughout their degree they had no use for it, quite possibly considered a waste of time. Overall it seems that teaching students these kinds of skills earlier on would be beneficial but as with CAD software the packages are costly and may be out of the budget range of some schools, this is potentially why roughly half had no instruction on it at all prior to university. The other issue is that these types of packages can be time consuming to teach.

To sum up and provide an overall answer to whether university students felt more design specific skills needed to be taught on their course at secondary school, they were asked simply that. The result was pretty conclusive with 85% of participants stating that more skills needed to be taught, with only 15% of participants disagreeing. The participants that disagreed are the students who had received instruction in both CAD and Photoshop skills prior to university and therefore felt they had been given enough instruction before university. If other schools operated in the

same way it is likely all students would enter design degrees at university feeling the same way.

Participants were also asked if they felt they were encouraged to be creative or restricted by syllabus requirements. The result of this question is fairly inconclusive with 54% saying they felt encouraged and 46% saying they felt restricted. Although this question failed to really provide any real conclusions, it was asked because it was interesting to see how relevant Csikszentmihalyi (1999) view of creativity being a reflection of that of the teacher actually was and whether or not current students felt restricted in their creativity. It appears that just under half do feel restricted and this could potentially be the way in which their teachers were conducting the syllabus requirements at the time.

The final question asked relevant to this section, and answering research question 2 was whether or not throughout the participants design education they thought they were taught enough about design history and how to design. Only 15% said they thought they had, with a much larger 85% saying they didn't think they had. Regardless of their answer they were then asked to comment on how they thought greater knowledge in these areas would improve their ability as a designer if they thought it would.

Some interesting points became apparent from this question. The first point made by a number of participants was that they felt that although they were often shown examples of what was good design from the past, they were never told why it was good design. They felt that learning more about how to design and how to use examples of good design would be beneficial as well as better education on styling and detailing. This is a very similar issue to that of Garner and McDonagh as mentioned in the literature survey where students 'lack of understanding of how to generate ideas' (Garner and McDonagh, 2001: 57) including the ability to use mood boards and assemblages, hindered them in their ability to generate designs.

The second point was that a better knowledge of the whole design process would be beneficial. How to take a design from the initial concept stage all the way through to final evaluations, in essence of how to develop a design. This

was something that they had to do during their university degree and felt better knowledge of the process prior would have helped them.

The final point was that on one hand, some felt that learning about history would be interesting and would aid them in design work through an understanding of design movements which would allow them to apply areas of it to their own designs. On the other hand a few felt what they had learnt about design history was wasted, as it had no correlation to design work they had done. One response stated that they thought teaching design history would be wasted on younger students, especially the ones not planning on pursuing it at university.

Overall with 85% of participants stating they did not feel they were taught enough about design history and how to design, coupled with the points made it clear that more teaching in these areas could be beneficial to students. It is interesting to note that some of the points made by students are similar to those made in areas of the literature reviewed, written approximately 9 years previous, this shows that the issues of understanding how to design is an ongoing one.

This section provides the results and evaluation of the second area of primary research conducted. The interviews and questions were carried out to gather feedback from design employees and gauge their perspective as to whether the skills currently taught in university design subjects prepared them for starting their job after graduating. It also looked at what skills they feel could or should be taught to produce better design graduates. It will provide an insight into what employers look for in graduating design students, based on what was expected of the graduates when they first started. This is comparable with some of the literature reviewed comparing design in education and design in industry, 92% of the participants who undertook the survey had spent some time working in the design industry as part of their education and 100% of these participants stated that they thought should improve the types of skills taught.

They were then asked what the skills were they felt had been most beneficial in learning prior to starting their job, and what skills would have benefited them if they had been

taught them prior to starting. A number of varying responses became apparent. One was that the use of CAD and Photoshop/Illustrator skills were very important and that better knowledge of it would have been useful. One design graduate employee agreed and said that the knowledge they had gained in this area prior to their job was very useful, another said that they had learnt very little of it at university and it was something they used a lot in their job and as a result had to pick it up quickly. Another point made by the placement students was that a better understanding of the professional design process including brainstorming, creative thinking and the ability to work faster would have aided them going into industry. Two of the graduate employees contrastingly thought that their placements had taught them better time management skills and the ability to hit short deadlines, this helped them to work more efficiently.

This question also revealed that a better understanding of how to work professionally and as part of team was crucial and something that some of the participants felt they lacked when first starting their job, but had gained through experience. This is a point also made by the Department of Design Education and Science (1987). The report on Design Education and Industry previously mentioned in the literature survey, the ability to research thoroughly was also something that one participant thought they lacked when they entered a job. It has to be noted that the participants who provided these responses had at the time of their industry work experience not finished their degree and so many of the gaps in their skills that they mentioned they may have quite possibly learnt in more depth during their final year at university.

As a whole the design employees who were interviewed felt that a better knowledge of the workings of business and a better business acumen would have better prepared them for their job. However it was admitted that this was more related to a business degree, but a module in it could have been beneficial. They agreed the main things they had learnt while at university that weren't directly related to design and had benefited them starting a job included; the ability to discuss ideas and gain feedback and the ability to present ideas to groups of individuals. These are

skills sought after by employers.

The following point made by a participant seems highly relevant 'I think there is only so much you can be taught in education with design. 'I learnt so much from just being in the industry which education could never have taught me. Education helps advance specific design skills. It's work experience that prepares you for the industry.' This point of view is shared by David Carter (1983) who feels that students can only develop as designers through experience, something that is potentially true for all careers. This is true in the sense that a person's education experience is only a very short period of time compared to their entire life and to teach a student everything they need in this time could be considered impossible.

## Conclusion

The study was set out to determine whether the way Design and Technology is taught at secondary and university level adequately prepares pupils who choose to pursue a career in design and then determine ways it could be improved. It answered three main research questions:

1. What do industry professionals look for in design employees and what do they feel is lacking or could be improved on?
2. What is the current pupils' perspective of design education and how do they think it could be improved?
3. What is the design employee/graduates perspective of design education and how do they think it could be improved?

With regards to what industry professionals look for in design employees, the literature uncovered two main points. Firstly, it was that it was felt that although design graduates were often good designers, they were naive to what is going on in the business world. They had the skills to design but were lacking in ability in areas such as; presenting ideas through oral presentations; writing up professional reports and findings; capability to research in great depth; teamwork and the ability to design feasibly sound solutions to problems across all areas of the design process. This was an interesting point as some of the design graduates interviewed and current students who had undertaken placements stated that business skills including

presentation and team work were things that they had learnt during their placement years. They felt that learning these skills on placement had better prepared them for full time employment. One participant who had undertaken a placement thought that they lacked the ability to research thoroughly when they entered the job, this was not a skill that the design employees interviewed felt they lacked.

One skill one of the employee interviewees thought they were lacking was the same point as a point mentioned in the literature survey and that was a lack of understanding of the business world. The graduate felt a better understanding of the costing of products and number crunching would have been beneficial. This falls in line with the point of David Carter (1983) who mentioned that in business products are being designed to be commercially viable and profitable and design graduates can often lack this understanding.

46% of the participants providing the pupil's perspective said they felt ready to start university in the area of design after leaving secondary school. However a number of areas were seen to be important throughout the design process and as such they felt that more instruction in them would be beneficial prior to university. The three main areas were the ability to sketch and communicate ideas on paper; the ability to use and understand CAD software and finally being able to operate illustration and photo editing software such as Illustrator and Photoshop to present and communicate design proposals. 62% of participants had been taught to sketch in two-point perspective, 92% had been taught a form of CAD and 46% had been taught the use of a form of illustration/photo editing software. This showed that around half or more of the students had instruction in these important areas, although when asked to explain how much they had, the majority said very little and that their instruction was virtually pointless.

To provide an overall answer, it was put to the students whether they felt more design specific skills needed to be taught at secondary school. The result was pretty conclusive, 85% of participants felt that more skills needed to be taught with only 15% of participants disagreeing. The participants that disagreed are the students who had received instruction in both CAD and Photoshop skills prior

to university and therefore felt they had been given enough instruction before university. If other schools operated in the same way it is likely all students would enter design degrees feeling the same way. The problem may be that implementing new software in schools across many computers can be very costly and the software can become outdated very quickly. Another issue is that different companies and universities teach different software and so choosing one that is relatively universal is almost impossible. Finally teaching these programs is time consuming and schools only have a limited number of hours in which to teach students a broad range of skills and have them prepare coursework. It would however be very easy to teach students more about how to generate and present ideas through the art of sketching, this however requires teachers to be able to do it as well, a view supported by Csikszentmihalyi in the sense a student is a reflection of their teacher.

The design graduate employees agreed that the ability to present ideas professionally through the use of Photoshop and Illustrator was highly beneficial in their industry but something one of them felt they had not learnt enough of prior to starting their job. It was also mentioned that means of communicating in other ways clearly and effectively was also beneficial; this could include sketching or brainstorming and also presenting to groups. Another skill they deemed beneficial prior to working was the ability to discuss ideas and gain feedback as a group. Overall it seemed that the design employees felt they lacked business acumen when they first started and that a better understanding of the functioning of the business world would have been highly beneficial. This could be achieved through the introduction of a university module in this area.

These findings show there are several areas that need to be improved upon within pre- university design education, with the core areas being a better knowledge of programs such as Photoshop/Illustrator and a CAD package if not prior to university, in more depth during the university study. As well as, this is a need for a higher skill in communicating design ideas on paper prior to university. The restrictions with this are the time available, the cost of implementing new programs and the need for higher skilled teachers. The

study also shows the value of links with industry and the experience that can be gained from internships and placements. It can be argued that secondary school is more about providing a foundation of many skills and that university and placements are where the experience is gained. This is how students gain a lot of the professional skills needed prior to starting a full time job and failure to gain these skills through work experience can produce weaker design graduates. The graduates currently employed felt that a better business acumen prior to starting a job would be very beneficial but understood this may be something that had to be learnt through placements.

Overall it seems that design education does prepare students for working in the design industry providing they have had experience in industry prior to full time employment. However improvement in the areas noted above could produce a much higher quality and skilled graduate designer.

There are of course limitations with the primary research that has been carried out. The first of these limitations is the scale of the results collected. In order to generate the most accurate results and provide more insights, more participants would be required to carry out the survey and more graduate design employees interviewed. This would provide a more detailed overview of what students and design employees feel is lacking in the design education process. Interviews with current design teachers could be conducted in a number of schools. These interviews could provide the teachers perspective on how and why they teach what they do. For example it may provide a view as to why specific design skills such as CAD and Photoshop are not taught in more depth and would allow them to justify what they do teach.

The second limitation is that of the literature reviewed. The majority of the literature ranges from 10-20 years old and as such could be considered outdated. In order to gauge a more up to date understanding of what it is design employers look for in design graduates could be made with the employers themselves. This could be done in the form of interviews to determine what it is they do actually look for and provide their view on the benefits of a better link



between design education and industry. It may also provide an insight into how they feel these links have progressed since the literature was written and whether there is currently better links and more placement opportunities than there used to be. This further study would allow better comparisons to be made and ultimately provide a better understanding of how to better prepare design students for work in industry in a more current way.

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