



Fostering a capacity for relational agency in undergraduate engineering and IT

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ABSTRACT

CONTEXT

Relational agency is the capacity for professional practitioners working in complex, inter-professional environments to align actions with others, interpret and solve complex problems - a core skill required in engineering practice. As part of a review and redesign of groupwork activities in large cohort, group project based, professional practice subjects at the University of Technology Sydney, we investigated using relational agency as a lens through which to evaluate and update our groupwork activities. Initial research investigated the capacity for relational agency in students and proposed a framework that described the development of this capacity from “novice” to “professional”. This paper extends and reports on this work.

PURPOSE OR GOAL

Our goal was to verify our proposed framework by applying this to data collected from two students and two tutor focus groups. The aim is to gain further insight to inform the design of activities and assessments that develop the capacity for relational agency in students.

APPROACH OR METHODOLOGY/METHODS

Focus groups were held with tutors from one second-year and two first-year subjects (the same subjects as in the pilot study). Tutors' perspectives on the development of relational agency were compared to previous findings. Additional focus groups were also held with students. The proposed framework was used to characterise the relational agency displayed by students and an inductive qualitative analysis done to identify any additional themes that emerged from this sample. The results from the student focus groups were triangulated using self and peer review data from the students and their group members.

ACTUAL OR ANTICIPATED OUTCOMES

Relational agency is a useful tool for understanding the skills that engineers need in professional practice. Our framework has value in characterising the development of this capacity and may be most useful in planning curriculum and learning over multiple subjects, rather than the development of group activities and assessments at the individual subject level. The focus group data confirmed the enablers and inhibitors for relational agency. We argue that these are valuable independent of the context of the framework.

CONCLUSIONS/RECOMMENDATIONS/SUMMARY

Initial research identified the capacity for relational agency as a valid lens for reviewing group work activities. However, we conclude that it is more useful at a subject level to focus on the enabling and inhibiting factors identified in this study, rather than on the broader scope of capacity for relational agency. Future work may look at a “whole of degree” application of the development of the capacity for relational agency as part of the learning trajectory for achieving graduate outcomes.

KEYWORDS

Relational agency, group work, professional practice

Introduction

Relational agency is the capacity for professional practitioners working in complex, inter-professional environments to align actions with others (Edwards, 2005). This facilitates the interpretation and solution of complex problems, a core skill required in engineering practice. To review groupwork activities in large cohort, group-project based, professional practice subjects at the University of Technology Sydney (UTS), we used relational agency as a lens to evaluate and update our groupwork activities.

Relational agency is described by Edwards (2005) as “a capacity which involves recognising that another person may be a resource and that work needs to be done to elicit, recognise and negotiate the use of that resource in order to align oneself in joint action on the object.” The concept developed to explain the capacity for professionals from various fields to work on a common object. In an educational context, relational agency has been applied to professional development and used to describe the experience of postgraduate doctoral students (Edwards 2010; Pyhältö & Keskinen 2012). In terms of relational agency in the engineering and IT sector, Kinti & Pouloudi (2019) report on the role of relational agency in a complex, interdisciplinary software development collaboration. Edwards (2010) acknowledges that relational agency has the scope to inform “understandings of relationships between people who are positioned differently within the same practices”. It is this focus that we apply to group work for our students. Relational agency involves collaborators using their skills to work “alongside others towards negotiated outcomes” (Edwards, 2010).

Our preliminary research investigated the capacity for relational agency of undergraduate engineering and IT students. The study proposed a framework that described this capacity as developing from “novice” to “professional” (Machet et al, 2020). The framework outlined the student approaches and behaviours that characterise the various levels of relational agency. It also identified factors that inhibited or enabled the ability of students to develop this capacity. Findings from the initial study were used to iterate activity design and assessments in first- and second-year professional practice subjects containing significant group work projects.

This paper reports on subsequent research gathered in additional student and tutor focus groups run following activity redesign. The aim of this research phase is to apply the proposed relational agency framework to new data to investigate whether this tool successfully evaluates students’ capacity for relational agency. In addition, the student and tutor responses were analysed to determine whether the changes to activity design influenced students’ or tutors’ group work experiences.

Background

Our students are engineering and IT undergraduates at UTS completing one of two first-year or one second-year group project based, professional practice subjects. A team of tutors teach across these subjects and subject coordinators work together to design activities and assessments that help students develop professional practice skills.

The initial research phase reported in Machet et al. (2020) investigated group work through the lens of relational agency and identified five levels indicating the development of students’ capacity for relational agency (see Table 1). It was found that students who had been at university longer (not necessarily in the ‘higher years’) displayed a higher capacity and that, depending on the context, students may describe group work at varying levels.

Table 1: Levels of relational agency

Level	Description
0	No/little agency Students do as they are told by others. View themselves as objects in the collaboration.
1	Recognising other people as resources Students recognise that others are resources to assist in completing tasks
2	Eliciting work from other people Active agency in eliciting work. Recognition of the value of different resources
3	Pro-active engagement Agency within and outside of the group (e.g. with tutor), recognition of reciprocal contributions, giving feedback to peers to build their capacity
4	Adjusted interpretation Self-awareness of group dynamics and reciprocity, adjusting personal interpretations or behaviour

Three factors that could facilitate the development of relational agency were identified in the study: the psychological safety of students, a strengths-based approach to group work, and the overcoming of communication challenges. Significantly, misaligned motivations were identified by students as a problem impacting successful group work outcomes. However, in most cases, they described themselves as having little to no agency in affecting this.

These factors were considered in the design of assessments and student communication in subsequent semesters. Our teaching was largely online and so group work activities were adapted to this delivery mode. The iterative changes to address these issues included:

- Psychological safety: while icebreakers were already being used for tutorial classes (30 to 40 students each) additional ice breaking activities for project groups (4 to 6 students) were introduced to promote psychological safety.
- Communication challenges: clearer explanation of the importance of using online communication channels. As an example, the second-year subject included an additional timetabled hour for 'tutor drop-ins' to student groups' online meetings. This aimed to overcome students' communication challenges, such as finding time to meet, or to talk to the tutor as a group, as well as agreement on remote communication methods.
- A strengths-based approach to group work: additional scaffolding for students in the group formation stage was introduced including explicit discussion of different learning and working styles, and individual expectations. While group charters and contracts were already used, students were provided with examples from previous semesters on how a strength-based approach to group tasks may prevent future problems.

Methodology

Data was collected from two tutor and two student focus groups. Students and tutors volunteered to participate and were compensated with vouchers for their time. The focus groups were one hour long and used semi-structured interview protocols developed from the

outcomes of the initial research study. Tutors and students were asked about their experiences of group work throughout their teaching experience and/or university degrees. There was a particular focus on the subjects under study. Interviews were conducted by research assistants who did not directly teach or supervise the students and tutors. None of the students or tutors had participated in the initial research phase.

Participants were recruited from first- and second-year engineering and IT students who had completed one of three subjects in the previous semester. Each subject had at least one student participant. Seven students (from a combined cohort of ~900 students) were interviewed in a group of four, and a group of three students. The initial research focus groups had involved only high achieving students (volunteers). In this study, an effort was made to include participants with more diverse subject results (students received marks from credit to high distinction in their professional practice subject). For student focus groups, the questions included prompts for students to discuss the issues identified in the initial research, including barriers to communication and how group work tasks were allocated.

The student focus group data was analysed through the lens of the relational agency framework and coded according to the levels described. Where their comments displayed the characteristics of behaviours of one of the levels (0 to 4) they were coded as such. In addition, the inhibiting and enabling factors were coded where they emerged from the data (namely the psychological safety of students, a strengths-based approach to group work, communication challenges and misaligned motivations). Each focus group was analysed by two coders, and there was consistent coding found for inhibiting and enabling factors, and discrepancies in coding the relational agency levels were resolved between the coders before the outcomes reviewed and discussed amongst the broader research team. As the students in the focus groups had all experienced some changed activity design, we were interested in whether this was evident in the focus group.

Self and peer reviews completed in the subjects were used as additional sources of data for understanding student experiences. These reviews formed part of the students' assessment activities for the subjects and were completed before the students were recruited for the study. In the self and peer review, students are required to give feedback to peers at different points in the group project. The feedback was coded for demonstrations of relational agency levels. This data was used to corroborate findings from the focus group data and not as evidence of new levels of relational agency. As these reviews were part of the assessments, they may have inaccurately influenced the results.

Seven tutors (from a teaching team of 22 tutors) were similarly interviewed in one focus group of four and the other a group of three. Each tutor had taught one or more of the professional practice subjects. The tutor focus group discussion focussed on their experiences of facilitating group work in first- and second-year subjects. Tutor focus group data was analysed for emerging themes, and again, considered through the lens of the relational agency framework. It was used to determine whether tutors identified these levels in their students. Where tutors referred to any of the inhibiting or enabling factors, these were identified.

Results and Discussion

Overall, the students in these focus groups demonstrated higher levels of capacity for relational agency in their discussions than those in the initial study. All of the students demonstrated at least a level 2 according to the framework, and over half reached level 4. This is a significant change from the initial research, where the students displayed a wider range and few demonstrated level 4. The higher levels of relational agency are supported by additional comments in the discussion and by their self and peer review comments. A student who was coded at level 4 received the following feedback from peers supporting the rating:

He provides good feedback when he looks over work and provides suggestions that are relevant and help assist with the project.

The students all expressed an appreciation for the importance of group work and an understanding that we were developing skills they need (rather than their teachers 'saving on marking' or putting them in situations they will never experience in professional practice as has been reported by students previously). Many did qualify that, despite its importance, they did not enjoy it, for example, one student commented that:

That's not to say that I particularly enjoy group work. I just understand that we need to be able to build the skills of group work so that we can more effectively work in groups when we need to.

Those students who understood the necessity of having group work experiences, also communicated that they felt they had learnt and developed their skills at university.

It's a process ... back then I didn't know much about ... like working in groups like ... how to work in a group in general.

The students in the focus group were a small selection of those who completed the subject. The changes to the subject design were not yet consistent across the subjects and were not the only changes experienced by students (and teachers) since the previous semester. For example, the COVID-19 situation had significantly changed with some students being allowed back on campus. There is no data to directly attribute the higher levels of relational agency to the changes in activity design. However, it is reasonable to conclude that the focus on development of relational agency (in the activities and approaches from subject coordinators) would have contributed to these findings.

We found that the application of the framework to the student focus groups supported the concept that the capacity for relational agency develops with time at university.

The tutor focus groups were conducted with tutors who taught the professional practice subjects across first and second years. This gave them a view of students across the initial years of study and the chance to identify any progress across the cohort. Interestingly, in contrast to the students, no mention was made by the tutors of students' approaches to group work changing across the years of study. This may be because they do not see individual students from one year to the next to be able to evaluate the progression. It may indicate that as a cohort, the progression was not noteworthy, which is worthy of further investigation. The shared tutor team is being extended across later years for professional practice subjects and will enable this trajectory observation. That students (as opposed to their tutors) commented on the development of their groupwork skills also indicates that students themselves are better placed to evaluate their own skill development. In terms of the changes implemented to support the development of the capacity for relational agency, it was the tutor focus groups that identified these as useful. Tutors, having taught the subjects for multiple semesters, have the 'before' and 'after' view of subject design while students do not have this frame of reference. Extended group time in tutorial sessions and the increased explicit focus on the purpose of group work were identified as useful by the tutors:

I found that a short lecture and followed by lengthy group activity where you put them into breakout room ...I thought that was fairly effective and then getting them getting people to report back which was the strategy that we all struggled with in the beginning, something I found xxx has done quite well ... is trying to spend the first few weeks to really trying to establish I guess the principles of good teamwork.

Tutors supported the findings (and experience) of poor communication hampering the development of relational agency capabilities, whether this be in terms of language level, reticence to speak in public, or the technical limitations of online teaching. However, they did acknowledge that the group chats (which tutors had access to) and tutor drop-ins were valuable in supporting group communication.

Tutors discussed how using clearly identified group roles in the first-year engineering and IT subjects allowed students to discover their strengths and then apply this to the group work:

You can try on roles that you may not have been comfortable trying in high school and you can have one person be the group leader this week and one person be the group leader next week and rotate and sort of experiment.

And:

We used team roles to figure out what your team role will be in a team. Once a team is formed, yes, I have a particular strength in terms of team member and that helps you. It force and encourage them to express who they are and also assess the situation that we have here.

In talking about group work roles or responsibilities, most students supported a strengths-based approach. However, for many of them it was a matter of achieving the best marks and this meant doing (or redoing) the work of others:

I'll be really honest, I work hard and need to get good marks. So while I do think teamwork is important like for the long term like I can't help but be caught up in like the short term like just wanting to do well.

Followed by:

I want to talk to the group and be like OK what do you wanna do? What do you want to do? Like do you wanna do this section but this section I'm happy to do like the longer sections you know if 'cause ... I prefer working individually... So for someone like me was hard 'cause I had to really depend and rely on their team effort, especially 'cause they worked really towards the end of the assignment and I really wanted to finish things early so it was kind of hard to wait for them. And I was kind of like slowly doing their parts during the semester.

The strength-based approach seems to be a hurdle when there is conflict in the group resulting from non-participation and misaligned motivations. In these cases, group members deemed to be poor performers are not given the opportunity to contribute their strengths. Instead, the group member who is (or considers themselves to be) the strongest may complete the work. This response from highly motivated and participating students is understandable. However, the 'unmotivated' or 'non-participants' may miss out on skill development. These 'high-performing' students have made a judgement that their peers have nothing to contribute and that they cannot learn anything from them. This may not be true. It is a shortcoming of focus groups such as these that students who are reticent to participate in group work are less likely to be represented.

The misaligned motivations were noted by both tutors and students as being a significant inhibiting factor in group work. Students in the focus group exhibited some agency (by honestly completing the self and peer review or requesting help from tutors). Despite this they considered the effect of their actions limited in the circumstances. Of interest is that almost half the students compared groups to the 'real world', considering the group work at university to be inauthentic when it comes to misaligned motivations:

However, the difference between group work in the workplace and in university is that in the workplace, if someone is not pulling their weight they're gone, but in university if someone's not pulling their weight you have to just keep on carrying them. And there seems to be very minor penalty for not carrying your weight.

There are significant differences between university group work and professional practice, but these comments indicate that the group work has not been suitably contextualised - students do not see university group work as representative of engineering practice where conflict and management challenges face teams in the workplace (for example Dulebohn & Hoch, 2017). These same students understood (as above) that group work was important to their professional practice, but they have indicated that they believe they will not face problems of misaligned motivations in the workforce. This suggests an opportunity to design scaffolded content that indicates how their experience at university is representative of behaviour in practice. We will trial case studies of group conflict sourced from university and

from professional practice which explicitly link these experiences. This will be designed to contextualise and develop students' perception of the authenticity of their group work experiences. In addition, when on-campus teaching resumes, we plan to include roleplay activities around these concepts and case studies.

Conclusions and Recommendations

The results of this study suggest that the activity design and assessment changes have supported tutors in developing students' group work skills (though not specifically in terms of relational agency). In addition, students who have experienced the new activity design were able to express higher levels of relational agency and are aware of their skills progressing as they have exposure to group work. The increased focus on developing relational agency has arguably brought benefits to students in terms of understanding the importance of group work. Furthermore, it has encouraged students to communicate higher levels of relational agency and express how their skills have developed.

Initial research identified the capacity for relational agency as a valid lens for reviewing group work activities. In this paper we have demonstrated that it is useful at a subject level to focus on the enabling and inhibiting factors identified, rather than on the broader scope of capacity for relational agency. In presenting this study to a teaching and learning forum at the university, the feedback from educators (experienced in group work in their own fields) indicated concern that the framework missed some factors that contribute to successful group work. These factors included group composition, personal learning styles, activity design, and the temporal aspect of group work. We acknowledge that the framework looks predominantly at a single dimension of group work, and this feedback has encouraged us to critically analyse the framework and to represent some of the 'missing' components.

In essence, it is this progress that we are looking to support and assess in our teaching. We propose that as engineering educators, we take on board a temporal view of the development of relational agency and make use of students' own ability to identify their skills progress (as emerged from the student focus groups). To develop relational agency, activity and assessment design should take a "whole of degree" approach, allowing students to reflect on the development of the skills. This should include presenting students with the framework to indicate how they can develop and to give them a language to question, evaluate and communicate their learning. This "whole of degree" approach to the development and assessment of relational agency could have the added advantage of incorporating students' internship and work experience – it is here that students are likely to best contextualise the framework and appreciate how relational agency may support their professional practice.

As one of the first reported studies of applying relational agency to undergraduate studies, the relational agency framework described and used here is emerging. Through approaching group work activity design from the viewpoint of developing the capacity for relational agency, we have uncovered useful insights into students' skill development. We have also identified areas where the framework can be enhanced and applied.

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Acknowledgements

This research is the final phase of a grant supported by the UTS First and Further Year Experience. Thank you to the students and tutors who participated in our focus groups.

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