Assessing Engineering Students' Industry Experience at Macquarie University

Industry Experience (ENGG400) is offered by the Department of Engineering at Macquarie University, as part of the graduate requirement of the Bachelor of Engineering degree. The internship is non-credit bearing but it is recognized by the university as a PACE unit, namely Professional and Community Engagement course unit. The PACE unit is a university initiative to enhance experiential learning. The internship constitutes the final semester of the degree, when students have to complete at least 12 weeks of relevant work experience. Both academic and industry supervision are combined at the internship, where the students can obtain industry experience. This engineering internship is also a degree accreditation requirement from the Institute of Engineers Australia.

Distinctive Features:

- Being linked with professional accreditation of engineering;
- Supported by university-wide strategic recognition of experiential learning activities with real-world partners;
- Embedding training and learning outcomes of holistic competencies in the expected graduate capabilities defined by the university

Intended Learning Outcomes (LO):

I. Develop engineering techniques and skills related to professional engineering applications;
II. Build awareness of occupational health and safety issues in engineering workplaces;
III. Develop professional conduct and learn workplace behaviour as an early career engineer;
IV. Build strong communication skills through report writing and team work activity.

Coursework Teaching & Learning Activities:

- Workshops in internship enrolment period (4 x 1.5 hours):
  1) Introduction to ENGG400 and PACE;
  2) career skills, ethical practice, and intellectual property;
  3) reflective practice;
  4) de-brief and unit overview
- Internship Period (at least 12 weeks)
- Post-internship Reporting

Assessment Approaches

	Name	Learning Activities	Weight	Aligned LO	Type	Generic Skills
A1	Final Report	Students have to prepare a report after the internship experience.	50%	I.-IV.	Summative	Collaboration; Critical Thinking; Problem Solving
A2	Logbook	During the internship, students need to record details on their daily activities in a logbook.	30%	I.-IV.	Formative	Collaboration; Problem Solving; Self-management
A3	Certificate	The industrial supervisor is expected to complete an evaluation form to indicate whether he/she is satisfied with the student interns' performance in terms of the use of engineering techniques, skills and tools, their demonstration of professional conduct and their awareness of occupational health and safety issues. The evaluation form acts as a certification by the employer for the student's work experience	20%	I.-IV.	Summative	Collaboration; Communication; Problem Solving;

Assessment Type

Both summative (Logbook) and formative assessments (Final Report) are adopted as the basis of evaluating student performance in this course.

Assessment Focal Areas

Holistic competencies: Being a PACE unit, this internship course gives engineering students "the chance to contribute their academic learning, enthusiasm and fresh perspective to the professional workplace" (Macquarie University 2018). By completing a PACE unit, students are expected to "develop their capabilities and build on the skills that employers value" through engaging with the community and learning from participation (ibid). The PACE unit is 'academically rigorous', while it is designed to "enhance students' educational experience", to "develop valuable career skills and professional networks", as well as to "foster students' capabilities to actively contribute to the well-being of people and the planet" (Macquarie University 2017). One of the pre-internship workshops prepares students with career skills. The skill development process and outcomes during the internship are documented in the course assessments, using the final report (A1), student personal entries to the logbook (A2), and industrial supervisor evaluation certificate (A3). The report writing (A1) and the internship experience with teamwork activities build up communication skills and collaboration skills of the students as part of their holistic competencies.

Knowledge application: Students are expected to apply their academic training of engineering techniques and skills in the professional workplace. Satisfaction of the industrial supervisor with the student's application of engineering knowledge and professional conduct is assessed in the certificate evaluation form (A3).

Reflection: One of the pre-internship workshops is dedicated to reflective practices. These workshops are formally timetabled as a course requirement. The value of reflection is thus stressed upon and well-structured in the course design. The logbook recording (A2) and report writing (A1) activities also help students perform formative and summative reflection on their industrial internship experiences.

Assessment Standards/ Sample Rubrics

Although PACE units are normally credit bearing at Macquarie University, this course carries zero credit point. The final grade would be either pass or fail. There is no rubric available.

Teacher's Stories

The content of ENGG is flexible, which can be research project internship with an existing faculty member in Engineering at Macquarie University, placements in engineering companies, or overseas project supports. These various contents require different sorts of teaching arrangements.

Dr Sammy Diasinos, Senior Lecturer in mechanical engineering and an instructor of ENGG400, offers internship opportunity to his students. He said that:

- *"A great advantage with students being involved in this project is how they obtain a lot of experiences, which would distinguish them from other students who they will be competing against when getting for jobs. Through my own experience I found that projects like this are very valuable for helping students obtain a niche in the marketplace when they come to looking for a job".* (online video, Mar 2017)

Through this course, a group of engineering students traveled to Indonesia to work with an education program in the country's Taman Pintar Science Park in 2016. Dr David W. Inglis, Senior Lecturer of Engineering, led this part of ENGG400 delivery. He noted that:

- "*We took a group of our students to Taman Pintar in Indonesia, a science museum a bit like the Powerhouse museum here in Sydney. We went there to try and do robotics workshops for primary school children. In going to Indonesia and undertaking a project like this, they get both the ability to tackle real-world problems, the confidence in tackling those problems, and a realistic understanding of what's involved, are really important for our students as they look for jobs*" (online video, Mar 2017)
- "*Different countries have different needs, and it's what this mission is all about. The best engineers are ones who have technical ability and professional skills.*" (online video, Feb 2016)

Students' Side of Stories

- *"Seeing the robots was amazing to them* [the school children in Indonesia], *just programming and playing with it was fun and it's like a toy to them"* (Taman Pintar student A, Feb 2016)
- *"My PACE experience in Indonesia has shown me I can use my degree to help build resilient community."* (Taman Pintar student B, Feb 2016)

Featured Video

- How Can ENGG400 Help You Stand Out From The Crowd https://youtu.be/T76zfZBL0Gs
- ENGG400 robotics workshops for school children in Indonesia https://youtu.be/B86PqVy4Pgc
- Community partners of the PACE units in general https://youtu.be/ufVKRyN2vZ0

References

Macquarie University (2015) Student Work Experience Evaluation Form. Retrieved from http://engineering.mq.edu.au/files/file/Work%20Experience%20Student%20Evaluation%20Form(1).pdf (Accessed 5 Mar 2018)

Macquarie University (2018) ENGG400 – Industry Experience. Retrieved from http://unitguides.mq.edu.au/unit_offerings/84025/unit_guide (Accessed 7 Mar 2018)

Macquarie University (2017) 2017 Handbook: PACE units. Retrieved from http://handbook.mq.edu.au/2017/Units/PACE (Accessed 7 Mar 2018)