



Built Environment and Engineering  
Brisbane Australia



# Strategies to engage engineering students in group work

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## Group Work





## Introduction

### Research Question

Does formation of student teams/groups and a more structured approach to assessment practices contribute to better student engagement and satisfaction along with overall academic results.

A study was devised based around two existing core units in the Bachelor of Engineering degree.



## Introduction

### Research Objectives

- How effective are team formation processes,
- What are the practical implications by prescribing marks and what lessons can be learnt through self and peer assessment, and
- Does student satisfaction equate to overall performance based on engagement with the project and a reduction in dysfunctional groups and staff time.



## Background and Context

Expectation of today's Engineering Graduates?

- transfer basic knowledge to real-life engineering situations,
- work in multi-disciplinary teams,
- adapt to change and solve problems in unfamiliar circumstances,
- think critically and creatively and,
- a commitment to continuous life-long learning and self improvement



## Background and Context

Engineering educators adopting group based, project based and problem based strategies.

These strategies are delivered through activities that also help develop other graduate attributes such as ability to identify, formulate, and solve engineering problems and the ability to communicate effectively.

**Problem** - Equipping students with necessary skills is much harder than determining whether or not they have these skills.



## Team/Group Skills

Do we provide training in team skills for our students, or ensure a structure for the ongoing development of those teams?

Do we monitor the progress of those teams?

Negative experiences can sour students' attitudes toward all team participation and affect their performance in later work teams.



## Team/Group Skills

### **FACTORS THAT NEGATIVELY IMPACT TEAM PERFORMANCE**

- Overdependence on dominant leader,
- Tendency to conform
- Overcommitment to goals
- Tendency to make risky or conservative decisions than individuals acting alone
- Social loafing
- Unresolved conflict



## Use of online Team Management system (TeamWorker)

- helps students and teaching staff manage their group activities and assessment,
- facilitates the early identification of problematic group dynamics thereby enabling early intervention,
- supports the teacher and students and,
- minimise the consequences of conflict becoming unhealthy



## Student Group Organisation

Academic Unit	Group Size	No of Groups	M/F %	Mixed M/F Groups %	% Groups with Leader	Response Rate Tasks TW %
ENB274- 2008	4	32	88/12	40	21.8	96
ENB274- 2009	4	46	84/14	26	19.6	94
ENB342- 2009	3	38	95/5	13	31.6	78



## Team Formation

Team formation varies significantly

Student teams frequently operate without explicitly assigned roles or established authority and are often classified as “informal”.

Group processes will generate a group leader, but not always the best leader and since leadership may affect performance, the quality of the informal leader can add or detract from team success and learning.



## Team Formation

In CE student groups in both 2008 and 2009 were partially social engineered based on previous results in design based units and,

- always making sure that there was never 1 female within a group,
- making sure that a maximum of two international students or mature age students per group.

In EE students were allowed to form groups randomly.



## Academic Results CE

**Significant difference** in academic achievement between the mixed gender groups.

All Male group average grade  
4.3 out of 7 in 2008 and  
4.6 out of 7 in 2009;

Mixed group average grade  
5.8 out of 7 in 2008 and  
5.8 out of 7 in 2009).



## Organisational Results CE

**Considerable variation** based around group organisation.

Groups with assigned leaders Average project grade  
4.7 out of 7 in 2008 and  
4.9 out of 7 in 2009.

Groups with no formal leadership structure achieved much  
higher performance with average grades  
5.6 out of 7 in 2008 and  
5.8 out of 7 in 2009.



## All Results EE

Group marks indicated there was *little difference* in academic achievement between the mixed gender groups  
Male average grade of 5.7 out of 7

Mixed group average grade of 5.2 out of 7.

**Minor variation** based around group organisation

Groups with assigned leaders average project grade  
5.8 out of 7

Groups with no formal leadership structure achieved slightly lower performance with average grades

5.6 out of 7.



## Findings

Students have become more aware of their own strengths and weaknesses.

Students also are becoming more adept at identifying the balance in terms of each individuals "team role preference" defined by Belbin.

Many students found the project challenging yet rewarding.

In the reflective assessment of their group performance (after completing the assessment) students also identified areas in which they needed to improve.





## Findings

In CE the number of dysfunctional teams has reduced from nearly 20% prior to the implementation of TeamWorker (2007) to 11% in 2009.

The implementation of both self and peer assessment ratings reduced the number of individual complaints

The social engineering of team formation reduced the number of dysfunctional teams and thus teaching teams time in dealing with these issues.

Students identified social loafers in 21% of the groups in ENB342 in 2009. As a result team formation will be reviewed in this unit in 2010.



## Conclusion

A more structured approach to assessment practices, connection to learning objectives, their fairness and use of a group management tool has enabled students to develop:

- group skills,
- undertake critical reflection on tasks and process,
- better understand group processes including awareness of phases of group development and,
- allow effective management at a personal and group level.



## Conclusion

Both student (through self and peer assessment) and staff feedback highlight this approach:

- as enhancing student engagement and satisfaction,
- improved student understanding of team roles,
- reducing the number of individual complaints from the students, reducing number of dysfunctional teams whilst
- requiring less commitment of teaching teams time in dealing with these issues.

More work to be done!!



## Questions?