Industry-Based Learning: Developing Professionalism in Industrial Design and Product Design Engineering Graduates

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ABSTRACT

This paper explores the benefits of an Industry-Based Learning (IBL) program in developing professional skills in graduates from Product Design Engineering (PDE) and Industrial Design (ID) degree programs at Swinburne University of Technology. Students in both courses are encouraged to participate in the IBL program, where six to twelve months are spent working in a relevant industry placement. This occurs one year prior to completion of the undergraduate degree.

The IBL program provides students with exposure to a range of different professional practices, including project management, interpersonal skills, schedules and budgets. These are activities and aptitudes developed as a specific response to a professional context that cannot be replicated in the university environment.

Value of the industry experience is evident in the attitudes and work ethic demonstrated by students when they return in their final year of study. This will be substantiated by contrasting outcomes of students who have and have not completed an IBL program in addition to graduate employment. Higher levels of interpersonal skills in relation to peers, staff and external stakeholders is also consistently observed by teaching staff in students who have completed IBL.

The paper both validates and evaluates the IBL programs for Industrial Design and Product Design Engineering at Swinburne, looking at how the program can improve in ID to increase the number of students who participate. This is particularly important as professional skills gap in industry readiness of ID graduates is still present, as supported by literature.

I. INDUSTRIAL DESIGN INDUSTRY: PROFESSION AND HIGHER EDUCATION

Historically education has aligned content with the requirements of current practice in the industrial design profession. However recent decades have seen a trend in higher education struggling with course content that supports the development of professional skills required by industry (Giard: 1990).

Yang, You and Chen (2005) discuss that Industrial Design graduates are not of a quality expected by employers (Kaufman: 1998) and there is a deficiency in the skills taught to Industrial Design students prepare them for practice (Ball 2002; Yeh 2003). The need for university to better meet the needs of the industrial design profession is further defined by Lewis and Bonollo (2002). Their study of 66 professional organisations identified five areas of professional behaviour valued by industry that could be improved in graduating student cohorts:

- Negotiation with clients
- Problem solving
- Acceptance of responsibility
- Interpersonal skills
- Project management

This challenge is still current in an Australian context.

A recent report on tertiary design education in Victoria confirms that the biggest complaint of employers was that industrial design students lack industry experience (Design Victoria: 2009). This is something that educators are aware of, with industrial Design courses across Australia all sharing the challenge of delivering the knowledge base and skill set required for graduates to be ready in short durations of three or four year programs (Schumacher & Trathen: 2009).

The 3 + 2 Bologna model is appearing as a way of introducing a more comprehensive delivery of discipline specific skills through a masters program (Schumacher & Trathen: 2009). Regardless of whether this structure will also address the deficiency in the professional practice skills identified by Lewis and Bonollo, there is still a current shortfall in industry readiness of industrial design graduates that needs to be addressed in the short term.

II. WORKPLACE LEARNING AND COOPERATIVE INDUSTRY PROGRAMS

The integration workplace learning and co-op programs is widespread across a range of different disciplines as a way of building industry specific and professional skills, however the value of integrating a work placement program in Design Faculties in particular is not examined much in current literature (Henschke & Poppins: 2009).

Design Victoria (2009) suggests that work experience placements for all industrial design students of three, two or even one month periods as an appropriate method to help rectify the current skills gap in professional industry skills. Workplace learning does occur in Design education, but on a small scale with 23% of tertiary institutions making a vacation experience or semester spent working in industry mandatory and no University had mandatory work experience or co-op year spent in industry (Design Victoria: 2009).

III. ID AND PDE BACHELOR DEGREES AT SWINBURNE

Swinburne University of Technology has offered workplace learning, which they refer to as IBL programs across all higher education departments since 1963, establishing themselves as one of the early pioneers of this approach to work place learning.

Both the ID and PDE degree courses offered by Swinburne integrate IBL programs, but in slightly different ways. This section will provide an overview of the structure of each course and how IBL is integrated.

A. ID Degree at Swinburne

Industrial Design at Swinburne is a three year Bachelor of Design, four years with Honours. The workplace learning program is called Industry Placement (IP) and occurs only as part of the four year Honours degree. Only students of a credit average and above at the end of their second year are eligible for IP. Those who are interested are selected for the program based on an interview process where they are required to present a folio of their undergraduate work. IP is conducted over a six or twelve month period and recognized with credit points that contribute towards the Honours degree. Students who only partake in six months of IP engage in other ID units that are offered to final year undergraduate students to sustain credit points towards their Honours degree.

The IP program positions students as an employee in a related industry workplace, where they are paid approximately 70% of the equivalent graduate salary and are expected to work a four day week. This is because students are still required to conduct one unit of complementary study when engaged in IP. While on placement, each student has an academic supervisor who at minimum will visit the student at work once for each semester completed and maintain contact via phone. Students are required to keep a reflective journal with weekly entries that evaluate their learning experience in addition to a final written report.

B. PDE Degree at Swinburne

Product Design Engineering at Swinburne is a four year Bachelor of Engineering, which is an integrated hybrid of ID and Mechanical Engineering courses (de Vere, et. al: 2009). The workplace learning program is called IBL and is an optional six or twelve month period of additional learning that occurs after three years of the undergraduate course is completed. Unlike ID, there is not an interview process for selection and all students are encouraged to participate in the program. The majority of IBL placements last for a twelve month duration, even though six months is an option.

PDE students positioned in IBL placements are also given a salary of approximately 70% of a graduate wage (higher than ID graduates as the degree is from engineering), however they are not required to complete any other units of study when partaking in IBL. Academic supervision, reflective journals and final reports are practiced in the same manner as the ID program, however interim reports are also required for submission.

IV. PROFESSIONAL SKILLS DEVELOPED IN ID AND PDE STUDENTS

The development of professional skills in ID and PDE students will be discussed through observations made by teaching staff, industry supervisors and evaluation of academic performance. PDE provides a strong contrast in the abilities of students who did and did not participate in IBL programs, as they undertake the same final year units. ID is difficult to accurately compare results of IP and non-IP students as they do not share any units due to IP being central to a specific Honours degree pathway.

A. Evaluation of PDE Students

Having taught into the final year program of PDE over the past four years it has become apparent that students who do IBL generally return to be students with stronger professional skill sets who perform better academically. This is in relation to peers who have not experienced IBL and
their own prior aptitudes as product design engineering students.

A number of specific observations made in returning IBL students will be discussed before validating these claims by an analysis of final year student grades that show a distinct difference between IBL and non-IBL students.

The first observation of students returning from IBL placement is increased levels of confidence in the design studio when working on university-based projects. After experiencing ‘real-world’ projects and having to deal with industry on a professional level, students were a lot more confident than students who had not completed IBL. Competence in communication was also evident. This level of confidence is often elevated as a majority of non-IBL students are in awe of the advanced skills and self-belief exerted by returning IBL students.

Another observation is the level of computer skills a final year student who has completed IBL has. This is not the case for all returning IBL students, however the younger generation students who are employed in predominantly design firms usually have better computer skills than their managers/directors. The younger generations are trained within the university context on computer programs that simply didn’t exist when senior designers/engineers completed their degrees, or the programs are significant advancements on what existed. This creates great opportunities for young designers/engineers and there have been many cases where the student worked solely on computer related design projects during their IBL employment. This advances the student’s practice-based skills, which they successfully bring back to the university environment.

From the experience of supervising approximately 15 IBL students over the last four years, a common observation is increases in inter-personal skills displayed in email and phone correspondence as well as in person at industry placement visits. In conversation at these visits and in the written reports, students are asked to evaluate what skills they feel they have built. Re-occurring responses are that they more thoroughly understand the reality of budgets. The cost implications of time spent in different stages of product development or manufacturing is better comprehended and extends to highlight the importance of project management to ensure budgets are met within deadlines. Students have also been surprisingly forthcoming in acknowledging any errors they had made on the job, exemplifying improved ability to take responsibility for their actions. About half have also commented on how negotiations are conducted with prospective and existing clients as a new area of knowledge.

To further substantiate the claims of observations in increased professional skills in IBL students, the grades of final year PDE students over three different semesters were analysed. Fig. 1 shows the grades of students cohorts graphed from lowest to highest. The red lines are the grades from the students that completed IBL (six or twelve months), each line representing a semester. The blue lines are grades from students who did not participate in the IBL program from the same three semesters. The dotted lines are the average results of IBL and non-IBL students over the three semesters. This shows a significant difference in academic performance with IBL students achieving average results 11.4 grades higher than non-IBL students. It is also interesting to note that if you look at the full spectrum of results, the lowest grade achieved by an IBL student is the average grade of a non-IBL student. From observation, higher results in IBL students were anticipated but the data surpassed expectation.

![Fig. 1. Design studio results from three semesters of final year PDE students that compares the difference between students who did and did not complete IBL.](image)

B. Evaluation of ID Students

Through supervision of approximately 10 ID students who participated in the IP program over the past few years, very similar observations in professional skills development have been made to PDE students. Increased levels of confidence and maturity are observed in attitudes towards their work but also towards staff and peers. This supports the development of inter-personal skills.

Understanding of costs involved in the design and development of product is also an area that students consistently attribute to participating in the IP program. Time spent on various activities, the implications of deadlines and interactions with clients are also frequently mentioned as knowledge built from workplace experience.

V. EVALUATION OF ID AND PDE PROGRAMS

The ability of the IBL programs integrated into the ID and PDE bachelor degrees at Swinburne are successful in building professional skills in the areas found generally lacking in ID graduates. Despite this, there is still a professional skills deficit in ID graduates and lack of industry readiness. This may be attributed to the small portion of ID students who engage with the IP program. This seems to be through lack of industry related positions, as each year there are successful applicants for the IP-based Honours degree who are not placed and this increasing. Last academic year, only three students were placed from ten successful applicants.

Decreases in the number of ID places may be attributed to PDE students now sharing places in the product design industry, and external factors such as the recent Global Financial Crisis. Growing numbers of student cohorts passing through the ID and PDE programs will also provide challenges in finding enough relevant industry placements.
Currently the number of students who participate in the program varies significantly, with ID being far lower than PDE.

As suggested by the ID industry in the Design Victoria report (2009), shorter work-based experiences of three months is an option to increase the number of students able to participate in an IBL program, without having to create more placements. This then presents a challenge for employees regarding the training of new candidates. It requires a greater commitment from industry as such a program would involve a constant cycle of training fresh students from scratch with little immediate benefit, due to the short period of time spent with the employer.

Another means of accommodating larger numbers of students in IBL and IP programs may be to offer workplacements in positions outside of the related product design industry. If the professional skills lacking in ID graduates can be groomed through placement in a professional environment and is not necessarily linked to the discipline context, then this widens the scope for finding placements. Students would miss out on other benefits from the IBL program of developing discipline specific skills (e.g. specific computer software programs as discussed in the previous section), informing future career choices and creating relevant industry networks. Confidence levels in approach to design work may also be impacted.

Finally another alternative may be the development of new curricula for units of study that better focus on the development of the professional skills lacking in creating industry ready graduates. The additional time IBL programs offer students to mature and build professional skills can be argued as contributing to the success of programs. Extra time through additional units of study in the Bachelor Degrees (if an IBL or IP placement is not incorporated) may also help build these skills. Integrating highly proactive industry partnerships to deliver real-world projects would be integral and may provide a more manageable way of industry support than the intensive training regime that would be involved with three month IBL or IP placements.

VI. CONCLUSION

While IP and IBL in ID and PDE make clear contributions to building professional skills, there remains scope to improve the programs, particularly ID, to increase the number of students engaging and benefiting from such workplace learning. This would therefore help decrease the deficit in professional skills and the associated industry readiness of ID graduates.

Alternative approaches to the IBL and IP programs have been discussed, including shortening length of placements and expanding the type of placements to include work in areas outside of the product design industry. Another alternative option would be to create new units of study with different curricula that is focused on the professional skills lacking and integrating industry partnerships.

To determine the best approaches, further research would be required to examine the advantages and disadvantages of each through closer scrutiny of the student experience and increased understanding of industry requirements and capabilities to support alternative programs.

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ID graduating students 2006-2009

REFERENCES