Peer Assessment barriers faced by international students engaging in project-based courses

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Structured Abstract

BACKGROUND

Project-based courses building on teamwork, communication and collaboration skills are compulsory for all students at The University of Queensland (UQ) where 11% of first-year students identify themselves as international. Many of these students find difficulty in adapting to western culture, in particular the learning culture (Chang & Chin, 1999). Students are often accustomed to the Confucian system which commonly focuses on transmission-based learning (lectures) and assessment through technical competence (exams) and there is little to no team work in this system (Gorry, 2011).

Teamwork underpinning two compulsory first-year project-based courses is evaluated through Peer Assessment (PA) that asks students to rate each other on the basis of four sub-areas: Teamwork and Leadership, Overall Contribution, Timeliness, and Quality of Work. PA occurs 4 times in the first-year of study; PA results are returned to student teams via a mentor to aid team development, and are also used to scale assessment marks. However international students (IS) perform poorly in these project-based courses, attracting low PA and grades due to poor quality of work, lack of contribution and/ or poor engagement (Chen & Kavanagh, 2013). In addition, domestic students have highlighted communication and lack of task understanding as problem areas for international students and domestic students often respond with discontent and resentment.

PURPOSE

In order to address transitional barriers faced by IS, a series of support modules are designed through:
*   identification of any PA sub-areas IS are struggling with; and
*   review of feedback IS received from their teammates and tutors.

DESIGN/METHOD

The four sub-areas of PA were investigated through graphical interpretation. Differences between the two cohorts (international vs. domestic) were then correlated with written feedback given by team members. Semantic analysis was carried out using the TeXTT online platform and Leximancer and findings were further verified by manual thematic analysis.

RESULTS

IS are graded lower in all PA categories, in particular Teamwork and Leadership, and Overall Contribution to the project. Feedback provided by peers and tutors highlight quietness and lack of participation in discussions as problem areas. A significant amount of IS were heavily penalised in the PA scores due to missing team meetings. Semantic analysis of student comments also showed inability to attend meetings in a timely fashion and quality of work as key barriers faced.

CONCLUSIONS

IS struggle to transition into project-based courses where they are required to work in teams. This is evident through skewed PA results and feedback provided by staff and team members. Language barriers as well as differences in educational expectations are likely to be the causes for the transitional barriers faced by IS. A contextual academic engineering language course has been designed and piloted following the findings of this research. This program will aid students in transitioning into foreign learning environments and integrate more effectively into engineering teams.

KEYWORDS

Peer assessment, International students, First-year, Teamwork.

Introduction

ENGG1100 - Engineering Design (E1) and ENGG1200 - Engineering Modelling and Problem Solving (E2) are compulsory team-based courses run at The University of Queensland (UQ) for first year engineering students. These project-based courses build on teamwork, communication and collaboration skills and are assessed through reports and prototype demonstration. Each course hosts approximately 1200 students from diverse backgrounds around 20% of which identify themselves as international and English as second language (ESL). Many of these international students (IS) find difficulty in adapting to western culture, in particular the learning culture (Chang & Chin, 1999). Students are often accustomed to the Confucian system which focuses on transmission-based learning (lectures) and assessment through technical competence (exams) and there is little to no team work in this system (Gorry, 2011). IS perform well in non-team based courses (Chen & Kavanagh, 2013) but do not perform well in E1 and E2. Anecdotal evidence attributes this to either poor quality of work and/ or lack of contribution/ engagement.

Teamwork underpins E1 and E2 with 60% of the final mark deriving from team submissions. Teams are intentionally formed with one IS per group of six and the individual's performance in the team is evaluated through Peer Assessment (PA). PA is divided into four categories: Communication and Collaboration (including leadership), Contribution to Overall Project, Timeliness, and Performance (i.e. quality of work). Students are also asked to leave comments to justify their marks especially if awarding low marks. In week 7, PA is formative but in week 13, the PA is used to scale team-based marks for each individual student. Week 7 PA results are returned to the student teams via a mentor to help the teams manage any dysfunction. Through comments in the PA system, domestic students have highlighted communication and lack of task understanding as areas where IS do not do well. These comments are supported by written tutor remarks on each individual student's performance at the end of semester, used to confirm final PA marks.

This paper presents an investigation into the four sub-areas of PA and analyses the content of IS feedback provided by peers and tutors to infer key transitional barriers faced by IS.

Transitional Barriers faced by IS

Overview

In western tertiary institutions a plethora of issues faced by IS have been studied and these include (Arkoudis, 2006; Rodgers, 2013; Stanley, 2011):

- socioeconomic background,
- past qualifications,
- motivation,
- ethnic differences, and
- educational differences.

Furthermore IS enter with a lack of tutorial experience (Samuelowicz, 1987), reflective writing skills and the ability to guide their own learning.

In the engineering context, where teamwork makes up large component of assessment, IS report a lack of confidence to engage in discussions and contribution to team projects (Arkoudis, 2006). Due to the social hierarchy of authoritative teaching figures, students from Asian cultures often find themselves reluctant to express their opinions unless they have mastered the material in question (Stanley, 2011). These issues stem from two major transitional barriers, English as a second language and differences in educational culture (Chang & Chin, 1999; Samuelowicz, 1987)..

Differences in Educational Culture

The two major learning paradigms are the Socratic and Confucian systems (Gorry, 2011). These key differences in the two systems are summarised in Table 1.

Table 1: Summary of differences between Socratic and Confucian education systems

	Source of knowledge	Teacher	Learning Style	Commonly observed learning techniques
Socratic	Self-developed, aided by teacher	Guidance, facilitator	Mostly deep-based, learning through questioning beliefs and establishing links.	*Teamwork, group discussion, tutorial based classes, independence.*
Confucian	External or more 'knowledgeable' source	Authoritative, manager	Mostly surface-based, emphasis on repetition and memory. Didactic teaching.	*Rote learning, lectures, text book.*

The pedestal which Asian students place teachers upon often hinders their ability to ask questions which is an issue in team based learning environments (Pratt, 1992). Furthermore Confucianism confers the belief that knowledge is transferred from a more knowledgeable source (Jin & Cortazzi, 2011) and can result in IS downplaying the important of peer learning and the expectations of team-based assessment.

E1 and E2 operate under a Socratic framework with a heavy emphasis on problem-solving and professional skills in an authentic learning environment. IS often have not come from an environment that developed or valued these core skills (Gorry, 2011; Mori, 2000).

English as a Second Language

88% of incoming international first-years are from non-English speaking backgrounds and are often disadvantaged by this. A low proficiency in English hinders their ability to develop cohesive arguments and write structured professional reports. In E1 and E2, the linguistic disadvantage also affects students in reflective writing tasks and limits their ability to integrate and converse with fellow team members. The inability to connect with their team can mean that they lose touch with the design project that underpins these courses very early in the semester. Domestic students may perceive this as poor contribution to the team project both in terms of the upfront decision-making and ideas, as well as the ongoing work on prototyping and reporting.

Age and experience

Age has also proven to be a strong factor in affecting student motivation, approaches to study and teamwork ethic (Hoskins, Newstead, & Dennis, 1997).

The majority (71%) of domestic students at UQ are from 17 to 20 years of age. International students typically are older with 69% of this cohort falling in the 19 - 22 age bracket. This age difference is mainly due to 2 factors:

- **Pre-tertiary study** – Diplomas, non-traditional qualification or work experience often lead to different learning styles and adapting to identity (Ternel, 2000).
- **Military conscription** –Asian male students from countries in the upper southeast Asian region (Vietnam to Burma) as well as bordering islands near China such as Taiwan are affected by enforced conscription. Service impacts leadership, teamwork, obedience and respect to superiors.

With regards to E1 and E2, age plays a role in how IS interact and are viewed by their peers. Older students are more likely to demonstrate leadership capabilities and their maturity can

usually be seen in the feedback left by peers and tutors. The maturity is also evident in their critical reflections on learning and goals.

Peer Assessment

PA is used in both E1 and E2 to assess the individual's learning (Dochy, Segers, & Sluijsmans, 1999) and aid in teamwork skills development. For each PA, students are asked to distribute 100 points between all group members including themselves on the basis of the following criteria:

- Communication/ Collaboration (Attendance and participation at meetings, email/ SMS/ discussion board response, ability to work with team, ability to share findings with team, ability to lead taking into account task and team (i.e. meeting deadlines and ensuring deliverable quality but continually consulting with team))
- Contribution to overall project (Including: scoping, research, design, testing, analysis, reporting, editing, final submission production *Don't forget to reward up-front work such as idea generation and literature research that may not have been used in the long run but that underpinned final work.)*
- Timeliness (Ability to meet agreed contribution times), and
- Performance (Standard and completeness of work).

A Peer Assessment Factor (PAF) can then be calculated for each student by:

$$PAF = \frac{\sum Points\ for\ each\ student\ across\ all\ criteria}{100 \times No.\ of\ Criteria}$$

PAFs typically lie between 0.9 and 1.1 with an average contributing student receiving unity (1.0). Students who receive a PAF less than 0.9 are perceived as at-risk students who may fail the course due to their lack of involvement in the team as perceived by their teammates.

As previously mentioned, PA is used in E1 and E2; Table 2 summarises the details. It is important to note that PAF2 is usually a better indicator of actual team performance as it is conducted at the end of semester when all team-based assessment tasks have been submitted. Students score PAF1 based on initial team meetings for E1 and workshop attendance and memo contribution for E2. In addition, PAF2 takes into account teamwork across the semester, therefore only PAF2 scores and comments are used in this paper.

Table 2: Types of Peer Assessment used E1 and E2

| Course	Timing in Semester	Type	Completed Team Assessment	Abbreviated
E1	Week 6	Formative	-	PAF1
	Week 13	Summative	Report (30%) Prototype (30%)	PAF2
E2	Week 6	Summative	Memo (15%) Workshops (5%)	PAF3
	Week 13	Summative	Report (15%) Prototype (30%)	PAF4

Methods

Cohort Identification

The total number of students enrolled in engineering at UQ over the past five years is detailed in Table 3.

Table 3: Number of students in first year engineering

Year	Domestic	International (%)
2010	880	117 (12)
2011	903	116 (11)
2012	868	113 (12)
2013	1044	103 (9)
2014	980	151 (13)
Total	**3695**	**449 (11)**

The majority (87%) of IS are from the Asian region, in particular China and Malaysia as shown in Figure 1. Countries with students totalling less than 3% of the sample size from 2010 to 2014 are not shown in Figure 1. Both Confucian and Socratarian learning paradigms exist in the each of the ethnic backgrounds but for the purposes of this research it is assumed that students' educational experience stem from the single major education system found in their country. As the number of IS from western cultures is scarce, all IS are assumed to have studied under a predominately Confucian system. In contrast, domestic students are assumed to have studied under a Socratic system.
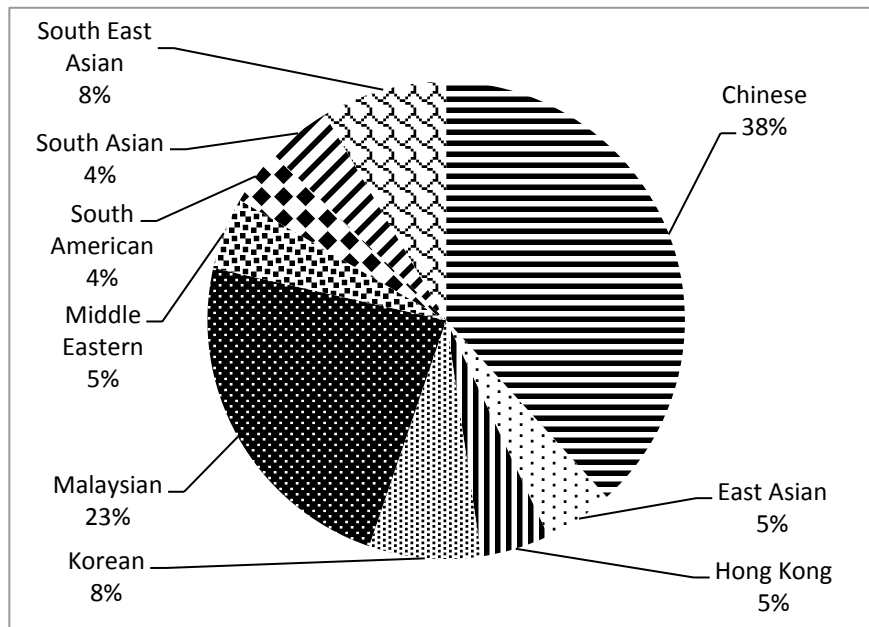
Figure 1: International students' country of origin, 2010 to 2014 (%)

Data Collection

PAFs were collected for 2010 to 2014 inclusive for all first year engineering students enrolled in E1 and/ or E2. E2 was first offered in 2012 so the students from 2010 and 2011 are only represented by one set of data.

In order to ensure that there were as few confounding factors as possible:

- only teams that contained a standard number of students (5 or 6 per team) throughout the semester were included in the study;
- only teams that had PA submissions from all members were used in the study; and
- any teams where students had tried to manipulate the score by allocating themselves a higher number of points and thus queering final PAFs were removed.

Students were then identified as domestic or international and PAFs for all IS were then separated then amalgamated into the four sub-categories.

Semantic Analysis

Two text analysis tools were used in this research: TeXTT and Leximancer. TeXTT was originally developed to analyse student reflective writing from E2 but its ability to filter and sort text was adapted for PA analysis. In particular, the tool can generate word clouds, bigrams and trigrams (Zahir & Nolan, 2013) and these allowed the distribution and occurrences of words within the PA comments to be used to identify major themes.

Leximancer is a text analytics tool originally developed at UQ. The tool extracts text and gives a visual representation of word links on a conceptual map thus providing a form of relational analysis. It also allows users to explore relevance and relationships of ideas in text and quantify common themes via the inbuilt thesaurus that builds its own content classes to group similar collections of words for conceptual analysis (Leximancer, 2011). The content of feedback provided by tutors and peers can be analysed using this software to draw inferences on the types of issues faced by IS.

Comments from tutors and peers about IS team performance were de-identified and collated and processed using TeXTT, and Leximancer. Manual thematic analysis was also conducted to verify the results of these tools. Figure 2 shows a graphical representation of this process.
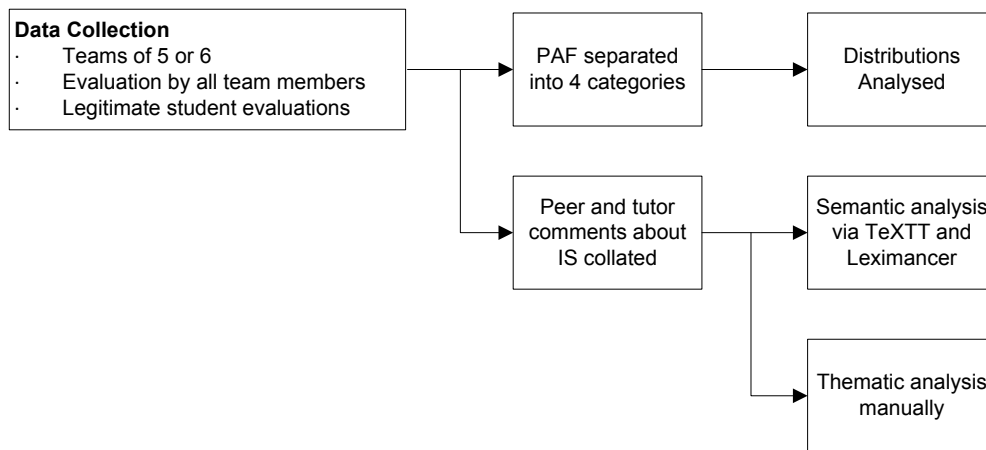
Figure 2: Methodology for analysing peer assessment categories and feedback

Results

Categorical analysis of PAF

If a student is perceived as doing their fair share of the team work, the total points they attract for each sub- category should be 100 (e.g. in a team of 5, the student receives 20 points representing 100/5 from each team member including themselves). Figure 3 shows the results of the comparison for the international and domestic students for each sub category of the PA. Each histogram follows a general normal distribution with IS performance reduced in each of the four sub-categories.

Table 4 shows the percentage of students represented under the 100 line as well as the average PA for all students in that category. Issues inferred from the table and respective histograms are:

A. IS students are over-represented (75:55% International: Domestic) on the left hand side of the graph indicating a failure to integrate with their teams and/ or demonstrate leadership.
B. As for Teamwork and Leadership, IS have a lower mean PAF total (93) in comparison to domestic students (99) suggesting that there is a perception that IS contribute less than their domestic counterparts.

C. The distributions for Timeliness are similar for both domestic and IS although the mean PAF total for the IS (97) is slightly lower than that for domestic students (99).
D. There are less high achieving IS in the Performance category but again, this is not so marked as the first two categories.
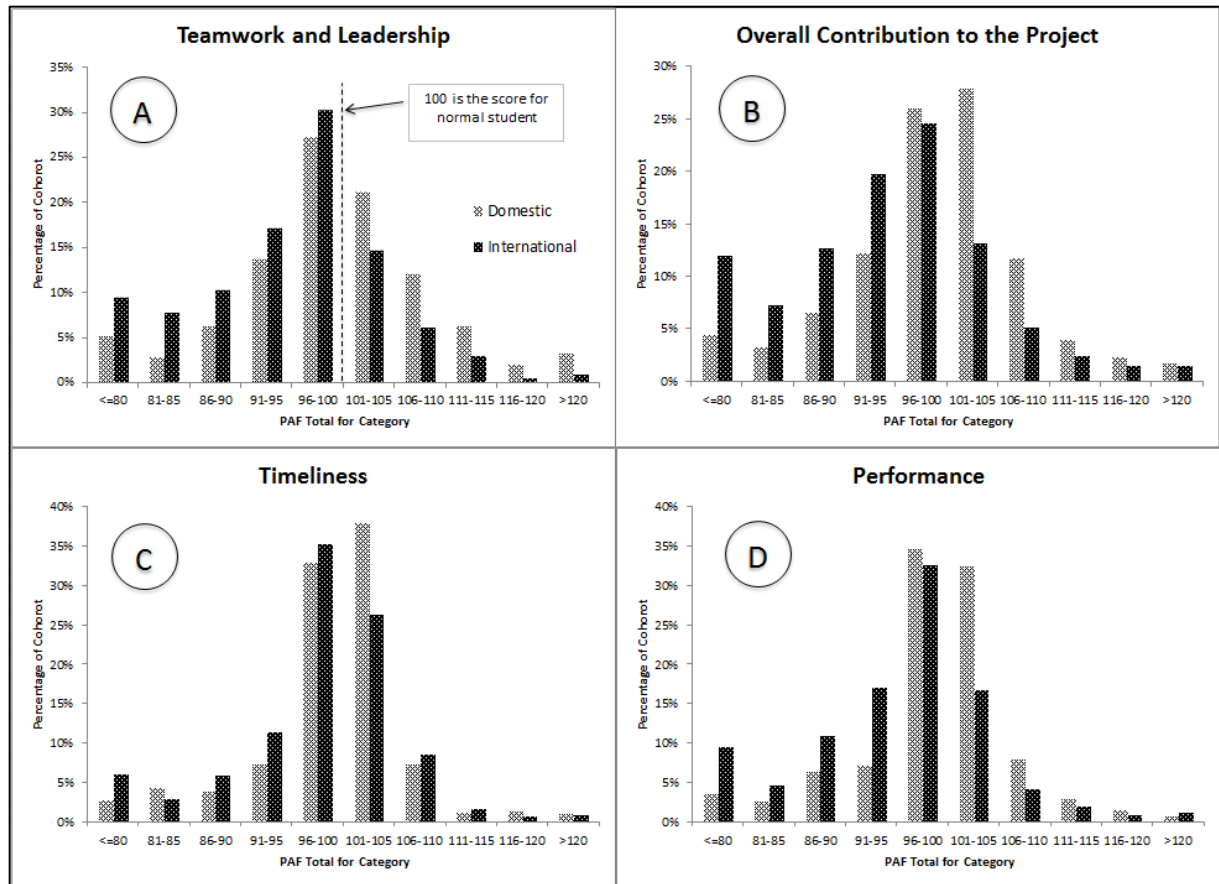

Figure 3: PAF comparison (2010 to 2014) for the four sub-categories

Table 4: Representation of students in each PA category

Category	International		Domestic	
	PA < 100, %	Mean PA	PA < 100, %	Mean PA
Teamwork and Leadership	75	94	55	99
Overall Contribution to the Project	76	93	52	99
Timeliness	62	97	51	99
Performance	75	94	54	99

TeXTT

Table 5 shows the results of semantic analysis done in TeXTT, of feedback provided to IS.

Table 5: TeXTT analysis IS comments from tutors and team members

Key Words	Key Phrases
• Quiet	• "Lack of … (effort/ contribution)"

• Late	• "Not … (contributing/ participating/ attending)"
• Participation	• "Irrelevant … (contribution/ ideas)"

The phrases identified by the software were also frequently observed when conducting the manual thematic analysis. These phrases were commonly found in students scoring less than 90 in a particular category and in students who scored a low PAF (<0.9) overall. The overall sentiment was negative towards these students however they all offered clear explanation as to why the student was given a poor score, typically:

> *Student is very quiet and occasionally participates during meetings. Student does not usually volunteer to do any of the work because of this. (Domestic student comment)*

This student has a similar perception to their peers who identified the quietness and low participation of IS to be major concerns. Within the scope of this research there is no way to discern whether this is due to shyness, introvertedness or language difficulties.

The students who achieved low scores for Timeliness (PA total <95) were of particular interest as thematic analysis of these students revealed a reoccurring lack of participation in terms of showing up to meetings and meeting deadlines; with a surprisingly high number of comments along the theme of:

> *… very poor attendance. Student misses project sessions, and team meetings. (Domestic student comment)*

Again, it is difficult to know why IS are missing team meetings and further research is required into this aspect. What is known is that frequent team meetings with full attendance are crucial to team success. Failing teams often have no established meeting times or have started meeting late into semester. It is clear through the number of comments similar to the above that team members place heavy emphasis on attendance at team meetings and that IS are being penalised if they fail to attend. This may be due to unclear expectations of the requirements of the engineering degree program, as team meetings are not formally scheduled into the curriculum. Failure to attend meetings will also have an effect on the scores attracted for the other sections of the PA, namely Teamwork and Contribution.

Leximancer

A concept map was generated by Leximancer from the feedback received by IS across all four PAF sub-categories. It focused around four major themes (top 57% of analysed phrases): 'Report', 'Work', 'Meetings', 'Team'. Of these, the 'Team' theme was concerning as it contained mostly negative excerpts with respect to the low PAF IS obtained. The concept map (Figure 4) shows the links between major themes and other subthemes (reoccurring words). Figure 5 shows the list of descriptive words which frequently appeared in comments about low students' PA. These figures along with manual analysis of each excerpt inferred:

- a link between the major theme *Team* and two negative subthemes *Late* (19%) and *Quality (20%)*;
- *Work* that was evaluated by peers was largely based around the *Final Report*;
- *Work* was commonly criticised based on *Timeliness* (14%), *Standard* (30%) and *Contribution* (23 - 27%);
- Several *Communication* (16%) barriers and issues throughout the *Project*; and
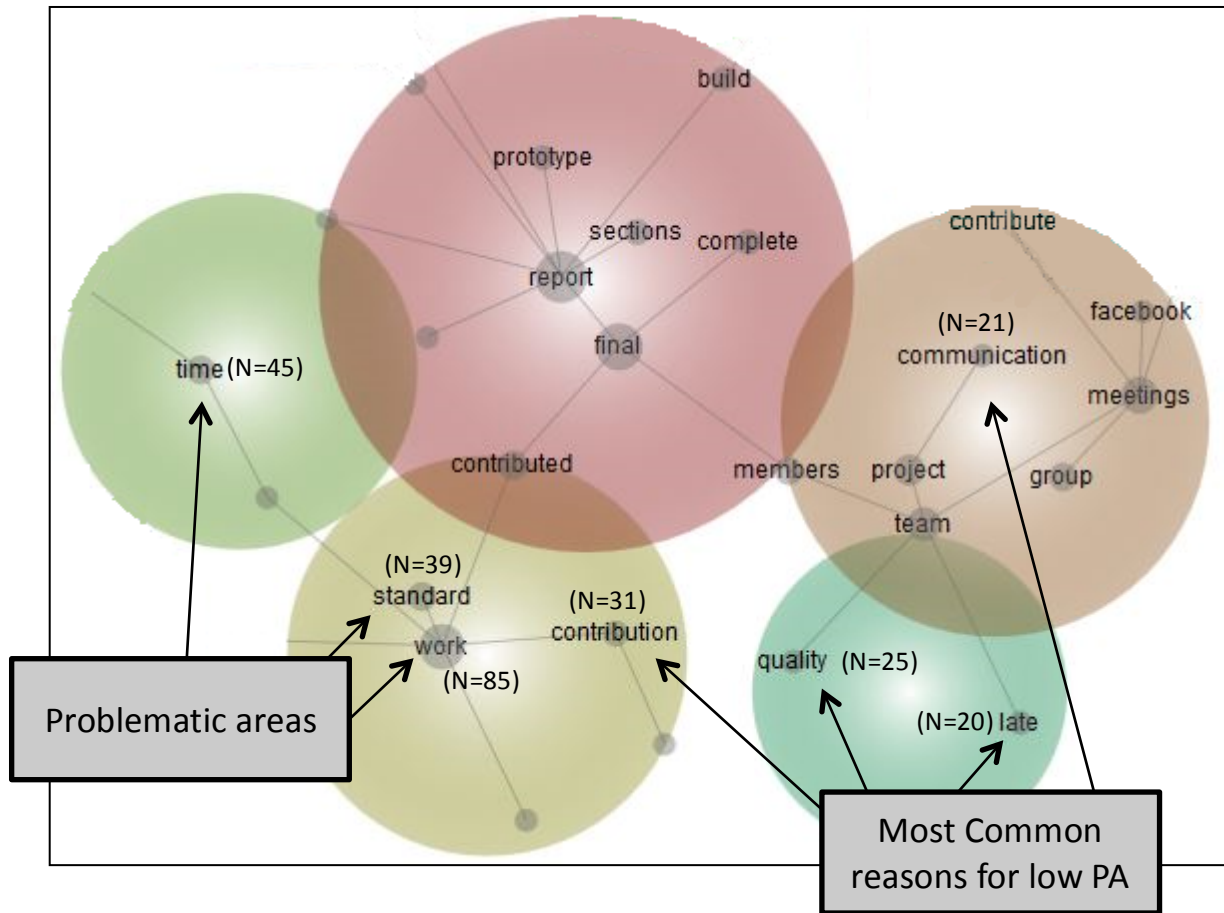- *Meetings* (61%) was a major concern due to non-attendance and *Contribution*.

Figure 4: Annotated Leximancer Diagram showing most common reasons for low PA and problematic areas faced by IS (N=130).

Word-Like	Count	Relevance	
report	132	100%	
standard	39	30%	
contributed	36	27%	
contribute	34	26%	
contribution	31	23%	
late	25	19%	
quality	20	15%	
times	19	14%	
low	15	11%	
effort	14	11%	

Figure 5: List of descriptive words related to statements describing low student PA

CONCLUSIONS AND RECOMMENDATIONS

First year IS struggle in authentic team-based project courses such as E1 and E2 through lack of experience and language difficulties. It was found that IS were perceived to be worse at teamwork across all the PA subcategories used to evaluate teamwork in E1 and E2 (Teamwork and Leadership, Overall Contribution, Timeliness, and Quality of Work) than domestic students with the first two categories identified as major weaknesses. Analysis of the qualitative feedback provided about IS show that quietness, lack of participation and poor quality of work are barriers that need to be overcome. It is hypothesised that these issues stem from language difficulties and unclear/ different expectations; however it would beneficial in future studies to verify these findings by analysing reflective writing assessment

in semester 2 as part of E2. Peers also placed a heavy emphasis on attendance at team meetings that IS frequently miss or are late to and it is thought that this behaviour negatively affects at least three of the PA sub-categories.

Currently the findings of this research have been used to inform the development of a contextualised academic English language course for IS. The program is being piloted concurrently with E2 and is expected to improve the confidence and teamwork skills required for IS to integrate into undergraduate engineering teams at UQ. The results of this program will be studied as a follow up to this research.

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