Improving Student-Industry Engagement through Project/Design Oriented Curriculum

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ABSTRACT

Industry expects a creative and innovative academic practice that provides students with valuable practical knowledge focused on graduate ready skills for future careers. The learning environment in engineering is inadequate for students to become a skillful graduate. The practical role of engineering is gained through working on real world problems in an industry collaborative environment through projects. Industry-academia collaboration seems to be actively increasing in the development of engineering education in various parts of the globe. The close relationship between industry and academia is a vital component of the engineering pedagogy to improve student engagement in industry through projects. By engaging students with industry, students will acquire global perspective about the core attributes expected in future engineering jobs. In today's large-scale industrial market, companies tend to prefer graduates with design skills attained through the project approach. Thus, universities should open their doors and accept the challenges of interacting with students with industrial experiences and expectations. This paper is focused on improving student-industry engagement through project/design oriented curriculum. Through quantitative and qualitative research, the paper shows the industry perspectives and students views on university and industry collaboration. The research results show that students and industry can possibly maintain their engagement by providing regular feedback, reviewing goals and objectives, improving communication, keeping focused, and sharing a similar vision.

Keywords:Project/design oriented curriculum, Design based learning, Student engagement, industry involvement

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INTRODUCTION

Engineering education should be a combination or integration of solid knowledge on the basis of fundamental engineering sciences and a good knowledge in more aspect of engineering technology. Industry expects engineering graduates to be career ready professional with practical and management skills. In academia, Students should be able to develop the ability and willingness to take ownership of their learning that prepares them to be good engineers in society.The School of Engineering at Deakin University has always tried to improve its unit delivery method to enrich the student experience and to produce capable job ready engineering graduates. To this end, it has explored new learning and teaching methods to aid in this process. One such method is Design Based Learning (DBL).

Unlike Problem Based Learning (PBL) and Project Based Learning (PjBL), DBL is a self-directed learning approach that opens up learning activity so that design skills must be learnt and applied by students[1]. Students must locate the resources required, and analyse any needs in order to create a design [2]. This method gives students the freedom to apply their design skills as they think best. DBL not only looks at the end product but also at the underlying process in creating that product [3].This paper is focused on improving student-industry engagement through project-oriented curriculum. Through quantitative and qualitative research, the paper shows the industry perspectives and students views on university and industry collaboration.

1 PROJECT/DESIGN ORIENTED CURRICULUM

Students choose to study engineering for many reasons associated with the profession. One of these reasons is the chance to design, which means the purpose of engineering education in most cases is to graduate engineers who can design [4]. John Webster recommends that engineering courses must be outcome-oriented and equip graduates for lifelong learning. In addition, he also suggests that in first year engineering, most of the time should be spent on the mathematical and scientific basics that underpin all engineering disciplines. If the curriculum is based around projects, the actual projects should be defined and structured by teachers in the first year for students to obtain fundamental knowledge. In the second and third year, students work on industry and/or community projects, and industry practice takes place in the final year[5-7].

At Deakin University, the engineering program involves Design-Based Learning, or DBL projects at different levels of course structure. It engages students in real-world assignments. It starts right from the first year of engineering[8, 9]. In the DBL projects students will work in a group of approximately four to six students on absorbing innovative issues. In this way, students will gain an idea of the field of work and students will learn to work in a team and try to solve problems by using technical and psychological knowledge. This is important, because in the future students will often cooperate with people from other disciplines. Students will often be the bridge builder between (technical) specialists, the consumer and society. The Design-Based Learning program is a cutting-edge, inquiry-based curriculum that engages students in simulations and understanding of essential questions. Engineering science and technology are at the core of its challenging multi-disciplinary curriculum

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2 METHODOLOGY

Engaging students is an important aspect of the learning and teaching process because it enhances students to be self-directed active learners. To measure student engagement and the experiences of staff in the learning and teaching process, engineering at Deakin has used project/design based learning as one of its engineering learning principles. This research study examines students perceptions of design-based learning in their curriculum through a paper based survey given to a cohort of final year undergraduate engineering students. By conducting online survey, the research also illustrated the perceptions of industry representatives about DBL in the engineering curriculum. From the analysed results, this research shows that students and industry representatives have adequate experience of engaging students and industry through a design based learning approach in an engineering curriculum.

3 RESULTS

3.1Student perspectives

The aim of all educational institutions is to educate students as graduate engineers, and equip them with the ability to work in industry with graduate ready skills such as creativity, innovation, teamwork, problem solving, observation, analytical thinking, communication, and prototyping etc. Every learning and teaching approach has its own special way of confronting engineering problems. In design based learning, students solve engineering problems by using design as a vehicle.

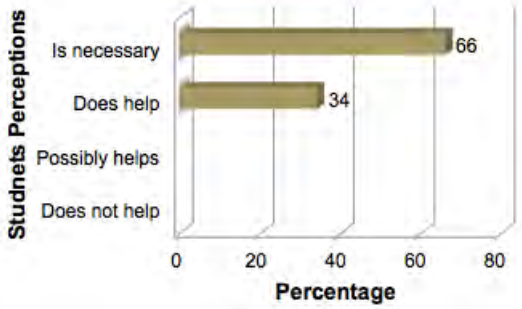

Fig 1. Industry partnership to students future career

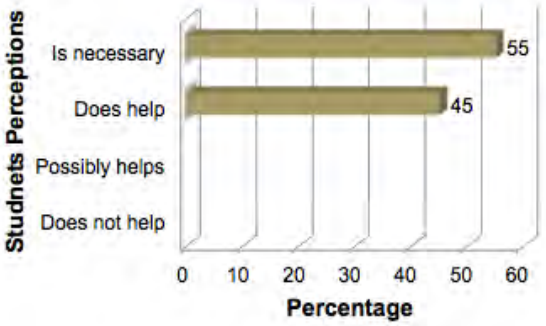

Fig 2. Industry partnership to students final year project

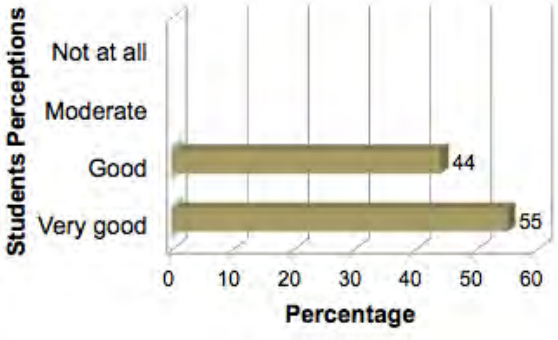

Fig 3. Industry partnership improves the graduates' ability to gain employment

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Figure 1 shows that the cohort of students of 66% and 34% says industry collaboration is necessary and does help with their future career. Overall 100% of students revealed that industry collaboration is necessary and does help their final year project (figure 2). Figure 3 shows students views on industry collaboration. Approximately 100% of students mention that industry collaboration helps to improve the graduates' ability to gain employment.

3.2 Industry views

The Project/Design oriented curriculum is a learning and teaching approach (LTA) that is based on engineering design activities while driven by a project. It has been proposed to use project/design oriented curriculum in Deakin Engineering to encourage independent learning and a deeper approach to learning. The survey was given to 12 industry representatives in regional area of Victoria, Australia. When industry representatives asked about project/design oriented curriculum, most of them revealed that project/design oriented curriculum approach is beneficial in defining industry challenges for graduates to obtain real world experience.

Industry views	%
Good, industry defined challenges encountered and helps graduate with career ready skills	28
Yes, would give graduates real experiences prior to commencing work	21
Yes	14

Table 1. Project/Design oriented approach is beneficial for the industry

When industry representatives are asked about what are the possibilities to achieve an innovative and sustainable partnership with industry. Table 14 shows industry (33%) expects academics to engage through research projects for real world applications, open discussion groups and 14% reveal that simple, frequent interactions, formal relationship for innovative outcomes and sharing facilities on both sides.

Industry perspectives	%
Real world applications, open discussion groups between industry and university	33
A great possibility which has been done in many universities	7
Simple, frequent interactions, formal defined relationship with deliverables, sharing facilities and governance to monitor programs	14

Table 2. Possibilities to achieve an innovative, sustainable partnership

Industry perspectives	%
Do it	33
Continued two way dialogue	14
Formal structure and governance, project related relationships, mentoring programs, vacation employment	14

Table 3. Recommendations for ongoing academic and industry collaboration

Table 3 shows industry recommendations for continuing academia and industry collaboration. The industry expects academics to perform the collaboration activities

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as quickly as possible.The overall industry perspectives are encouraging for the academics. From these survey results, academics and industry are very clear in working together for enhanced collaboration.

4 PROJECT/DESIGN ORIENTED CURRICULUM

The project/design oriented curriculum approach is focused on innovation and creativity where students learn through design based activities but are driven or oriented by a project. The project/design oriented curriculumapproach is a design centred approach driven through projects to assist learning and teaching. project/design oriented curriculum allows students to demonstrate professional capabilities expected of graduating professional engineers [8, 10-12]. Industry expects graduate engineers to be educated with skills, knowledge and attitudes that have changed over time. The purpose of the project/design oriented curriculumis not to change the engineering curriculum but to reform engineering learning and teaching through design centred curriculum.

The project/design oriented curriculum approach acquired the perceptions of current students, staff, and industry to remodel pedagogy without any distractions. It is encouraging for students and staff members to understand the approach and to implement it in all design engineering classes. Development of project/design oriented curriculum framework includes framework guidelines for students, staff, industry and faculties. On the basis of previous recommendations by industry and academics, as well as from national and international research, it is very important and critical that we identify a framework that is unique to Engineering at Deakin based on a Project Oriented Design Based Learning (PODBL) model [10, 13].

5 INDUSTRY COLLABORATION

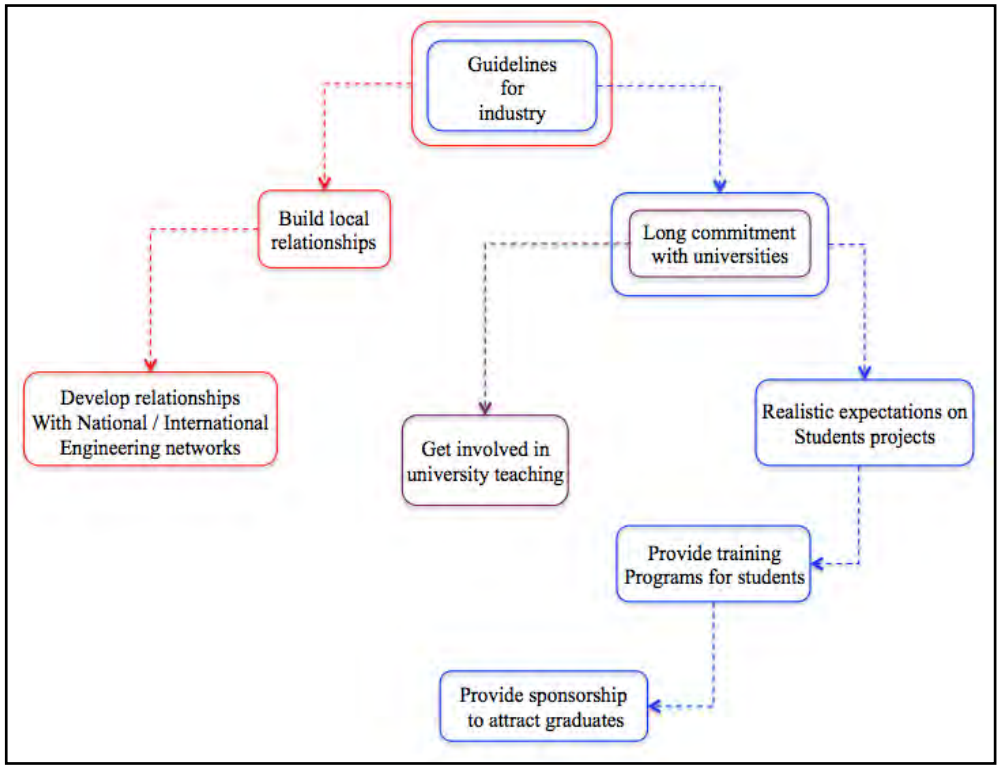

Fig. 4. Project/design framework guidelines for industry

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The real value of industry collaboration is to create benefits for society. Universities focus on educating students as professionals while industry concentrates on giving opportunities to students to experience real world problems in a competitive environment. The core interest is different for both industry and universities. Academics pursue the practice of teaching theory to practice through research projects in an engineering curriculum. Industry expects graduates with careerreadiness skills such as problem solving, analytical thinking, and designing to work on real world projects.

Industrial companies are working together with educational institutions to renew and redirect engineering education[14]. To increase the productivity and to meet the competitiveness in the global market, industry needs effective management practices, skills and capabilities of a skilled workforce. Figure 4 shows project/design framework guidelines for industry.

The role of industry in Project Oriented Design Based Learning is as follows:

a) Develop a global partnership for engineering and technology development.
b) Work towards a long commitment with universities.
c) Develop relationships with national/international engineering networks.
d) Obtain realistic expectations of student projects.
e) Provide training programs for students.
f) Provide sponsorship to attract high quality graduates.

6 CONCLUSION

This paper is focused on improving student-industry engagement through project/design oriented curriculum. Through quantitative and qualitative research, the paper shows the industry perspectives and students views on university and industry collaboration. The research results show that students and industry can possibly maintain their engagement by providing regular feedback, reviewing goals and objectives, improving communication, keeping focused, and sharing a similar vision.The project/design oriented curriculum approach is encouraging because it allows current students, staff, and industry perceptions to remodel pedagogy without distracting from the curriculum. It is inspiring for students and staff members to understand the approach and to implement it in all engineering design courses and programs. The PODBL framework guidelines for students, staff, industry and faculties are a pathway that leads to a sustainable design practicing education.

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