A relationship-based approach for improving a course co-taught with industry lecturers

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Abstract

The exchange between industry and engineering students is widely recognised as valuable, particularly for students later in their degree programs. Industry-led assessment provides opportunities for students to practice vocationally-relevant skills that can give them an edge in today's competitive job market. Despite these advantages, there can be challenges integrating industry lecturers into the learning and teaching infrastructure of a university. Industry lecturers may be time-poor, have less time to build relationships with students and may have unrealistic expectations of students resulting in high failure rates on industry-led assignments. After several predominantly structural changes to improve a course, it was recognised that there was a need to better support industry lecturers to engage with students and learning and teaching practices typically available to academic faculty staff. This paper proposes a relationship-based approach to course improvement with specific aims 1) to bring industry lecturers closer-in to university faculty and support their teaching and learning development as part of achieving better student outcomes; and 2) to reduce high failure rates on an industry-led assignment. Interventions included: introducing a pre-trimester planning and reflection meeting; inviting industry lecturers to attend internal learning and teaching workshops; aligning course elements towards industry-led assignment outcomes; increasing industry-student touchpoints; and, capacity-building marking practices. These interventions were successful in increasing industry engagement and accountability for student outcomes as evidenced by a highly significant ($p<0.01$, by Welch's ttest) increase in the mean mark for the industry-led assignment, and a 0.5 out of 5.0 points unit increase in student satisfaction reflected by end-of-term student evaluations. A relationship-based approach shows potential for improving courses co-taught with industry.

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Introduction

The exchange between industry and academia is widely recognised as valuable in applied disciplines of engineering (Hoernicke et al. 2017). It is common for industry to be involved in guest lecturing and setting project-based assessments (Jestrab et al. 2009) for design, elective and specialist topic areas in the later years of undergraduate programs or at masters-level. Industry involvement is particularly valued where key competencies are built through many years of experience working in the field, and in disciplines that are rapidly transforming or responding to change. Specialist elective courses involving industry lecturers are a good way to introduce hands-on practical experience and exposure to facilities and equipment reflective of current industry practice as is a key requirement of engineering programs within Australia (Engineers Australia 2019, Michael et al. 2019).

Partnering between industry and academia assists the transition between education and practice (Ghosh et al. 2013) which is valuable for the future employability of graduates. Students view industry involvement in university teaching favourably and place high-value on industry lecturers for their ability to bring real-world engineering examples into the classroom (Johan 2015). While academics have little to no formal training, they usually benefit from attending short courses on teaching methods and innovation (Niemeier et al. 2001). Industry lecturers don't necessarily have the same opportunities to engage in pedagogical discourse and develop their learning and teaching practice. They therefore may not have the same skills in curriculum development, student assessment (Jestrab et al. 2009) or opportunities to engage with concepts such as 'active learning' to make lectures more engaging (Van Dijk et al. 2001). Further, as we introduce new methods of teaching and enhanced learning in technology-rich environments (Lanz et al. 2019), these differences will become more stark.

In this paper, we present a case study for improvement of a course co-taught with industry. After several early iterations of course improvement with a predominant focus on structural and learning design changes, a relationship-based approach was applied that focused on the relationships between industry professionals and the university community (students, academic staff, learning and teaching infrastructure and administrative processes). Relationship-based approaches have been described in education for improving outcomes for marginalised student groups, with teachers finding a focus on relational/interaction helpful for improving practices and outcomes (Hynds et al. 2011). This paper applies a focus on relationships to improving a course co-taught with professionals from industry. Specifically, this paper contributes to the field of engineering education by exploring whether a relationship-based approach has value for improving outcomes in industry co-taught courses.

Course background

The course that is the subject of this paper is a final year undergraduate and masters-level elective with typically 40-60 students, co-taught 50:50 by lecturers who work full-time in the engineering consulting industry and by academic staff members. The course includes a substantial industry-led assignment worth 40% of the total course marks that requires students to consider a real-world problem reflective of current industry practice to showcase

their research, writing, problem-solving, and critical thinking skills. The course was offered in 2013, 2016, 2017 and 2019, with the first offering delivered by the author in 2016. Each offering included the same two industry lecturers and an industry-led assignment contributing 40% to the total course grade.

Early challenges with course structure and industry-led assessment (2013)

The 2013 course consisted of 6-hour lectures run every fortnight to suit industry lecturer preferences for longer more infrequent sessions. Unsurprisingly, the course performed poorly in student evaluations (3.3/5.0) with students predominantly reflecting on issues with the structure, as evidenced by the following comments: “Due to the delivery of the course on a fortnightly basis it was difficult to stay engaged with the course” and “No subject should be taught all day – even with regular breaks it’s still too much to concentrate on in one day”.

Students also had difficulty interpreting the industry-led assessment, and felt they were inadequately prepared. One student commented: “[they] seemed to ignore the fact we had no experience in industry and didn’t have a clue about what assumptions were and weren’t reasonable” and “[it was] very hard to distinguish between legislation requirements and the assessment requirements and how they are used together”.

Despite these grievances, the students recognised the value of industry lecturers, as evidenced by the following comments: “It was good the course was taught by industry professionals who have solid knowledge and experience of their subject area” and “The course was practical. The field trips were particularly interesting”. It was clear students valued industry participation and the opportunity for real-world experiences.

Addressing early challenges with structural changes (2016)

In 2016, the course structure was revised based on student feedback to a weekly 3 hour lecture followed by a 1-hour tutorial where industry lecturers could explain assessments and answer student questions. These basic changes to course structure helped increase the student evaluations by 0.6 unit (from 3.3/5.0 to 3.9/5.0) but there were still elements that needed to be addressed.

The industry-led assignment was challenging, and 43% of students (n=60) failed in 2016. The convenor could see students underestimated the task, left beginning the assignment to the last minute and struggled to understand what was needed of them. Students cited difficulty understanding the assignment expectations and suggested it be broken down into smaller parts: “At first it was a little hard for me to understand the exact expectations for the [industry] assignment. It would help if we could split the assignment in two or have the assignment submitted in stages”.

Despite the high failure rate, students continued to value industry participation and could see the relevance of the industry-led assignment for their future careers as evidenced by the following comment: “the major assignment can be used as a show of real-life work that can be shown to employers”. The convenor observed the assignment had the potential to give graduates an edge in the job market. For example, one student reported they used their assignment in a graduate interview to demonstrate their skills relevant to the position and were selected above 100 other applicants.

Structural changes were not enough (lessons from 2017)

To address the high failure rate for the 40% industry-led assignment, it was separated into four smaller milestone assessments worth 10% in 2017. The intention of this change was to encourage students to begin working on their major assignment earlier and to get feedback along the way as to the quality expected, so they could course-correct if needed. This didn’t go as well as anticipated, and the individual stages of the industry assignment also received high failure rates, which resulted in delays returning marks. Students also commented on a

lack of clarity about what was required: “the course content and some lecturers did a poor job at giving students the knowledge required to assist with completing the assignments.”

The convenor asked an experienced tutor to mark one 10% component of the industry-led assessment and noticed the failure rate was lower (only 2%) compared with the other three industry marked components (9-22%). While the section marked by the tutor was a different aspect of the assignment, the discrepancy highlighted a potential difference between industry and academic marking practices. In addition, the high failure rate overall for the industry-led assignment (32%, n=44) also suggested there was a disconnect between industry expectations and student’s understanding of the assessment task.

Despite these challenges, evaluations in 2017 continued to reflect that students valued the participation of industry lecturers in the course: “I loved all the guest lecturers from industry and to be able to talk to them about their industry experience and make new connections”, and “it was very good having industry professionals as guest lecturers as they provided us with valuable insight on what a career in [industry] would be like”.

Focus of this paper

Observations and results from 2016 and 2017 prompted a relationship-based course improvement process that is the subject of this paper. The first aim of the improvement process was to bring industry lecturers closer-in to the faculty of the university to achieve better student outcomes and experiences. The second aim was to reduce the failure rate on the 40% industry-led assessment.

Study Design

Two interventions were made to increase industry lecturer engagement prior to the teaching term (Table 1). A pre-teaching reflection and planning meeting was organised to create shared strategies for course improvement and enhance industry lecturer understanding of student backgrounds and experiences. One industry lecturer attended a 2 day “Foundations of University” teaching workshop which introduced them to key pedagogical concepts. The workshop also gave them the opportunity to present a lecture and receive constructive and independent feedback from experienced learning and teaching professionals.

Table 1 – Course improvement interventions to increase industry lecturer engagement

Interventions to increase engagement	Objective
#1 Pre-teaching reflection & planning meeting - Discuss outcomes of previous iteration (what worked, what didn’t, what the students said, what the marks said) - Share perceptions of student experience (what we noticed) - Allow industry lecturers to share own experiences of teaching (what was challenging or supportive) - Share demographic data and openly discuss (how would students given their background respond to the course, how can we adapt ourselves to better support them)	• Create shared strategies for course improvement • Enhance industry lecturer understanding of student backgrounds and experience
#2 Facilitate industry lecturers to participate in internal learning and teaching training - 2 full day workshops paid for by the faculty	• Create a shared understanding of learning and teaching practice

Three interventions were made to reduce the failure rate of the industry-led assignment worth 40% (Table 2). These interventions included increasing student-industry interaction through active learning and a discussion board; increasing lecture and assignment cohesion

by constructive alignment of course elements; and, capacity building the marking practices and expectations of industry lecturers.

Table 2 – Course improvement interventions to reduce failure rate on industry-led assignment

Interventions to reduce failure	Objective
#3 Increase student-industry interaction - Introduce discussion board - Encourage industry lecturers to incorporate active learning in lecturers	• Enable industry lecturers to get feedback as to student understanding
#4 Increase lecture and assignment cohesion - Encourage industry lecturers to address lecture and tutorial examples towards the assignment outcomes	• Ensure students are sufficiently supported to complete the assignment
#5 Capacity-build marking practices - Discuss marking theory (e.g. bell curves and differentiating student levels of competency) - Facilitate changes to rubrics to suit industry preferences	• Increase capacity to critically evaluate their marking • Increase responsibility for learning and teaching outcomes

Data

Insight into the success of the relationship-based course improvement interventions was based on formal student evaluation of course (SEC) surveys at the end of the trimester and analysis of mark bands achieved in the industry-led assignment over the three most recent course offerings (2016, 2017 and 2019). Student evaluation of course (SEC) data was used as an indication of student experience including quantitative responses to the statement "Overall I am satisfied with the quality of this course" and typical qualitative responses. The mean mark for the 40% industry-led assignment in 2016, 2017 and 2019 were compared using Welch's ttest for unequal variance with a significance level of 0.05. As outlined in course background, the data was limited to a single course case study.

Results and Discussion

Pre-teaching reflection and planning

The initial course meeting had a stronger emphasis on the reflection and sharing of experiences, rather than structural and administrative planning. This enabled the convenor to understand better where industry lecturers were relatively connected or distant from the student experience. Both lecturers expressed they were grateful for the opportunity to reflect and that it was otherwise difficult to clear time in their busy work schedules to think about the course or update course materials. Reflecting on past offerings allowed assumptions about the lecturer-student relationship to be discussed. Naturally, without a lot of time to establish relationships with students, industry lecturers had developed some incorrect assumptions about the student cohort. These included assumptions about the performance and level of competency of some groups of students including differences between postgraduate and undergraduate, local and international students. Through the meeting we were able to review the data from the previous offering and pull out more accurate and subtle messages. This then acted as a springboard for further conversations to emerge. For example, the industry lecturers were surprised that 60% of the student cohort did not speak English at home, and that we had 13 languages represented in our class of 43 students. This was a good platform for discussing the language we use in the classroom, including colloquialisms and industry jargon, and also how we might structure regular breaks in the long-lectures for students who

are working harder than native English-speakers to listen and comprehend. One industry lecturer mentioned at the end of the teaching term that they had tried to steer away from Australian sayings and explain things better in all their lectures, suggesting the meeting had had a lasting effect over the term in helping re-frame their relationship with students.

Internal learning and teaching training

Industry lecturers expressed a high degree of willingness to participate in professional learning and teaching development. Only one lecturer was able to attend the “Foundations of University Teaching” course in 2019, however, the second lecturer asked to complete the 2-day workshop at the next opportunity. While the convenors primary objective was to create a shared understanding of learning and teaching practice and vernacular to work on course improvement initiatives, industry lecturers valued the invitation and perceived it as an attractive and supportive opportunity. The use of technology is also increasing in higher education and universities will need to invest more in the training needs of sessional staff (Boyden 2000) including industry lecturers. This has been shown to be a worthwhile long-term investment, as involvement of industry in academia is essential for improving and maintaining the quality of technical engineering education (Upadhayay and Vrat 2016).

Increasing student-industry interaction

It was easier to work with the industry lecturer to increase interaction with students after they had attended the “Foundations of University Teaching” workshop. Attendance at the workshop also sparked enthusiasm for innovating into the course which made the suggestion of active learning strategies easier to implement. However, interestingly it was the lecturer who did not attend the workshop that most successfully introduced active-learning strategies. Through attending the workshop, the industry lecturer became familiar with the importance of learning outcomes. This made it easier to work together on aligning the lecture and industry-led assignment with learning outcomes as a common language.

An online discussion board was introduced as an outcome of the pre-teaching reflection and planning meeting. It was successful in increasing student-industry interaction and relieving the convenor of gate-keeping student emails. As industry lecturers do not frequently interact with course sites such as blackboard, it was important to remind them of critical times (such as approaching assignment due dates) so they could increase the frequency of checking and responding. The introduction of the discussion board as an outcome of the course reflection meeting facilitated a smoother transition to this new practice.

Capacity building marking practices

Industry lecturers had previously marked assignments offline due to inexperience with blackboard. Showing them how to access the assignments online and setting up the rubrics to suit their preferences, greatly increased course efficiency. Setting up online rubrics was also the perfect time to have broader discussions about marking practices, bell curves and differentiating student skill levels through marking practice. These discussions likely had an impact as the failure rate was halved from previous years and there was overall better differentiation between student skill levels.

Improving marks distribution for an industry-led assignment

The 2019 failure rate for the industry-led assignment (14%) was reduced by more than half compared with 2017 (32%) and by a third compared to 2016 (43%). Compared with the two prior offerings, there was no need to moderate the marking in 2019 and marks could be returned to students without delay. This excellent result is likely due to a combination of changing industry expectations around assessment and marking; together with increased constructive alignment between lectures and assignment outcomes. The distribution of marks also improved in 2019 with double the students receiving a distinction (D) or high-

distinction (HD) compared with previous years. In 2016, there was a 43% failure rate; 40% of the class received a credit or pass; and, 17% received a D or a HD. In 2017, 32% of the class failed; 66% received a credit or pass; and 2% received a D or HD. In 2019, there was a 14% failure rate; 58% of the class received a credit or a pass; and 28% received a distinction or a high distinction in 2019 (Figure 1). Overall, the mean of the 2019 offering (66.1%±16.9, n=42) was significantly higher than both the 2016 (54.7%±19.3, n=59) and 2017 (52.8%±11.8, n=43) offerings which were not significantly different (p>0.1, by Welch's ttest) from each other.

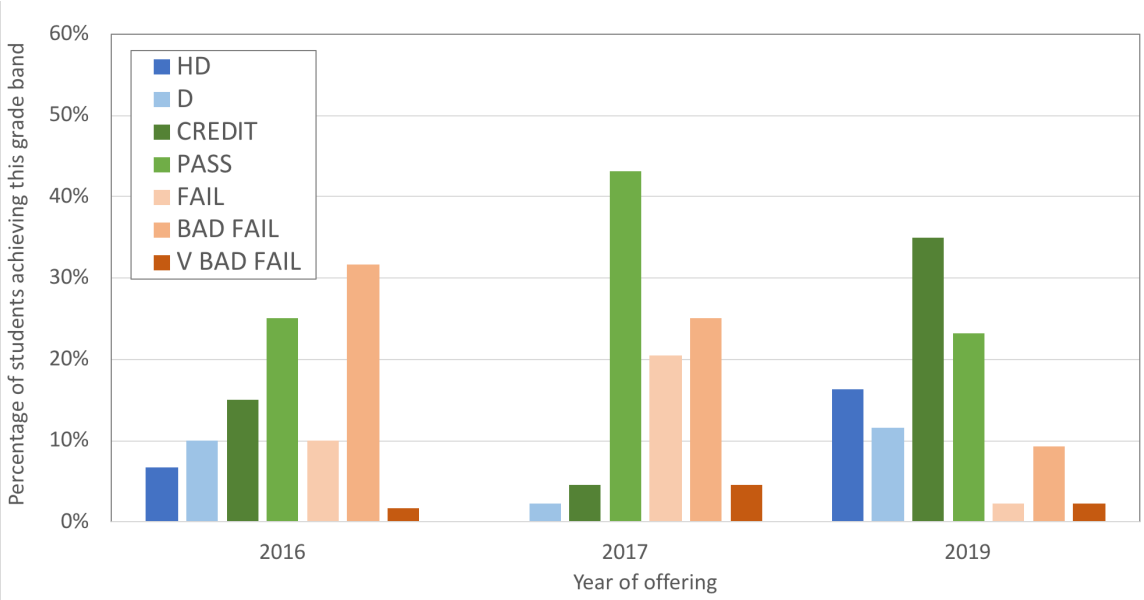

Figure 1 – Industry-led assignment marks with a high proportion of fails in 2016 (43%, n=60) and 2017 (32%, n=44) and a more reasonable level of fails in 2019 (14%, n=43) as a result of course improvement interventions

Industry lecturers were more satisfied with the overall experience of the assessment and took greater ownership over the distribution of marks as reflected in the following comment: "I saw the distribution as being much more meaningful than the previous distribution and [reflected that] obviously a majority of the students understood what I was trying to say". It was also positive that industry lecturers were seeing marking as a form of feedback as well as a judgement of student merit as evidenced by the following comment: "If I don't mark the assignments, I have no feedback about where people are".

Overall the relationship-based interventions, particularly capacity-building marking practices and the pre-course reflection meeting, positively influenced the marking outcomes for the industry-led assessment enabling students to fully capitalise on its industry-relevance. Unfortunately, the industry lecturers did not provide written feedback comments when marking the assignment, which will need to be remedied in future course offerings.

Improvement to student course satisfaction

The course increased a further 0.5 units from the 2017 offering to 4.4/5.0 in 2019 which overall was a good result providing scope for further improvement through ongoing collaboration between the academic and industry teaching team. A "lack of feedback on assessment" featured in the student comments as something the course needed to improve, but predominantly comments reflected favourably on the industry-led assignment's relevance and practicality. This is evidenced by the following student comments: "the assessments were practical and relevant for when we graduate and work in industry" and "I feel like it gave me real-world experience". One student also picked up on the deeper alignment between the lectures and assignment as evidenced by the following comment: "I liked that the lectures were tested through assignments and applying the knowledge learnt".

Conclusion

A relationship-based approach to course improvement considers relationships as the primary mechanism for making course changes. In courses co-taught with industry professionals, the focus is on the industry lecturer and their relationships with students, academic staff, the university, their place of work and their own professional development in learning and teaching. This paper case study has demonstrated the potential value of a relationship-based approach for improving a course co-taught with industry lecturers.

A pre-teaching planning meeting with an emphasis on reflection and the sharing of experiences can be impactful and of enduring value throughout the teaching term, and as a foundational practice for making course improvements over time. The emphasis on reflection and sharing of experiences allows deeper contributions from industry lecturers in course planning, development and improvement. Open discussion of student demographics and performance from past offerings can assist in establishing relationships between industry lecturers and students prior to the trimester that are more compassionate towards the student experience. This enables industry lectures to be more student-centred in their approach and to have more realistic expectations of skill level and the student development pathways needed to be created by them as teaching staff.

Inviting industry lecturers to attend internal learning and teaching workshops recognises their contribution to the university and the time they intentionally take out of their busy careers to participate in teaching activities. The motivation of industry professionals to lecture at a university is not usually based on financial reward but by a sense that they have accumulated a certain wealth of knowledge within their profession that is worthwhile to pass on to the next generation. As caretakers of this knowledge, they are enthusiastic about the opportunity to develop professionally in the area of learning and teaching and to do the best job possible in conveying that information to students. Investment in industry lecturer learning and teaching training strengthens the relationship between industry and the university and provides academic convenors with a valuable common understanding of pedagogical discourse that can be drawn upon at any time to make course changes and improvements with industry lecturers. Capacity building particular practices such as online discussion boards and marking rubrics to suit industry lecturer preferences is a worthwhile investment of time that enables opportunities for constructive discourse as a foundation for further course improvements.

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