

## From 'English language proficiency' to cross-cultural communication in engineering education

Melanie Fleming<sup>a</sup>, Bev Coulter<sup>a</sup>, and Shaun Chen<sup>a</sup>

<sup>a</sup> Faculty of Engineering, Architecture and Information Technology, The University of Queensland  
Corresponding Author Email: melanie.fleming@uq.edu.au

### ABSTRACT

#### CONTEXT

Providing an inclusive learning environment for international and domestic students to develop professional skills is relevant to a number of the Sustainable Development goals (SDGs), particularly Goal 4 Quality Education. For NESB students, perceptions of their English language proficiency by other students may impact the extent to which they are able to adjust academically and socially to a new learning environment. It may also limit their exposure to the language experiences they need during their studies (Benzie, 2010). Developing inclusive education for both international and domestic students requires a 'greater than the sum of its parts' approach if we want to contribute to students' development of cross-cultural communication and employability skills valued by industry.

#### PURPOSE OR GOAL

This study sought to understand the experiences, attitudes and needs of both international and domestic students studying engineering in a large first year course. Given the emphasis on teamwork in engineering programs, a more in depth understanding of how best to support students learning experiences is needed. We were seeking an answer to the question "how do students perceive the learning environment and nature of English language screening and support offered during their studies?"

#### APPROACH OR METHODOLOGY/METHODS

Surveys were conducted asking for input from both domestic and international students in the first-year engineering course. From these, 57 completed surveys were returned. A total of 8 interviews were conducted with students. Themes were developed during the analysis of this data that reflected the qualitative variation in students' views of English language screening and support.

#### ACTUAL OR ANTICIPATED OUTCOMES

Students demonstrated qualitatively distinct ways of viewing English language screening and support, English language proficiency, its links with collaboration, teamwork and the learning and social experience more broadly. The outcomes indicate that more work needs to be done in this space to maximise the learning experience for all students.

#### CONCLUSIONS/RECOMMENDATIONS/SUMMARY

The findings suggest students may benefit from expanded educational opportunities focusing on more social and integrative activities to develop cross-cultural skills and communication for all students and have implications for the design of truly inclusive education. Pedagogical solutions aimed at addressing these issues will be briefly outlined in this paper.

#### KEYWORDS

Interpersonal, intrapersonal and cross-cultural communication, inclusive education

## Introduction

Ensuring that the engineering student learning experience is inclusive is a challenge compounded by diverse student cohorts. Engineering students, both domestic and international have varied experiences of, skills in confidence, and competence in English language receptive language skills, language comprehension and production. In simple terms our cohorts consist of domestic students who speak English as a first language, domestic students from Non-English Speaking Backgrounds (NESB), international students who grow up in bilingual or multilingual households (where English could be considered a first language) and students for whom English is a second language, but may have been learnt in formal education for example. These groups have very different experiences of using English in both formal education and social contexts.

The wider engineering education literature adopts a variety of views on enhancing student learning. For instance, some educators advocate the use of e-learning and blended learning approaches. Collaborative learning has also been seen as a method to encourage interaction between students, but it does not always have successful outcomes (Benzie, 2010). Whilst these are laudable initiatives, they do not address the issue of how domestic students or international students with high English language fluency perceive the situation when they work with students they perceive as having lower fluency or lower skill sets and vice versa.

Salven (2017) found evidence that Chinese students studying in Canada viewed their skills unfavourably when working collaboratively with other students. They experienced feelings of embarrassment, anxiety, shock, a steep learning curve and the need for acceptance of the student's English language competency. These issues are compounded when it can take years to develop competence (Salven, 2017). International students have also been known to suffer acculturative stress (as part of the acculturation process), social isolation (either self-imposed or deliberately imposed by other students) as well as impacts on their socioeconomic, internship and job success. There is evidence that more frequent use of the second language (in this case English), as well as more positive experiences increase perceptions of competence (MacIntyre & Charos, 1996).

The learning environment has also been described as lacking respect for international students' knowledge, equating English language proficiency with academic ability, and ignoring the local linguistic and cultural knowledge required to successfully participate in class but also socially (Ryan & Viète, 2009). but also their financial, housing, social and cultural situation can have a profound effect on students' decisions to stay and complete their program of study. From the student's perspective this has a clear impact on their future employability and on their relationships with peers and family.

From the university's perspective it has an impact on course or subject environment and completions. From an industry perspective lack of intercultural competence impedes knowledge transfer in the business environment (Pauluzzo & Cagnina, 2017). It has also been linked to business failure (2006). Culture is an agent of sustainable development and links (UN SDG). Aririguzoh (2022) states when someone is culturally literate, they reduce the chance of miscommunication, therefore advocating for the importance of cross-cultural literacy. Culture has also been strongly linked to identity. This vein of research frequently focuses how language enables people to share meaning in their own or a second language, reflect their identity and participate in and share a culture with others.

This suggest the added importance of promoting a positive learning experience for international and domestic students that enables all to fully develop their identities as engineers, and be able to participate in that culture fully. Provision of cross-cultural communication has shown promise in improving international and domestic students' learning experiences (Young & Schartner, 2014; Glass & Westmont, 2014; Pho & Schartner, 2021). Perhaps the question in this case needs reframing. What skills are all students missing out on? Inter-cultural and cross-cultural communication skills are necessary for all graduates of engineering programs and are reflected in Engineer's Australia's Stage 1 competencies. For instance, under element of competency 3.2 "Effective oral and written communication in professional and lay domains" is the statement

“appreciating the impact of body language, personal behaviour and other non-verbal communication processes, as well as the fundamentals of human social behaviour and their cross-cultural differences.” The aim of this study is to explore how students perceive the provision of English language support in a large first year engineering course. All students in this course participate in mandatory English language screening and are referred for optional English language support based on the results of the screening.

In line with a phenomenographic approach (Åkerlind 2022;2023; Marton, 1981), this research assumes that students’ (domestic and international) will have qualitatively different experiences of the provision of English language support. Understanding how different students experience the provision of English language support allows us to develop better ways to provide such support and mitigate misconceptions about the role of English language support. The goal of phenomenography is to describe people’s experiences and the qualitative ways in which these experiences differ Marton, (1981; Marton and Booth, 1997). Phenomenographic studies usually investigate only one phenomenon at a time, however, if the phenomena are addressed sequentially, through the research design, multiple phenomena can be explored (Åkerlind 2022). In this case, the phenomena to be explored were students’ experiences of English language screening, of English language support and of their learning experiences within a course where this support is provided to those students who might benefit from additional support.

The primary research question addressed was:

- 1) What are students’ experiences of the provision of English language support in a large first year engineering course?

Secondary research questions included:

- 2) What are students’ experiences English language screening?
- 3) What are the ways that first year engineering students understand English language support?
- 4) What are their experiences of collaboration and teamwork?

## Methodology

This research was part of a mixed methods approach to explore students’ attitudes to English language screening and support and the learning experiences of international and domestic students more broadly. Students were invited to participate in either or both a survey and an interview. Students were asked questions about the provision of English language screening and support, their use of and experiences with this support and any additional support they would have benefited from. They were also asked about their experiences with learning in general. This study adopted a phenomenographic approach to data analysis. A total of 58 survey responses were submitted and 8 interviews were conducted. The research project had institutional ethics review support (HE001420).

A blended phenomenographic approach was adopted in this study (Beagon & Bowe, 2023; Mendoz-Garcia et al., 2020). This blended approach involved the use of surveys to gather the initial information. From the surveys a purposive sampling strategy was used to select students for interview. Although phenomenography frequently involves the analysis of interviews, it can also include the use of text-based comments as found in surveys (Åkerlind, 2005). This study used both the qualitative comments from the surveys and the interview transcripts to explore students’ attitudes to English language screening and support. Data collection continued until no new perspectives or experiences (saturation) were revealed through the interviews or survey responses. The focus of phenomenographic research is “the qualitatively different ways in which people experience, conceptualise, perceive, and think about various aspects of phenomena in the world” Stolz (2020, p.). This study focuses on data collected from first year engineering students’ experiences English language screening and support in a course work subject featuring working in diverse teams.

## Results

The interviews were transcribed word for word. The blended phenomenographic approach proceeds through a number of phases. The researcher then read through each transcript and all relevant survey comments multiple times, looking for similarities and variations in ways of experiencing English language screening, support and the learning experience, collaboration and teamwork. Individual transcripts are read closely in order to understand the context. Variation is evidenced through analysing quotes from the transcripts or extended survey comments. The structure of variation is identified, and dimensions of variation developed. In this case 7 dimensions of variation or critical aspects were identified. These are:

- 1) Attitudes to and experiences of screening and support
- 2) Relevance of support provided
- 3) Incidental support or opportunity to engage
- 4) Engagement with peers
- 5) Collaboration
- 6) Teamwork
- 7) Professional skills

The dimensions of variation are displayed in the tables below and represent the outcome space for the analysis. Students had a variety of perceptions about English language screening being conducted in class which are depicted in Table 1. These ranged from screening being seen as unnecessary, to screening being seen as useful at all stages throughout the degree. Indicative quotes from the interviews and surveys are below:

*"I remember some students across from me thought it was a hassle"*

*"I didn't really think anything of it at the time because it didn't take up too much time. And it wasn't during my own time outside of classes either."*

*"So I think that it is necessary 100% for all students to undertake that (the screening)"*

*"...yes, particularly for international students who are just coming and then obviously English isn't their first language."*

*"as a cohort, it would be nice having that sort of, maybe not fourth year, but maybe second and third year ..."*

Students who did engage with the English language support program gave varying reasons. This included feeling that they had "not met the English requirements", to wanting to "improve my English communication skill", to helping to "better integrate into the teaching environment, understand and adapt to the content and teaching context". Reasons for not engaging with the available support included, "Because I have adequate English skills", "I am a native English speaker", "My English skill is pretty fine" and "I already did personal English class". A good example from an international student of why they did not participate in the available support programs is quoted below:

*I don't have enough time to take part in some programs, and, actually, I'm afraid of participating in some activities where I have to interact with other people, because I'm afraid that I can't be able to quickly understand others' opinions and accurately express my own ideas. (International student)*

**Table 1. The qualitatively distinct ways in which students perceived of screening during their course and participation in the English language support program**

<b>English language screening</b>	Unnecessary	Other students need screening	Screening is not an issue	All students need screening	Ongoing through all years of the degree
<b>Participated in English language support program</b>	Recommended to enrol	English is not good enough	To improve specific academic skills	To integrate into the learning environment	Additional overall support
<b>Did not participate in English language support program</b>	Unaware of support	It wasn't recommended to the student	Did not want to do more study	Don't need it English is sufficient	

Table 2 represents the qualitatively distinct ways in which students view the relevance of English language support to their learning. Students' expressed qualitatively distinct experiences of the learning environment and the provision of English language support. For example, at one end of this spectrum we have students who have high levels of proficiency in the English language, who also want to get better. A typical quote is below:

*"I believe that no matter how good someone can be, there's always scope for improvement"* (Domestic student, Interview 2).

*Personally, I'd only still go if an issue was identified by one of my tutors or lecturers in my assessment. I think that if it were, if the relevance were outlined, you know, more, it would certainly motivate me more to go* (Domestic student, Interview 3)

**Table 2. Relevance of provided support to students' learning**

	← Relevance to student →			
<b>Perceived relevance of support to learning</b>	Self-perceive that they need to develop better proficiency, engagement with support offered is subject to other contextual factors.	Would like the option to further develop their skills through available support, even if they self-perceive that they already have a high level of proficiency	Would like to develop further if there was an identified need (e.g. from tutor, etc.) for a specific issue (e.g report writing). Do not seek out additional support.	Perceive themselves as having a high level of English – "my English is good enough" Do not see the need to develop their skills further

Table 3 shows the qualitative variation in students' experiences of incidental support, engagement with peers (both domestic and international students).

**Table 3. Variation in incidental support and engagement**

	← Level of opportunity for engagement →			
<b>Opportunity and incidental support (e.g. in the community)</b>	Inability of international students to communicate within family in English due to unavailability of people to talk to in English. Low levels of incidental support	Family members speak English as well as another language, community (e.g. school) based opportunities to practice English in a supportive environment (bilingual households and community)	English is a second language, but grow up in Australia, therefore extensive community resources for developing English language skills, schooling is in English	English as a first language; family and friends speak English. All schooling is in English. Extensive incidental support. Monolingualism is the standard experience

Table 4. depicts the distinct ways in which international and domestic students experience collaboration, team, personal and social and professional impacts of language proficiency.

**Table 4. Students' views of English language proficiency in class or university environment**

<b>Engagement with peers</b>	Lack of engagement due to lack of confidence	Those with more confidence more likely to engage	Proficient students do not engage with less fluent students
<b>Collaboration</b>	Students feel comfortable only engaging with others from similar cultural backgrounds, thus self limiting collaboration	Students with higher levels of proficiency may limit their interactions with or inputs from those with lower levels of proficiency	Lack of genuine collaboration amongst all students leads to missed opportunities in terms of learning
<b>Teamwork</b>	Students feel that other students' lack of English proficiency puts a strain on team projects	More confident and competent students may take over key assessment tasks.	No awareness of potential benefits of developing cross-cultural communication skills.
<b>Professional skills</b>	Students perceive gaps in skill sets of other students, but these are primarily related to completing assessment tasks and grades	Emerging view of the value of disciplinary specific academic skills (e.g. engineering report writing) Identification of skills related for professional practice	Good communication skills as needed for professional practice (but these are not conceptualised in terms of cross-cultural communication).

A domestic student comment indicative of the impact on teamwork can be found below:

Some international students don't speak English well and they don't want to try to speak English. Either because they're embarrassed because they don't speak that well or some other unknown reasons to me, but it makes it hard for the rest of us when we have to do group projects. For some reasons they do not participate nor speak. And it isn't from the lack of trying to get them to participate and communicate to us.

Students learn how to get better at English through a career perspective through feedback provided from assignments

(O)ne of the primary areas that was identified, that the whole cohort needed to work on was our ability to speak and talk on a topic without having tools to assist us. Like palm cards or reading off a PowerPoint or things like that. (Domestic student)

I think that kind of showing all students really how the skills they learn are transferable to things they do later on in their degree and into their professional career, I think that might be useful as well. (Domestic student)

When I was going through not only their individual reports ... I could see that even the domestic students, there's definitely a lot of gaps in their knowledge of professional engineering literature. (Domestic student, also a tutor for large first year engineering course))

## Discussion and conclusion

The findings indicate that international and domestic students show similar attitudes to both the English language screening and support provided by the institution. With regards to screening, whilst some students (mostly domestic students) may not understand why they need to participate in that, there are those students who think it would be beneficial to spread screening across multiple years of the degree and that it should be tailored to indicate their weaknesses in particular areas relevant to academic work as well as to professional practice. Some higher achieving students tended to make use of the support provided as an extra support for their own studies to develop what they see as additional career skills relating to communication. This also raises the question of whether more tailored screening tests should be developed. With regards to English language support, for most students, whilst they appreciate that it is there, if it is not seen as directly relevant to them, or they perceive that they do not have the time to participate in the support, those most in need may not utilise it.

Some international students indicated that they believed that their English was not 'up to the mark' despite successfully gaining entry to a course (and therefore passing IELTS, TOEFL or equivalent). This was also reflected in comments from some of the domestic students. Whilst some thought that they had "done enough" English language study and did not want to do more. To these students, the English language test that they had completed suggested to them that they did not need more study. These students did not see their learning of English in a more holistic way that necessitated ongoing commitment.

Both domestic and international students experience some degree of confusion or frustration about the available support and also how best to interact with each other. At the extremes of these experiences, some international students appear to restrict attempts at communication and engagement, and some domestic students, despite attempting to engage, eventually seem to stop trying or limit engagement. It seems that what is needed is better learning activities for all students in order to realise cross-cultural communication that would also benefit students professional practice. Students tend to see the primary responsibility for development of English skills as individual and personal, they do not see learning and English proficiency as a collaborative endeavour, nor do they recognise the cross-cultural communication skills that they could develop together.

There is a missed opportunity to develop all students' cross-cultural communication skills, that is both domestic and international students. They are not always being adequately preparing to work in diverse teams if they do not have the skills to interact with colleagues with diverse background levels. Engineers' professional practice can frequently involve working in teams with people from around the world. This skill set is therefore part of the practice of global engineering practice and is recognised by a number of authors (Del Vitto, 2008; Rico-Garcia & Burns, 2020). Additionally, domestic students who are primarily monolingual English speakers, are not placed in a position of questioning their identities, ethnicities or skill sets. Many of our international students, however, are placed in a situation where they are challenged by these issues.

Our current approach to screening and support could imply that international students have a "deficit" and that English language skills are not a significant problem for domestic students. Offering screening and support to all students goes some way to avoiding this issue. Framing the desired competence as a cross-cultural communication issue, enables us to reframe the "problem" and involve domestic students. It suggests that all students have skills that could stand to be further developed, not just international students. The knowledge and expertise that they have developed within their own culture, ways of working and language skills are undervalued and underutilised in the current context.

There are several teaching and learning implications for engineering education that arise from this research. The development of a joint cross-cultural communication course that integrates domestic and international students is one. However other suggestions include:

- Additional mentoring opportunities for international and domestic students that value their skills (for example of a later year student with earlier students). This could be a volunteer service and would require students to receive training and ongoing support.
- Designing curriculum to take advantage of the existing skill sets of students; for example including project work and assessments that involve a comparative analysis of engineering practice, standards and legislation or are located in an international context. They could also involve simulated or virtual project work with other international institutions where diverse language backgrounds and cultures are an asset.
- Development of a program to assist staff to develop assessment and curriculum to be inclusive of the skill sets of all students (e.g. a global, cross-cultural project – see additional details in the point above)
- Buddy systems for international students in order to foster a sense of belonging. International and domestic students could be paired or grouped together on the self-identified willingness to participate in such a program and learn more about each other's cultures.

The potential limitations of this study are that international students whose first language is not English may be under-represented in both the interview and survey responses. This is particularly likely to be the case with regards to the interviews. A different researcher may find alternative themes and degrees of variation in the data. The results may not be generalisable to other cohorts or institutions and may reflect the particular context at this institution. However, it is not necessarily the purpose of phenomenography to produce generalisable findings (Akerlind, 2023; Marton, 1981). Its purpose is to explore a particular context and situation. Nevertheless, blended phenomenography has been used to uncover international and domestic engineering students' variations in experience of English language screening, support and learning in diverse teams. In conclusion, the use of blended phenomenography has provided an interesting method to capture the variations in students' experiences of English language screening, support, perceptions of English language proficiency and its impacts on the learning experience. This is especially the case as this relates to collaboration and teamwork.



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