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Industry Field Trips in Engineering Education: Student, Educator & Industry Perspectives

CONTEXT

In engineering education, anecdotal evidence suggests that industry field trips significantly enhance the student experience and provide a valuable bridge to employment opportunities and real-world engineering environments. Nevertheless, the value of these field trips to students, educators, and industry hosts has had limited focus in academic research.

PURPOSE

This research seeks to support (or refute) the sentiments of the value of field trips, from the perspective of the key stakeholders who participate. The research examines field trips in the School of [redacted] Engineering at [redacted], with a focus on annual, multi-day trips to the Gladstone region of Queensland, run separately for undergraduate chemical engineering students and postgraduate students in the sustainable energy program. The purpose of the research is to explore the success factors, challenges, and the value of running industry field trips for students, educators, and industry representatives.

APPROACH

Surveys of student participants were used to understand their sentiments clustered around three main themes - enhancing student learning; developing a sense of professional identity; and building friendships and cohorts through participation in the field trips. Further, surveys of relevant teaching staff and industry representatives were obtained. Thus, the value propositions based on these three groups' perspectives can be compared.

ANTICIPATED OUTCOMES

The surveys show that students, educators and industry hosts who participated in the field trips in 2025 highly valued the experience and interaction. Student results show the composition of this value across the themes of learning, professional identity, and cohort building. The survey responses provide more detail on the success factors and challenges in running the industry field trips and the value propositions for educator and industry stakeholders.

CONCLUSIONS

The study supports anecdotal findings that student learning, professional identity, and cohort building are strengthened by running industry field trips in undergraduate and postgraduate engineering programs. Further, educators and industry stakeholders highlight employability and the reinforcement of classroom learning as key value propositions, despite the time and cost requirements of running and hosting multi-day field trips. Success factors identified in the study will enable improved outcomes for subsequent trips.

KEYWORDS

Field trips, value proposition, professional skills.

Introduction

Engineering education faces the challenge of preparing graduates for increasingly complex, interdisciplinary professional environments. While classroom learning provides theoretical foundations, authentic exposure to engineering practice is critical to developing the capabilities demanded by industry (Engineers Australia, 2022; Kolmos et al., 2020).

Industry field trips provide this authenticity by situating learning in operational environments where students can observe processes, interact with practitioners, and understand the interplay of technical, social, and economic considerations (Bennett et al., 2007). More broadly, Gast (2021) discusses the value of field trips from a teaching perspective, providing students with both fundamental knowledge and an understanding of the complexities of technological systems. In the Australasian context, such activities contribute directly to meeting accreditation requirements under Engineers Australia's Stage 1 Competency Standard for Professional Engineers (Engineers Australia, 2022).

While much has been written from an educator perspective, comparing the value propositions across the three key stakeholder groups that participate in field trips – educators, students and industry – has received more limited research focus. Anecdotal evidence is that field trips significantly enhance the student experience and provide a valuable bridge to employment opportunities and real-world environments. Also anecdotally, industry's reasons for participation in field trips may align with a sense of community responsibility and a branding exercise with future employees.

This research project seeks to understand the sentiments of the value of field trips, from the perspective of the key stakeholders that participate. It does so by considering a case study at the [redacted]. There, the School of [redacted] Engineering has been successfully running industry field trips for students for over 40 years. It now runs annual or bi-annual field trips to the Gladstone region, separately for undergraduate [redacted] Engineering students and Master of Sustainable Energy students.

Through surveys of these three participant groups, this paper explores the success factors, challenges, and the value of running industry field trips for students, as well as educators and industry representatives. The surveys explore three main themes: enhancing student learning and motivation; developing an early sense of professional identity; and building friendships and a sense of cohort through participation in industry field trips. Both surveys responses and feedback from students, field trip staff and industry representatives are analysed. In doing so, the value propositions of these three groups' perspectives will be able to be compared.

Background

Pedagogical foundations

Kolb's (1984) experiential learning cycle, comprising concrete experience, reflective observation, abstract conceptualisation, and active experimentation, provides a strong pedagogical rationale for field trips. In engineering, the "concrete experience" of site visits allows students to connect theory to practice, while structured reflection helps consolidate learning (Kolmos et al., 2020).

A theory of education as experience (Jackson, 2023) also underpins this approach, emphasising that learning must be grounded in real-life contexts to be meaningful. Schön's (1983) concept of the reflective practitioner is particularly relevant to engineers, as field trips can prompt reflective thinking about professional roles and ethical responsibilities.

Lave and Wenger's (1991) concept of situated learning positions knowledge acquisition as inherently tied to the context in which it is applied. This concept describes field trips as enabling students to participate as legitimate peripheral participants in professional communities, observing

and engaging in authentic activities that reveal the norms, values, and tacit knowledge of engineering practice.

In the Australasian higher education landscape, field trips are recognised as a form of work-integrated learning (Patrick et al., 2008; Smith et al., 2021). While they may be shorter in duration than internships, field trips share WIL's goals of developing employability skills, building industry connections, and fostering reflective practice.

Professional identity, the sense of self aligned with the norms and expectations of a profession, is shaped by exposure to authentic practice (Trede et al., 2012). Field trips provide opportunities for students to envision themselves in professional roles, particularly when they see practitioners who share their career aspirations, backgrounds, or values.

Tinto's (1997) student integration model highlights the role of social and academic integration in retention and success. Field trips foster both by creating shared experiences that strengthen peer networks. Social capital theory (Bourdieu, 1986) further explains how these relationships can translate into professional advantages through collaborative learning and information exchange.

Field trips in the School of [redacted] Engineering

The School of [redacted] Engineering at [redacted] is a world leader in [redacted] engineering education and research. The School's strong industry partnerships provide pathways between its innovative research and industrial commercialisation. The School has, since the 1980s, run a yearly field trip to Gladstone, primarily targeted at its second-year undergraduate students. Since 2017, the School has also run a separate field trip to Gladstone for its Master of Sustainable Energy students.

The Gladstone region of Queensland offers an ideal location for multi-day engineering field trips. It hosts a concentration of industries spanning chemical process plants in industries such as alumina and aluminium production, liquefied natural gas (LNG) production, explosive production, wastewater treatment and energy generation. This combination allows students to see both legacy infrastructure and new technological innovation, making it a powerful location for applied engineering. The School's field trips typically last two to three days with participant numbers ranging from 30 to 70 students.

Methodology

A mixed-methods design through a feedback survey was employed, combining quantitative survey measures with qualitative thematic analysis. The field trips surveyed were the chemical engineering undergraduate field trip in March 2025, and the sustainable energy postgraduate trip in July 2025. Participants were surveyed in July 2025. Participants included:

- **Students**: The undergraduate [redacted] engineering and postgraduate sustainable energy students.
- **Educators**: Academic and professional staff involved in each trip's design and delivery.
- **Industry Hosts**: Representatives from organisations providing tours, presentations, or networking.

All surveys asked participants to reflect on a number of statements. Responses used a Likert scale as follows: 5 = Strongly Agree, 4 = Agree, 3 = Neither Agree nor Disagree, 2 = Disagree, 1 = Strongly Disagree. The statements were grouped by the following themes:

- Statements L1-4: Enhancing student learning and motivation;
- Statements P1-4: Developing an early sense of professional identity; and

- Statements S1-4: Building friendships and a sense of cohort through participation in industry field trips

Educator surveys contained the above statements for Likert scale responses, plus an additional:

- Statements R1-4: Resources and logistics of running field trips

Educator surveys also contain freeform text fields focussed on perceived educational value, challenges, and recommendations. Industry surveys were briefer, consisting of five Likert statements on the value of student field trips, along with freeform feedback.

The surveys were assessed and approved via the ethics protocols of [redacted] (Project 2025/HE000560). Participation in the surveys was anonymous and voluntary, with clear information presented at the beginning of each survey explaining its purpose, the non-identifiable nature of any data/responses gathered and the right to withdraw from the project. The survey sought explicit consent from participants to use their data/responses for this research project.

Quantitative data were analysed descriptively, with means and standard deviations calculated. Freeform feedback was also analysed to provide additional statements to illustrate data trends.

Results

Students

Table 1 shows the mean and standard deviation of student responses based on the Likert scale. There were 12 student responses in total (6 undergraduate chemical engineering and 6 postgraduate sustainable energy students).

Table 1: Mean and standard deviation comparisons between student surveys of undergraduate and postgraduate field trips

Theme	ID	**Statement stem** *The Gladstone Field trip...*	Undergrad Chem Eng MEAN (SD)	Postgrad Sust Energy MEAN (SD)
Impact on student learning	L1	Provides students with authentic learning experiences which complement the theoretical content of the relevant course/program	4.43 (0.53)	5.00 (0.00)
	L2	Allows students to develop broader professional knowledge and understanding beyond the course/program content	4.86 (0.38)	4.8 (0.45)
	L3	Allows students to see and appreciate the scale and complexity of industry plants	4.14 (0.69)	4.8 (0.45)
	L4	Enhances students' motivation for their [redacted] studies	4.14 (1.21)	5.00 (0.00)
Impact on professional identity	P1	Provides an opportunity to see how professionals work and communicate in industrial plants	4.00 (1.00)	4.80 (0.45)
	P2	Provides an opportunity to see how professionals manage hazards and risks in industrial plants.	3.71 (0.95)	4.40 (0.89)
	P3	Provides an opportunity to see how professionals work and live in a regional location	4.14 (1.21)	4.80 (0.45)
	P4	Provides students with a clearer understanding of role of professionals in industry.	3.29 (1.80)	4.6 (0.55)
Impact on social experience	S1	Allowed students to build connections and friendships with their cohort	4.86 (0.38)	5.00 (0.00)
	S2	Allowed students to build a sense of belonging to their cohort	4.1 (0.49)	4.80 (0.45)
	S3	Allowed students to build connections with [redacted] staff	4.00 (1.15)	4.80 (0.45)
	S4	Allowed students to build connections with [redacted] chemical engineering and MSE alumni at the industry sites.	3.71 (1.38)	4.20 (1.10)

The field trips had positive sentiments on the impact on student learning for both undergraduate and postgraduate students (L1-L4). As one sustainable energy student commented:

> *"The Gladstone field trip lets you experience firsthand and meet people behind the scenes of the industry, and gives you an actual glimpse of what is happening on the ground. It was a fantastic experience."*

Undergraduate students valued the opportunity to meet other graduates to understand their work. comments included:

> *"The mixer with past* [redacted] *engineering students now located in Gladstone was an amazing way to network and ask them questions about living remotely."*

Undergraduate sentiment towards the impact on professional identity (P1-P4) was substantially lower than the postgraduate sentiment. Some recurring comments were that some [redacted] engineering students were confronted by the realities of working in a process plant in a remote location. These included:

> *"Seeing the conditions that chemical engineers worked in made me not want to join the chemical engineering plant workforce."*
>
> *"It kinda* (sic) *solidified my decision to not major in process engineering."*

For sustainable energy postgraduate students, sentiments were more positive to the impact on professional identity.

> *"Helped me understand the work and its effect on the people and community."*
>
> *"The trip certainly expanded the scope of fields of work that I would apply in the future."*
>
> *"It was wonderful to meet some of the people working in the industry."*

The impact on social experience and cohort building (S1-S4) was identified as of high importance by survey respondents in both field trips.

Undergraduate comments on the social experience included:

> *"Builds connection with classmates. A lot of my friends today are from this trip. Having friends in your course is important to have motivation to keep studying and stay on top of things with everyone."*
>
> *"Social experience was incredibly important. Without this trip, I would not have met the friends that I know today. These friends are what keep me going during times of stress and without them, I likely would have failed several courses without their explanations."*

MSE comments on the social experience were in a similar vein, including:

> *"It was great opportunity to meet fellow students and* [redacted]*."*
>
> *"This was the highlight of the trip for me. The relationship built during this field trip would go beyond the* [redacted] *program, especially for me as an international student. It is always good to know and meet people that are passionate about making a difference in the energy space."*

Educators

Table 2 shows the mean and standard deviation of educator responses to the Likert scale. Surveys yielded three participants associated with the undergraduate field trip, and one participant from the postgraduate field trip.

Table 2: Mean and standard deviation comparisons between student surveys of undergraduate and postgraduate field trips

Theme	ID	Statement stem *The Gladstone Field trip...*	Undergrad Chem Eng MEAN (SD)	Postgrad Sust Energy MEAN (SD)
Impact on student learning	L1	Provides students with authentic learning experiences which complement the theoretical content of the relevant course/program	5.00 (0.00)	5.00 (0.00)
	L2	Allows students to develop broader professional knowledge and understanding beyond the course/program content	5.00 (0.00)	5.00 (0.00)
	L3	Allows students to see and appreciate the scale and complexity of industry plants	5.00 (0.00)	5.00 (0.00)
	L4	Enhances students' motivation for their [redacted] studies	5.00 (0.00)	5.00 (0.00)
Impact on professional identity	P1	Provides an opportunity to see how professionals work and communicate in industrial plants	4.67 (0.58)	5.00 (0.00)
	P2	Provides an opportunity to see how professionals manage hazards and risks in industrial plants.	4.67 (0.58)	5.00 (0.00)
	P3	Provides an opportunity to see how professionals work and live in a regional location	4.33 (0.58)	5.00 (0.00)
	P4	Provides students with a clearer understanding of role of professionals in industry.	4.33 (0.58)	5.00 (0.00)
Impact on social experience	S1	Allowed students to build connections and friendships with their cohort	5.00 (0.00)	5.00 (0.00)
	S2	Allowed students to build a sense of belonging to their cohort	5.00 (0.00)	5.00 (0.00)
	S3	Allowed students to build connections with [redacted] staff	4.67 (0.58)	5.00 (0.00)
	S4	Allowed students to build connections with [redacted] chemical engineering and MSE alumni at the industry sites.	4.33 (0.58)	4.00 (0.00)
Resources and logistics of running field trips	R1	Is time consuming and complex to organise and run	4.33 (0.58)	2.00 (0.00)
	R2	Staffing the Gladstone Field trip is difficult	3.67 (0.58)	5.00 (0.00)
	R3	Building effective relationships with industry is crucial to the success of the Gladstone Field trip	5.00 (0.00)	5.00 (0.00)
	R4	The value of the Gladstone Field trip for students outweighs the time and effort that staff invest to organise and run the field trip	5.00 (0.00)	5.00 (0.00)

Educator comments were in general very positive to the field trip experience:

> *"The Gladstone Field trips are integral to the positive Chem Eng culture and student experience. I hope they continue for many years to come*."

Industry

Table 3 shows the means and standard deviations of industry responses based on a Likert scale. There were 4 participants.

Table 3: Mean and standard deviation comparisons between educator surveys of undergraduate and postgraduate field trips

Theme	ID	Statement	MEAN (SD)
Value of field trips	V1	The Gladstone Field trips allow industry staff to help develop the next generation of chemical engineering and/or energy sector professionals.	4.50 (0.58)
	V2	The Gladstone Field trips allow industry staff to provide context and motivation to complement the students' coursework.	4.50 (1.00)

	V3	The Gladstone Field trips provide a valuable opportunity for industry staff to showcase their facilities through hosting field trips.	4.75 (0.50)
	V4	The Gladstone Field trips provide a valuable opportunity for industry staff to strengthen connections with the [redacted] students and staff.	4.25 (0.96)
	V5	We are likely to continue hosting [redacted] students for future Gladstone Field trips.	4.75 (0.50)

Industry feedback was that the companies were more than happy to host, as long as the experience continues to add value to the students. One industry respondent noted the importance of the field trip to the business by challenging status quo practices:

> *"The field trips are important and it could be beneficial for the students to have enough time to reflect on the situation they see in front of them. They should be encouraged to challenge the existing designs and the operational constraints."*

In addition, one industry respondent emphasised the connection between the field trips and workforce recruitment:

> *"This program and this trip in particular is (*sic*) indeed an invaluable opportunity for industry staff to strengthen connections with the [redacted] students and staff - our most recent hire to the energy team ... is a current student."*

Discussion

Enhancing student learning

Both undergraduate and postgraduate students highlighted the strong contribution of field trips to their learning. Site visits were reported to provide an appreciation of the scale, complexity, and interdependencies of chemical and energy processes that are difficult to convey in classrooms alone. For undergraduate students, seeing equipment and systems in refineries and processing plants contextualised project work and deepened their understanding of core concepts. Postgraduate students emphasised how the sustainable energy field trip enabled them to grasp the multidimensional nature of energy transition challenges, particularly issues of technology readiness, stakeholder engagement, and environmental considerations in remote contexts.

Educators reinforced these perspectives, noting that field trips exemplified pedagogical approaches centred on relational learning and multi-perspective analysis. Although assessment tasks were not directly tied to the trips, respondents agreed that students' subsequent project performance and conceptual grasp benefited from the immersion in authentic industrial contexts.

Developing a sense of professional identity

The trips were also seen as significant in shaping students' professional identity. Undergraduate respondents described the trips as clarifying their career aspirations and helping them imagine themselves in future engineering roles. For many, conversations with practicing engineers, particularly alumni of their own program, provided relatable role models.

Educators explained that one of their aims in facilitating field trips was to support professional identity development by fostering authentic connections with practitioners. Informal interactions, whether during site tours or evening events, gave students opportunities to engage with engineers, operators, and professional staff in less structured settings. These exchanges encouraged students to reflect on their own emerging identities as engineers and to see themselves as part of a broader professional community.

Industry partners echoed this view, noting that hosting students allowed their own staff to share experiences and act as exemplars of engineering practice. From the industry perspective, such engagement also served a strategic purpose by showcasing organisational culture and identifying potential future recruits.

Building social cohesion

Finally, students consistently emphasised the importance of social cohesion during field trips. For both undergraduate and postgraduate groups, being immersed in a shared experience outside the classroom fostered bonds that extended beyond the duration of the trip. Respondents noted that these connections enhanced their motivation and helped them persist through challenging aspects of their studies. Several students stated that without the support of peers built through the trip, they would have struggled more significantly.

Educators confirmed the importance of these outcomes, viewing them as central to student engagement and retention. Having students from diverse stages of study on the same trip was described as particularly valuable, as the mix of naive and advanced perspectives created a rich and supportive peer learning environment. Such cohort-building benefits, though sometimes overlooked in formal curricula, appear to be among the most enduring outcomes of industry field trips.

Challenges

Key challenges identified by educator respondents were related to the time and effort required to create the learning experience. For example, this comment illustrates this:

> *"The organisation of the trip takes many hours. Fortunately, our administration team gives great support in organising this trip; without them, the trip would be too time consuming."*

The key challenges in running the field trips for both undergraduate and postgraduate students is securing enough sites to host industry visits for all students. Respondents stated that the available sites can change from year to year depending on their operating status. Respondents also commented on the importance of support from the School's executive team in running these field trips, providing funding and administration support for the trips.

The field trips increase students' familiarity with industry contexts, norms, and expectations, which supports smoother transitions to the workplace. Considering these connections against the Engineers Australia Stage 1 competencies, it is clear that the student responses correlate to 3.5 b) "Understands the importance of being a member of a professional and intellectual community, learning from its knowledge and standards, and contributing to their maintenance and advancement"; and 3.6 d) "Recognises the value of alternative and diverse viewpoints, scholarly advice and the importance of professional networking". Industry sees the value of field trips in the context of promoting 3.3 a) "Applies creative approaches to identify and develop alternative concepts, solutions and procedures, appropriately challenges engineering practices from technical and non-technical viewpoints; identifies new technological opportunities".

Conclusions and recommendations

Field trips represent a high-impact educational strategy that contributes directly to graduate competencies, employability outcomes and career transitions and pathways. Further research should explore their value and importance for cohort building and sense of belonging/cohort experience.

A key recommendation is to more explicitly integrate field trips into undergraduate and postgraduate curricula to strengthen students' learning, sense of professional identity and social cohesion. This also assist in building and maintaining connections with industry partners. Further,

diverse experiences could be included in field trips where possible, to showcase the various workplaces and settings and assist decision making on career path preferences. Implementing feedback mechanisms can also help to continuously improve field trip design and better align the value to students, educators and industry.

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