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OPTIMISING COLLABORATIVE LEARNING AND GROUP WORK AMONGST TERTIARY STUDENTS

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Team work and group assessments have become very common in the higher education context with the aim of enhancing communication skills and student engagement. However, group member accountability introduces a new challenge and constraint to groups in achieving their best performance. To investigate this issue, the current research analyzes the relationship between performance of individual members and group composure to test their relationship and dependency. Towards this research aim, individual and group marks in several units in were analyzed statistically. Empirical results show that there is tendency amongst same-gender students to team up together and this has a significant impact on group results. The current research contributes to improvement of theory and practice in higher education and identifies opportunities to enhance effectiveness of group work.

Keywords: Collaborative learning, Free-riding, Gender equality, Group assignments, Individual assessment, Performance and output, Project-based learning, Self-selected groups, Student experience, Higher education pedagogy.

1 INTRODUCTION

Previous research has shown the interdependence between group learning and graduate attributes related to employability and resilience (Arashpour *et al.* 2015). These justify the investment of higher education providers in developing modern learning infrastructure that facilitates 'learning in the round'. Interactive lecture spaces are often equipped with cutting-edge technology to enable peer presentation and group collaboration (Asok *et al.* 2017, Stache *et al.* 2017). Sometimes design of learning spaces can be self-configured by students to better suit collaborative activities (see Figure 1).

Although modern and interactive spaces provide the required infrastructure for collaborative work, the role of instructors in facilitating 'learning in the round' is still crucial (Arashpour and Aranda-Mena 2017, Khuzwayo 2018). Educators should encourage student groups to work efficiently on collaborative assignments with the aim of developing decision-making skills, communication and critical thinking (Adwan 2016). Towards this aim, important factors in designing group activities include but are not limited to optimal group size, member selection methods, proper scheduling of teamwork, and setting challenging tasks (Arashpour *et al*. 2018b)

Figure 1. Collaborative learning spaces for facilitating group works.

The aforementioned factors can significantly influence dynamics of teamwork; however, they do not necessarily optimize member interdependence, involvement, and fair division of labor (Caple and Bogle 2013). One variable that has been largely overlooked by the higher education literature is the influence of gender-inclusiveness. This variable can provide essential intellectual and social resources to groups and encourage both female and male members to develop a sense of responsibility towards the team success (Magogwe *et al.* 2015, Arashpour *et al.* 2018a). The focus of current research will be on impacts of gender inclusiveness on collaborative learning.

2 BACKGROUND

The main objectives of group work in classrooms are to develop skills including communication, cooperation, collaboration, and compromise (Arashpour *et al.* 2017a). Considering the importance of group work and its objectives, tertiary educators need to make every effort to understand dynamics of group activity in order to enhance student experience. The following sections provide background information from the literature on two important variables of member assignment and gender differences that have major influence on group dynamics.

2.1 Group Composition

There are several methods by which students can be assigned to working groups including self-selection, random assignment, hybrid methods, and purposeful assignment. Self-selected and instructor-selected groups are both very common in the tertiary education context (Ficano 2018). In self-selected groups, students can freely select the members they want to work with. Previous research has shown the superior performance of self-selected groups in terms of communication between members, confidence in the collective competence, and enthusiasm to work together (Khuzwayo 2018). Self-selected groups, however, can face problems with regard to time management, completing work of other members, and failure to follow commitments (Woolard 2018).

Instructor-selected groups are usually formed by random assignment of students to different groups. Furthermore, group composition can be determined by adopting a hybrid approach by which students first have the opportunity to form groups themselves and then instructors assign remaining students to existing or new groups (Woolard 2018). Another approach to form instructor-selected groups is to purposefully assign students based on some assignment-related criteria. Instructor-selected groups minimize the problems of free riding (Ali *et al.* 2018), and boredom caused by working with same circles of friends (Nasirian *et al.* 2018). Instructor-selected groups, however, are not usually favored by students, and members are less likely to work together in future group activities (Thrall *et al.* 2016). Reviewing the tertiary education literature suggests that member assignment methods have significant impacts on group dynamics and should be chosen based on course and cohort characteristics (Stache *et al.* 2017).

Self-efficacy beliefs can explain many gender differences in learning and academic performance. Self-efficacy determines whether or not female and male students believe in their learning capability (Stache *et al.* 2017). Theorists contend that past research related to gender differences in academic learning has frequently centered on individual performance and has often neglected group activities and their dynamics (Zitzelsberger *et al.* 2015). The objective and contribution of the current study is to bridge the existing gap by focusing on group dynamics in higher education under influence of important variables such as gender differences and member selection.

3 RESEARCH METHOD

Different higher education courses were selected in which there were both group assessments and individual assessments including projects and final exams. Collected student performance data were analyzed to test the three developed research hypotheses. Altogether, 60 students comprising 25 males and 35 females participated in this study. The students were in year two to four of their undergraduate studies in two public Australian universities. Table 1 shows the median and interquartile ranges (IQR) of assignment marks for the study population sample.

Table 1. Median and interquartile ranges of assignment marks for the study population.

N= 60	**Marks Median** (IQR 25%-75%)
Female 41.6% Male 58.4%	
Individual Project	**85** (75.6-92.5)
Group Assignment	**80** (76-88)
Final Exam	**80** (68.5-86)
Total Score	**81.5** (72.2-87)

4 ANALYSIS AND RESULTS

Previous research has shown the importance of motivational beliefs on academic performance of tertiary students (Caple and Bogle 2013). Among the others, self-efficacy, recognition of task value, and learning goal orientation are the most influential motivational beliefs. On this basis, pedagogical interventions to enhance motivational beliefs can be beneficial. However, such interventions have not been customized to reflect unique characteristics of learning in female and male students (Ali *et al.* 2018). Some research in higher education literature claims that motivational beliefs and therefore performances of female and male students in group activities

are not significantly different. Towards the aim of this research, the validity of the above claim is tested by developing the following research hypothesis:

Null Hypothesis: Performances of female and male students in group activities are not significantly different.

As discussed, individual and group marks of 60 students were analyzed across a variety of assignments including projects, quizzes and exams. The first null hypothesis proposes that performance of female and male students in group activities are not significantly different. In the first step to test the hypothesis, descriptive statistics including median and interquartile ranges (25%- 75%) were used to summarize data (see Table 2). As can be seen, for the studied population sample, the median (50^{th} percentile) of achieved marks has been higher for female students in both individual and group assignments.

Table 2. Effect of gender difference on assignment outcomes.

	Female Median (IQR)	**Male Median (IQR)**	**Effect Size**	**P-value (t-test)**
Individual Project	**90** (77.5-92.5)	**82.5** (75-92.5)	0.7	0.1
Group Assignment	**88** (80-92)	**80** (72-84)	0.8	0.05*
Final Exam	**82** (70-90)	**77** (64-84)	0.5	0.1
Total mark	**85** (73.5-89.5)	**78** (70-85)	0.75	0.02*

Although descriptive statistics are helpful in measuring central tendency and variability of data, inferential statistics are required for an in-depth interpretation of trends (Arashpour *et al.* 2018c). On this basis, t-test was deployed to measure the significance of difference between achieved marks by female and male students. Furthermore, Cohen's effect size was calculated to translate the difference between the two groups into standard deviation units.

As Table 2 shows, the p-value derived from t-statistics indicates the significant difference between performance of female and male students in group activities. More importantly, the effect size of 0.8 suggests that performance of the two groups differ by 0.8 standard deviations. Both descriptive and inferential statistics result in rejection of the null hypothesis and confirm that performance of female and male students in group activities are significantly different.

5 CONCLUSIONS

The optimization of collaborative learning and student experience in group work has long been the focus of research in higher education literature. However, only few studies have adopted a holistic approach that considers important performance variables such as gender inclusiveness and selection interventions in collaborative learning (Arashpour *et al.* 2017b). In order to bridge this gap, the current research analyzed individual and group performances of a large population sample of tertiary students to shed light on dynamics of group work in higher education. Results of analysis were used to test three research hypotheses around performance of different genders in group work, relationships between individual performance of associated members and group outcomes, and finally the role of instructor interventions to form gender-inclusive teams.

Using both descriptive and inferential statistics, it was found that female students generally outperform their male counterparts in group assignments. This superiority creates a tendency to form all-female groups with the aim of achieving higher marks in group exercises. Therefore, instructors' interventions will be required to maximize gender balance in all groups. Considering

the diversity of motivational beliefs and self-regulation in male and female cohorts, such interventions will optimize learning goal orientation, task value, and self-efficacy that are key ingredients for group output and performance.

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