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Women's experience of industrial design education: What worked, what didn't and where to in the future

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This paper addresses an acknowledged but seldom discussed concern: the participation and representation (or not) of women in design courses and the wider industry. Over the past decade, the proportion of women engaging in design tertiary education has increased significantly, rising in an environment that has historically been inundated with male students. For example, university enrolment statistics show that women now typically compromise approximately a third to half of the design student population. Yet despite these positive gains, women are not represented more widely in the profession. In Australia, anecdotal evidence suggests that women remain underrepresented in both senior leadership roles and in local, state or distinguished national design awards (Anthony 2001; Fowler & Wilson 2004).

This gender distinction in terms of career progression and visibility is evident in the architecture professional accreditation process: recent statistics show women comprised 43% of architecture students in Australia, yet registered architects in each state varied from 12-18%, with only one per cent of directors at architectural firms (Whitman 2005). Similar statistics have been documented overseas, including the United Kingdom where women comprise 38% of students yet comprise only 13% of practising architects and 22% of teaching staff (de Graft-Johnson, Manley & Greed 2003). Whilst professional registration is not the only indicator of career success, and is not a requirement for other design disciplines, it highlights a gendered difference between educational training and career opportunities for female designers. The unanswered question that remains is where are these women? Are they working in other industries? Is our education system failing female designers? Is it the workplace? Or is the underlying culture of design, building and manufacturing not alluring or inviting to women? This paper begins to address these questions, focussing on exploring the educational experience and perspectives of female designers, utilising the discipline of industrial design as a case study.

Exploring the experience of studying industrial design at university

Industrial design is a relatively new discipline that focuses on the design of products, best defined as a '*creative activity whose aim is to establish the multi-faceted qualities of objects, processes, services and their systems in whole life cycles*' (International Council of Societies of Industrial Design, (ICSID 2012). For industrial design educators, designing the curriculum is a challenging task as they seek to balance teaching traditional foundational design skills as well as the new/emerging skills required for a twenty-first century workplace. This rapidly changing work environment emphasises the importance of multidisciplinary 'design thinking', of considering sustainability and climate change at all stages of the design processes, of anticipating the impact of government policies, regulations and changing consumer expectations, and of actively engaging with existing and emergent technologies (Ball 2002; Bridgstock 2013; Buchanan 1998; Savage, Davis & Miller 2009). The education of a creative, flexible and effective designer is an important goal for being 'work ready' in this changing environment, yet research shows that students, educators and the design profession may differ in what technical and social skills they prioritise.

In a recent Australian Learning and Teaching Council (ALTC) funded project exploring Professional Education in Built Environment and Design, Savage, Davis and Miller (Savage, Davis & Miller 2009) explored what key design stakeholders (professionals, academics and students) thought about current design education and identified any gaps between academic and practice-based knowledge/experience and understanding. The project included a range of built environment and design disciplines – including industrial design, architecture, civil engineering and urban planning – who variously participated in workshop (n=35), focus groups (n=22) and an online survey (n=148). The focus group data showed that the three stakeholders - professionals, academics and students (final year and recent graduates) held different views about the key challenges facing the industry. Students emphasised the challenges of getting their first job, as well as the importance of interpersonal social and communication skills. Academics – the educators - focused on the negative impact of the global economic crisis and how their role was to prepare graduates for life beyond university, by building transferable skills such as critical thinking and lifelong learning. On the other hand, professionals – the employers – focussed on the abilities (or not) of new graduates and the need for them to be critical thinkers, aware of sustainability imperatives and proficient in specific technological programs. In reflecting on the critical transition-to-work from university

phase, both professionals and students felt educators were not doing enough to prepare students.

As the ways of defining business and industries change, understanding how and where the designer fits – and what skills are most valuable - is a critically important task for educators. In Australia, most industrial design courses aim to develop design 'all-rounders'; this means that their understanding and skills are developed across all roles including form giving, materials and production, commercial and user appropriate designs. The key-learning environment, unique to design disciplines, is the design studio that provides a safe place to explore the principles, practices and possibilities of designing. The reality is that, to adequately prepare students for the profession, they need experience resolving different types of design problems that are frequently based on real-world problems and poorly defined (Talbot 2007). Yet, to date, relatively little research has explored the design studio learning experience for industrial designers. Interestingly, three decades ago, Frederickson (1993) utilised video recordings of 112 juries (commonly used for assessment and feedback in architecture) and a survey to evaluate any gender-differentiated experiences in three design schools in the USA. He found females students were interrupted significantly more often during their presentations than their male colleagues and thus felt less confident to defend their designs to criticism; when on the jury, female members spoke less and provided less feedback and discussion when they were in the minority on the panel.

While it is unlikely that such strongly gendered findings would be present in contemporary design studios, the reality is that no research has explored this question. Despite a large body of literature documenting how psychological, sociocultural, contextual and biological factors intertwine to reduce female participation in the traditionally male-dominated STEM (science, technology, engineering and mathematics) (Ceci, Williams & Barnett 2009; Hill, Corbett & St.Rose 2010; Wang, Eccles & Kenny 2013) fields, only a handful of studies have investigated the experience of women in design. Over a decade ago, Clegg, Mayfield and Trayhurn (1999) investigated reasons for low level of female engagement in information technology and design courses at one UK university. Despite multiple equal opportunity initiatives, women remained underrepresented; Clegg et al. argued that potentially the technical competencies required in design disciplines led women to be over-represented in "soft design" areas (e.g., fashion and jewellery) and under-

represented in "hard design" areas that required the use of a workshop with tools and machines (e.g., furniture and product design).

Aside from a few internal university reports (e.g., see Creating a Career in Design, (University of Technology Sydney 2009), academic peer-reviewed publications documenting students' experience of studying design at university remain non-existent. If we are to grow the industry, we must better understand the experience of design education (and practice), and identify the key facilitators and barriers to women's participation. Given this knowledge gap, this paper – drawing on in-depth qualitative interviews with nineteen female industrial designers who completed their degree at one Australian university - has two key aims. The first aim is to identify what these students perceived as the highlights and lowlights of their educational experience, specifically focussing on their experience in the design studio, with assessments and fellow-students and identifying their recommendations for change. An important focus is to identify any gendered aspects of their educational experience. The second aim is to investigate how well (or not) these students felt their design education prepared them for the workplace and identify any evidence-based recommendations to help design educators with the process of future curriculum change.

Method

Design and Sample

As literature exploring the experiences of women in industrial design is virtually non-existent, an exploratory qualitative research approach was adopted. We used a phenomenological approach, so as to better understand the unique 'lived experiences' of women in industrial design (Liamputtong & Ezzy 2009, p. 5). Ethical approval was received from the university, with best practice ethical protocols followed. Socio-demographic characteristics of the nineteen participants are depicted in Table 1. Almost all (n=18) had graduated in the last ten years (when the course was approximately 41% female) and most (74%) were currently practicing industrial designers. At the time of interview, in 2011, they ranged in age from 21 to 37 years.

Code	Year of graduation	Current type of employment	Position title used
6	1995	self employed	Designer
10	2002	self employed	Designer
19	2002	self employed	Designer
13	2002	self employed - stay at home Mum currently	stay at home Mum
1	2003	self employed	Industrial Designer
4	2003	on going contract	Industrial designer + graphic designer
16	2004	contract + own projects	Designer
18	2004	full time	Footwear Designer
5	2005	full time	Industrial Design + Account services
12	2005	full time	Account Manager
17	2005	full time	Ergonomist
2	2006	self employed	Design director
9	2006	full time contract	Exhibition Designer
8	2007	full time	Industrial Designer
14	2007	full time	Project Manager
3	2008	full time	Events officer
7	2009	part time	Designer
11	2010	internship	Junior Designer
15	2010	full time - on maternity leave	Industrial Designer

Table 1: Participants socio-demographic profile

Procedure

A non-probability purposive snowball sampling approach was utilised to identify and recruit participants. Utilising graduate publications, personal contacts and word of mouth, potential participants were emailed an invitation to participate in an in-depth semi-structured face-to-face interview about their decision to study industrial design, experience at university and in the workplace. Interview questions (pilot tested with three female graduates to ensure appropriateness) were based around a three-hurdle model developed by Bruce and Lewis (1990) to explain the factors influencing career advancement for women: getting the qualification (hurdle 1), getting the first job (hurdle 2) and becoming a success (hurdle 3). This paper focuses specifically on participants' recollections of their undergraduate educational experiences in industrial design (the first hurdle - getting the qualification).

All interviews were digitally recorded and transcribed verbatim into text, with numbers replacing participant's names and specific identifying information changed to maintain anonymity. A thematic approach was utilised to analyse the data, with key themes and patterns identified in the data through an iterative process of reading and

re-reading the transcripts to identify common and contrasting themes (Liamputtong & Ezzy 2005). This paper focuses specifically on one dimension of the data, their evaluation of the strengths and weakness of their industrial design educational experience (for other analyses of this dataset, see (Lockhart & Miller 2014a, 2015).

Results

The analysis revealed that being a designer, and studying design at university, could be a gendered experience. Participants openly discussed the highlights and lowlights of their educational experience, emphasising the importance of developing professional capabilities beyond the basic design skillset (for example, entrepreneurship and skills in small business management). Although they felt gender was not a major factor in their experience, they recalled how simple things could negatively impact on their educational engagement and participation. For example, describing how assessment items often-focussed on masculine topics (e.g., redesign a car related product or tool) and the workshop environment was intimidating at first. As one explained, "*I remember thinking throughout the course this is such a masculine project, I wish I could do something a bit more feminine*" (#3).

Course evaluation – strengths and weakness of the industrial design curriculum
As the quotes in Table 2 illustrate, they typically praised the breadth of the course (covering the wide range of skills needed to be a practising industrial designer), the focus on planning and group work (which encouraged creativity through collaboration), and the importance of the ability to select and focus on a specific major project in their final year.

> I think it delivered what it could. It gave you the skills to do research, to approach people, to find out about materials. It at least taught you which questions you need to ask, at least at the base level. I think design is such a complex industry, that there is so much on the job learning, a design course couldn't possibly teach you everything you needed to know. And it's quite industry specific too, depending on where you end up (#15)

The complexity of the discipline requires students to understand issues varying from mechanics; material science, manufacturing and marketing are often treated more discreetly throughout the course to allow the students a greater depth of understanding. The importance of the major project in the final year is highlighted as the opportunity to bring together all these elements and to demonstrate their

knowledge developed over the course. This can be haphazard and is dependant on the student's own choice of topic of research and their ability to develop a design brief that provides the opportunity for the demonstration of their knowledge. Criticisms of the course centred on being employable and 'work-ready", with several identifying a need for more training in marketing, management, budgeting and running a small business as that is what many designers have to do given the relatively small design job market in Australia.

Strengths	*Weaknesses*
Probably how broad it was, in that I felt like I got a really broad set of skills, both computer skills and 3D skills and model making, sketching and all that sort of stuff. I really like all the hands-on aspect. I really enjoyed model making. (#11)	Negatives? I probably could have helped doing a bit more work experience, I think. I found when I got my first job I was chucked in the deep end and it's - I mean, you always learn on the job but maybe just a bit more. (#12)
I liked the project work. I thought it was - yeah, I thought it was really good, working on assignments rather than exams. Like, the group work was really good and that was probably one of the, I guess, highlights (#12)	I feel like I came out of uni not ready or not prepared for a job. I think that was probably the most negative thing; that I came out on top of the world and feeling like I was ready to get into things, but I wasn't - I didn't have the skills to get a graduate job. (#13)
I really like the hands-on nature of design and I think maybe that was something I was missing in my former career. (#15)	Negative? I think in hindsight I would have liked to learn more about running your own business There's only a few consultancies around and obviously because of the demand in the market only those few survive, however many graduates start up their own business. Rather than working for someone, if you have more tools to work for yourself and know how to do that kind of stuff (#4).
I think it was generally the learning of the mindset. I remember when we did the orientation week, they said, "By the time you finish this course, every door handle you door, every light switch you flick, every job you pick up, you will think `I know how that was made, how much it cost, where it was made, who made it, blah, blah, blah,'" and I thought, "surely not," but it's true. (#06)	
	I think now there's more opportunities to do work placement as well because we didn't really have that. So if there's more opportunities to do that, that would be good. Sort of get your foot in the door as well. I think that would be better (#2)
I think I learnt planning because the first couple years of the course I found that if you have to print something or a model made or anything can go wrong in that process and a million things can and will go wrong, the printer you will have the wrong file type or your model won't dry in time and so I learnt kind of to really pre-plan everything and put in false deadlines before the actual deadlines, so that's probably a pretty important lesson (#17)	I find that time constraints are very airy-fairy and budgeting to them is something they've never considered. When we say this is a project, you have creative control but this must be done in this amount of time to this budget, they're like well, what's that, what does that mean? So I don't think they're prepared for a real job (#3)

I think the most important thing was learning to work with other peers in my group and listen to all their opinions and that sort of stuff and how they approached their problems and how we could sit down together and actually discuss different points of view on how to solve a problem (#18)	Oh, good question (laughs). I think - oh, I mean, I would like to say I wish there was more work experience, but then you can't learn what you learn in a workplace. That's the thing. I mean, I think it taught you the basic skills for you to build upon as you started work, yeah (#12).

Table 2: The industrial design course – perceived strengths and weakness

Discussion

This paper investigates the educational experience and perspectives of female designers, who comprise nearly a half of the industrial design student population at university, yet remain underrepresented in leadership roles in practice. Fortunately, most did not think gender was a major factor in their experience of the course or how they were treated, although there was a sense that gendered life experiences and preferences had an impact (for example, making males more confident with technical skills and in the workshop). This research illustrates how that the course does provide students with a good 'all-round' foundation in the development of design thinking and methodologies illustrated by the various creative career paths taken. The emphasis on design process and conscious problem solving methodologies in the studio context helped foster this process although perhaps not identified explicitly by the students. An interesting finding was that these female designers did not fully appreciate how their choice of final project was shaping the direction of their future careers. Green and Bonollo (2003) have proposed the taking of a more systematic approach to the identification and development of this project would ensure a more consistent outcome and deeper understanding.

The physical making of objects in a workshop environment, although initially intimidating provided many with the understanding of making objects and the confidence to eventually transfer those skills to the production of their own designs under their own name and take them to the market. Consistently with several other studies, however, these women designers felt that they lacked confidence in the skills of business, specifically how to set up and manage a small business (Ball 2002; Lewis & Bonollo 2002; Yang, You & Chen 2005). Upon graduation many also reflected on how they felt underprepared for the demands of the 'real world' and had trouble identifying how to transfer their skills to this new context. This highlights how the student needs help to develop the understanding, attributes and qualities needed to initiate their career. Confidence in their work-ready skills can be assisted through

the inclusion of industry linked live projects, work experience from early stages of the course and exhibitions of their work included in the curriculum.(Ball 2002; Bridgstock 2013; Haukka 2011)

Curriculum developers need to be aware of the changes to design industry work environments and expectations by working with industry to be able to better prepare graduates although the pace of change may make it difficult to be addressed due to course cycles and scale of change. Through closer links with industry employers the often-negative perceptions of recent graduates skills can further be changed. (Haukka 2011; Wormald 2011; Yang, You & Chen 2005) The incorporation of new thinking and methods is perhaps larger than one discipline and at one university this is being offered as an adjunct degree and treated in a multi-disciplinary manner such as a Bachelor of Creative Intelligence and Innovation. Clearer pathways in electives may further diversify the education and how it could be utilised to develop a business focus understanding the high number of graduates within design and the creative industries that do enter self employment at some time in their careers.(Ball 2002)

In conclusion, this study highlights the positive experiences of skill development in the design studio may require explicit discussion with students of their competencies and how they can develop a sustainable design career.

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