The Effects of Interpersonal Variables on the Validity of Peer Assessment

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ABSTRACT

PURPOSE:
This study was based on the following research question, "What is the effect of interpersonal variables on the validity of peer assessment?"
DESIGN/METHODOLOGY:
In order to understand the relationship of social interaction and its effects on peer assessment, four interpersonal variables were identified to be used within this study: psychological safety, value diversity, interdependence, and trust.
Seventy final year undergraduate engineering students volunteered to participate in a survey after having completed their first formative peer assessment.
FINDINGS:
Early results indicate: (1) if the team had a shared understanding of the goals and aspirations of the assessment purposes (value diversity), a relationship could be drawn between the quality of assessment and that of perceived learning gains by individual team members, (2) there was a link between positive conceptions of peer assessment trust and psychological safety.
CONCLUSIONS:
The findings from this study, combined with evidence from other studies, support the view that interpersonal variables have the potential to affect the outcomes of peer assessment and impact on the perceived learning outcomes of students.
VALUE:
While there is considerable literature devoted to the peer assessment process in undergraduate engineering programmes, there are relatively few empirical studies on the effects of interpersonal variables on the outcomes of this process.

Keywords: Peer assessment, Interpersonal variables, learning outcomes.

INTRODUCTION

Accreditation criteria for engineering programmes in Australia highlight the need for engineers to work effectively in a multidisciplinary, multicultural, and multinational environment (Engineers Australia, 2011, Stage One Competency Standards 1.5, 3.2, 3.6).

Problem Based Learning (PBL) and Project Based Learning (PjBL) are two student-centred team activity based learning experiences that are used in engineering education to deliver learning that meets some of the criteria described above (Shi, 2010). Peer assessment is commonly used to provide a fairer assessment by allocating individual student marks in these PBL and PjBL type team projects (Johns-Boast & Flint, 2009; Willey & Gardner, 2010).

While there is considerable literature devoted to the peer assessment process in undergraduate engineering programmes, there are relatively few empirical studies on the effects of interpersonal variables on the direct and perceived outcomes of this process (Evans, 2013). Successful collaborative learning through group work involves social interaction (Dahlgren and Dahlgren, 2002) and the coordinated mutual engagement by team members in an effort to solve a design problem (Dym et al., 2005). Educational theory holds that everything we learn takes place in a social context; Vigotsky (1995) proposed that understanding is shaped not only through adaptive encounters with the physical world but also through interactions between people in relation to the world. Engaging in peer assessment exposes students to shared and different assumptions (interactions) about their involvement in a team task and what constitutes quality work.

The term peer assessment is used to describe the process undertaken by students to assess the performance/contribution of themselves and their peers, in relation to group work (Evans, 2013). Peer assessment forms the basis of a process whereby students judge a peer's performance quantitatively by providing a grade or score, and/or qualitatively, by providing the peer with written or oral feedback (Evans, 2013; Topping, 1998). Falchikov (1995) identified two distinct types of peer assessment; the peer assessment of a product and peer assessment of individual performance. Product assessment was where the student peer assessed a piece of work undertaken as a team, this could be formative in nature when undertaken as milestones or summative when applied to the finished artefact. Van Gennip, (2009) stated that "peer assessment is fundamentally a social process whose core activity is feedback given to and received from others, aimed at enhancing the performance of each individual group member and/or the group as a whole" (p.41). Within this social process, interpersonal factors influence the outcome of the peer assessment process; these factors may have a positive impact, through collaboration, or negative impact, through lack of acceptance, and this in turn , would impact on the validity and perceived validity of the peer assessment.

- Several recent studies have identified four interpersonal beliefs that are relevant to understanding how interpersonal interactions affect learning associated with peer assessment (e.g. Stanier, 1997 and Van Gennip,

2012). The four interpersonal beliefs are as follows: Psychological safety: a situation where an individual believes it is safe to take interpersonal risks in a team or group. Value diversity: is the differences in shared understanding of a groups task, goal or undertaking. In peer assessment, value diversity is considered a crucial interpersonal factor in the peer assessment activity. Interdependence: the existence of shared common goals and that each individual's outcomes are affected by the actions of others, i.e. is it cooperative or competitive actions?

The type of interdependence, cooperative or competitive, might influence how the individual interacts with others. Trust: is the confidence or trust that students have in themselves as an assessor and in their peers as assessors.

While Van Gennips (2010) conclusions have received warranted criticism (Toppings, 2010) due to their basis on a limited study group (single gender, single discipline students with no prior exposure to peer assessment), Stanier's (1997) earlier work means they offer a reasonable base for further research.

In order to broaden the findings, this project studied the impact of interpersonal variables on the validity of peer assessment in the context of multi gender, multi discipline groups working on a two semester long design project. It is hypothesised that the approach and participation of these groups in peer assessment will be influenced by the individual's interpersonal interaction.

METHOD

The research reported here is drawn from a wider study into the effect of interpersonal variables on the validity, reliability, and transparency of peer assessment in the evaluation of undergraduate engineer attributes and learning outcomes in a project based learning environment. The wider study incorporates both qualitative and quantitative methods to investigate differences in how students perceive peer contribution and interpersonal interaction, and how their perception influences the way they respond in using peer assessment to evaluate contribution and participation in group work.

In this paper, we report the results from the qualitative stage of the research into the effects of interpersonal variables on peer assessment. The study reported here involved 55 fourth year maritime Bachelor of Engineering students undertaking a multidiscipline capstone *System Design Project*. Of the 55 students that participated in the survey, 34 are domestic and 21 international, distributed across three engineering disciplines. Domestic students were identified in the survey tool and as classified by the Australian government to be Australian or New Zealand citizens and/or permanent resident visa holders.

A survey was undertaken after the students had completed their first formative peer assessment task at the end of first semester, and at the beginning of their final weekly 6 hour consultation time. The formative assessment task included a grade

using a Likert scale of 1-5 (1 being strongly disagree and 5 being strongly agree) being given against questions pertaining to the students contribution, management, and time management with comments made against each question to substantiate the grade given. The students had not been trained, but had participated in previous PBL projects which had used summative peer assessment. On completion of the peer assessment the students, both as a team and individually, were provided with formative feedback on the outcome of the task by the course lecturer. The approach used was to highlight areas within the team that showed an area that needed to be improved or showed a large separation between team members.

The survey consisted of 15 questions which linked to the four areas of interpersonal variables, Trust, Psychological Safety, Value Diversity, and Interdependence. The research questions were:

> Q1   *I enjoy working in teams.*
> Q2   *I feel comfortable when I assess my peers.*
> Q3   *I often feel undervalued when contributing to group work.*
> Q4   *The roles and tasks allocated to individual members' are determined by their abilities.*
> Q5   *I trust my peers as assessors.*
> Q6   *My peers are good at giving feedback.*
> Q7   *It is easy to ask my peers for help.*
> Q8   *Team members agree on what is important for the team.*
> Q9   *I respect the views of my fellow team members.*
> Q10   *I depend on my peers for information and advice.*
> Q11   *Peer assessment is beneficial to my learning.*
> Q12   *My peers depend on me for information and advice*
> Q13   *Assessing my peers has taught me to look critically at my own learning.*
> Q14   *You have to learn how to assess your peers*
> Q15   *The team as a whole had a single goal*

The authors acknowledge there are some limitations to this survey and in particular in the areas of cultural response impact and the student's perception and understanding of the peer assessment process. On-going qualitative research is being undertaken to explore this in more depth

RESULTS & DISCUSSION

Initial results suggested that there was a relationship between interpersonal variables identified by members of a team, and those variables impacted on the perceived validity of peer assessment.

This paper concentrates on the results between the domestic and internationally enrolled students in the course.

Trust

Figure 1 shows that domestic students (68%) felt comfortable assessing their peers, but were less comfortable (From Figure 2, around 50%) in others assessing them (Figure 2). In contrast, with exception of the relatively high neutral response, international students (52%) feel their peers are good at assessing their contribution, and are relatively comfortable (From Figure 1, around 40%) assessing others.
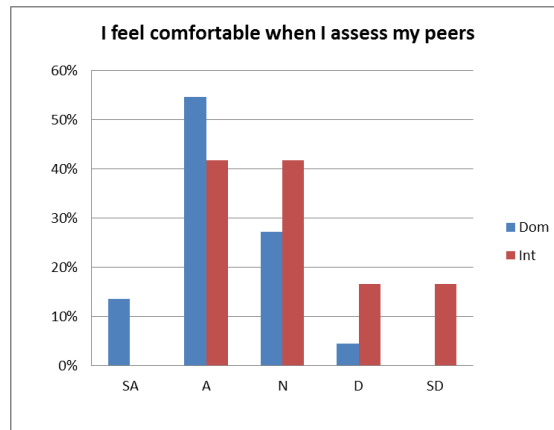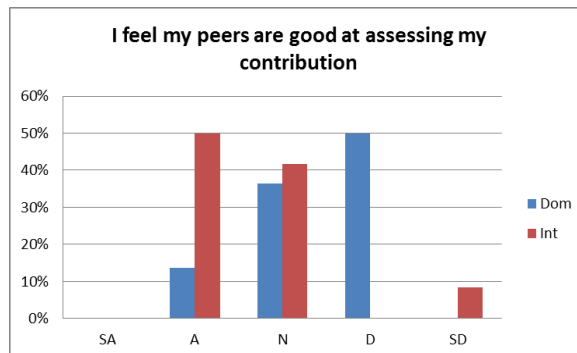

Figure 1 Students opinion on their comfort in assessing their peers

Figure 2 Students opinion on their peer's ability to assess their contribution

It can be seen from the results shown in Figures 1 and 2 there is a distinct separation in the context of trust between domestic and international students when it comes to the ability to both assess and be assessed. Given the results it can be said that students are confident in themselves in their assessment skills, but domestic students show distrust in their peer's ability to assess their contribution to the activity. Hence this response may conclude that the factor of trust influences the approach the students take in responding to peer assessment.

Psychological safety

With exception of the relatively high neutral response in both the international and
domestics cohorts, international students (58%) feel undervalued when
contributing to teamwork (Figure 3), while the domestic students (14%) tending to
invert the trend. When evaluating the responses to asking their peers for help the
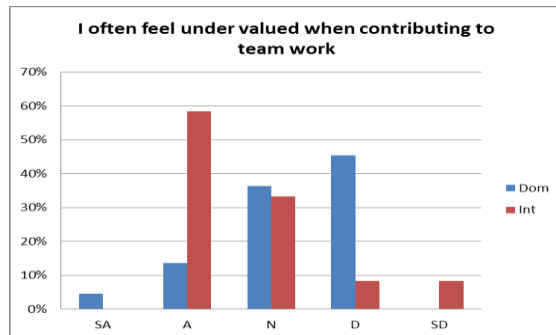majority of all students felt comfortable participating in asking for and providing
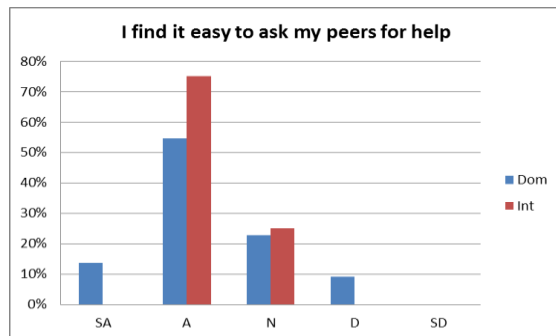help.

Figure 3 Students opinion of contribution

Figure 4 Students opinion of asking their peers for help

The student's preparedness to take less risk in a group might be attributed to their
confidence in their overall perceived ability in evaluating their peers and the
willingness to provide help

Interdependence

Figure 5 shows a close distribution of cooperative/competitive type of
interdependence with international students. Overall there was a high percentage
(59% international and 56% domestic) of students that presented a cooperative
type of interdependence to the students individual and peer dependence on advice
(Figure 6). It is noted that international students may tend to accept more readily

that they depend on their team members. The relatively high number of students who did not depend on their peers (43% of international students and 33% of domestic students in Figure 5) is of concern, as it may indicate a significant number of students not embracing a team approach, or issues with trust among the group. Could the latter be the reason for their willingness to help but not be helped?
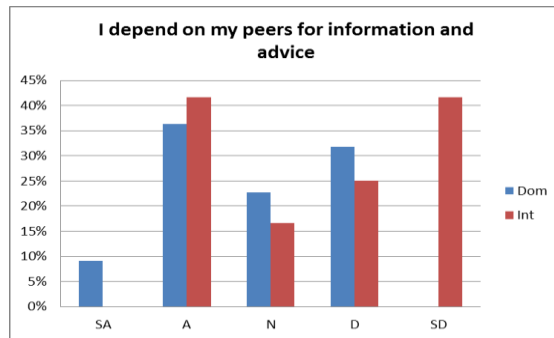

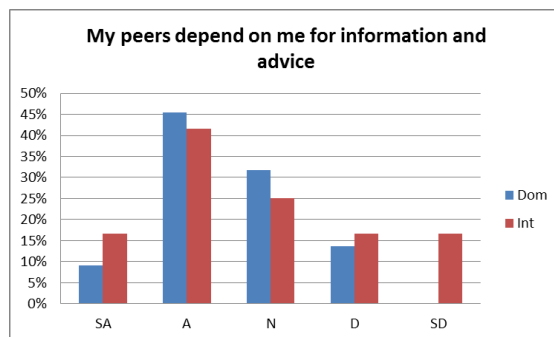**Figure 5 Students response to dependence on peers for information and advice**

Figure 6 Students response their pees dependence on them for information and advice

The responses exhibit a positive approach to interdependence. The students perceived the activity as being practised cooperatively, instead of be competitive in terms of individual performance. Observations of the team interactions and participation demonstrated a positive influence in holding the team together.

Value diversity

The results indicate that in the project the team members possessed cohesive conceptions towards the team goal and criteria. However there was a 26% difference between domestic and international students in their perception of what was important for the team (Figure 7).
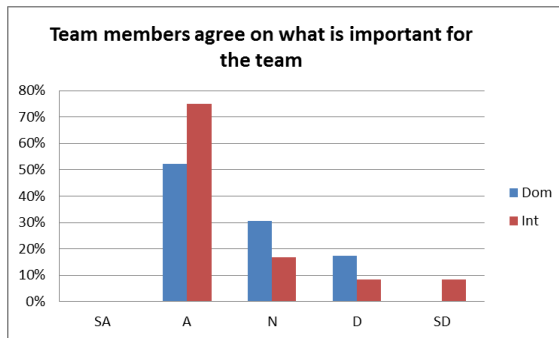
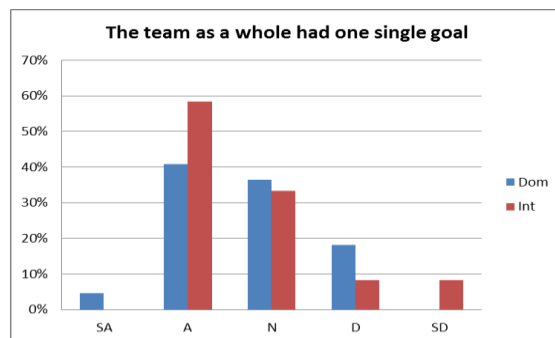**Figure 7 Students perception on team criteria**

Figure 8 Students perception on the team goals

The importance of having a shared understanding of team goals and criteria seems to have an influence on how the students approach the peer evaluation of such things as contribution to the team goal.

CONCLUSION

An investigation has been conducted into whether interpersonal variables have an effect on the validity of peer assessment, especially looking at domestic and international students working in groups to carry out a two semester capstone design project. To date our results indicate possible empirical evidence that interpersonal variables influence how domestic and international students approach peer assessment. It is seen form the results that the confidence in the trust that the students have in the ability of their peers to assess them has an overarching influence in such variables as psychological safety. Results show the area of greatest deviation between domestic and international students lie in the variables of trust and psychological safety. However, this should be interpreted in light of the relatively high neutral response on these areas especially among the international students, which could be due to cultural factors that may favour non-confrontational outcomes. Interestingly, all students see the value of team work to achieve their goals and are happy to assist others, however a significant number are reluctant to ask for assistance, a possible reflection on the lack of trust.

These current findings indicate to lecturers, tutors, and assessors that these deviations should be paid attention to in the context of evaluating peer assessment responses. They are also important when developing projects and creating suitable environments to ensure successful outcomes and promote reliable peer assessments. It is the intention of the authors, through further research in this topic, to develop recommendations and guidelines to enhance teamwork and reliable peer assessment.

Further research will be undertaken in fine tuning the survey instrument and the introduction of qualitative research methods to define the impact of the differences in the survey response and the proportionally high neutral responses to some questions.

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