INTERNATIONAL DESIGN CONFERENCE - DESIGN 2004
Dubrovnik, May 18 - 21, 2004.

DESIGN 2004

MULTIPLE PERSPECTIVE ASSESSMENT STRATEGIES FOR GROUP WORK

A. Williams and T. Gajendran

Keywords: assessment strategies

1. Introduction

Within the Australian context there has been an increasing focus on the quality and effectiveness of the student learning experience in University programs. The momentum has been toward the enhancement of professional programs through the enrichment of the curriculum with a range of professional attributes. The momentum, created by this initiative has been significant in the design and engineering related disciplines. This momentum has been created in the Engineering discipline by the development, implementation and evaluation of Programs against attributes defined by the Australian Institute of Engineers. These attributes have added a measure of complexity to the delivery of the programs, this most noticeable in the assessment of student performance in the attainment of these attributes. This paper looks at the assessment processes of the professional attributes of collaboration and effectiveness as a team member.

Authors such as Cross [1983] and Olsen [1992], consider the thinking processes involved in group design and problem solving. This research provides a level of understanding about the protocols that designers follow within groups interacting face to face, these now being the framework for curriculum considerations. Broome and Chen [1992] focused specifically on group design and problem solving in a technological context. The majority of this research, in the use of the design paradigm, has been in the industrial domain [Cooley, 1994]. The effective implementation into a curriculum provides considerable challenge.

2. The Roles of the Assessment Process

Assessment of students is a fundamental and pervasive element of teaching and learning, and a potentially powerful means of driving their continuous improvement. Assessment is a complex, multi-faceted system (process), having the primary purpose of motivating, directing and enhancing student learning. Assessment events may be of two broad kinds, distinguished by whether or not they contribute to a student's final mark or grade for a course, though a single assessment item may fulfill both roles. In *summative assessment*, the most familiar kind, assessment events contribute to the final mark or grade in a course. The event serves the primary purpose of assessment i.e. "motivating, directing and enhancing student learning".

Formative assessment, on the other hand, is aimed at facilitating learning. In this type, assessment events are designed and offered during a course to guide students in their learning and to allow them to find out how well they are doing it. The products may be marked or graded by the students, their peers or teachers, simply to give them feedback, and the marks or grades may not aggregate into the final course mark or grade. Formative assessment is a valuable adjunct to summative assessment for these reasons.

3. The Assessment Process Implemented at Newcastle

As a measure to address the concern of lack of core skills the assessment procedures were modified through the introduction of peer, self and lecturer assessment of the targeted core skills, this providing the multiple perspective evaluation of a student's performance. Such a procedure was designed to assess those core skills not evident in the group report. The core skills for this course were expressed as:

- participation in group meetings/discussions,
- degree of preparation for group meetings/discussions,
- communicates well with the group,
- makes positive contributions to group dynamics,
- fulfil allocated responsibilities.

The course assessment was modified to include peer, self and lecturer assessment was performed two times during the module. Each student assessed themselves and the other students within their team on the defined criteria (see Table 1).

The five key skills associated with team participation were assessed/evaluated. The methodology developed to support students in the evaluation of both their own and their peers was informed by the methodologies proposed by Habshaw [in Gibbs, 1995] involving:

- Detailed instruction and discussion of the process prior to implementation.
- Process should be trialled before full implementation.
- The topic chosen for study should be new to all students in the group as to remove any notion of advantage.
- There should be no free choice for individuals allowed within the topic, the outcomes should be specific.

This process involved the evidence of each skill being ranked from 1 to 5, as demonstrated in the evaluation sheet below.

Table 1. Peer Assessment Sheet

Please fill in the following assessment sheet using the key below:

- **1 never**
- **2 rarely**
- **3 sometimes**
- **4 most of the time**
- 5 always fulfils task completely

For the person under consideration circle the number that is most appropriate:

		Never				**Always**
1.	*Participation in group meetings/discussion.*	1	2	3	4	5
2.	*Degree of preparation for group meetings/discussions.*	1	2	3	4	5
3.	*Fulfils responsibilities allocated at group meetings.*	1	2	3	4	5
4.	*Communicates well with the group.*	1	2	3	4	5
5.	*Makes a positive contribution to group dynamics.*	1	2	3	4	5

Student teams were also required to maintain a Log of the project in the form or team meeting notes. The meetings were documented using a formatted report. The documentations required documentation of the contribution of the individual team members and provided a summary of issues and decision making outcomes. The meeting pro forma is summarized in Table 2.

Table 2. Meeting Documentation Pro Forma

PROJECT MEETING LOG	
Meeting Date:	Time:
Team Members Present:	
Report on Carried Over Actions or Items	*Member Reporting*
Issues Discussed	Decisions
Participating Member	
Meeting Date:	Time:
New Actions	*Member to Action*
Members in Attendance Sign-off	

4. Assessment Experience

Team working skill does not develop simply with the formation of students groups and letting them perform group assignment. Team work environments have to be properly designed, managed and assessed from a learning perspective. As project managers the graduates of the Construction Management program require team working skills. The above mentioned assessment methodology to measure team work effectiveness was piloted in a 5 week integrated problem based learning module in the first year Construction Management Program. This module was chosen to explore how students manage team work in a short term group assignment. The assignment was real life problem, drawn from an industry context, development of residential land. The project demanded industry standards and skills to be employed by the students in developing their solution to the problem.

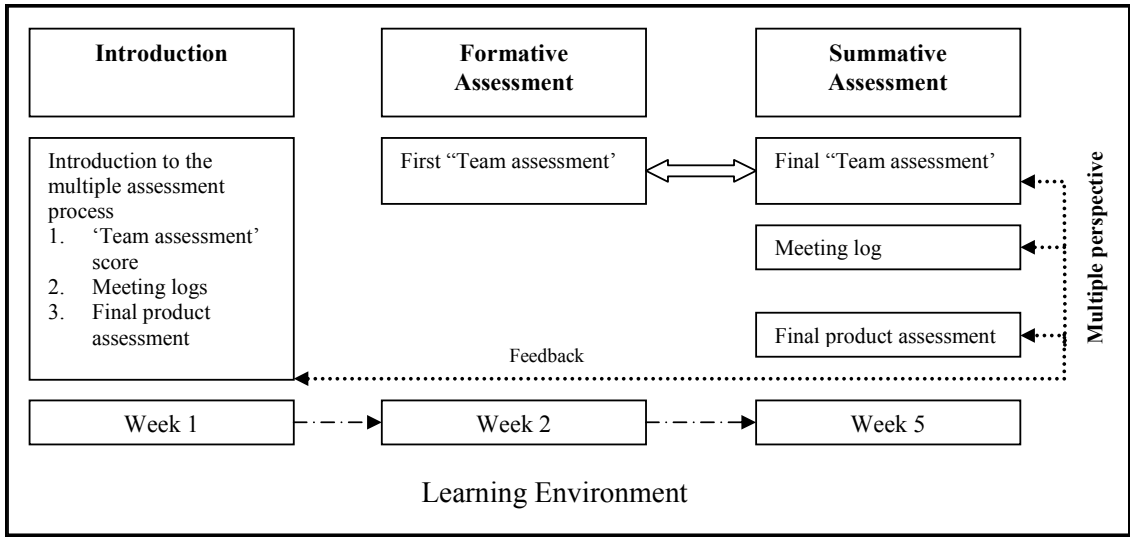

Figure 1. Conceptual Framework of the Module

4.1 Setting up the team work environment

In, industry, in most instances, individuals do not have the choice of picking the team members with whom they work, rather the individual is directed to a team. In the module, students were not given the choice to form their own teams, team formation was managed by the lecturer and twelve groups of 3-4 members were formed. The assessment methodology was explained to the students focusing not only on the assessment process but also on the industry context and practice. Two assessment ratings were requested from each student one in the middle and the other at the end of the course. The first of the Assessment processes was to provide formative feedback to the student allowing them to address

issues with their performance prior to the summative assessment phase. Meeting logs were submitted at the end of the course and provided evidence and validation of the students' performance of tasks as well as documentary evidence of the methodology applied by the group. The assessment of the log also provided a basis for student feedback about the activity.

4.2 Effectiveness of the peer assessment system in assessing group dynamics

In the evaluation of the effectiveness of the process and the relationship of the students' self and peer assessment ratings in comparison to the project outcome was conducted using a statistical analysis methodology. Table 3 indicates overall average rating over all five assessment criteria as allocated by each team member for first and final assessment (this is an average of all ratings of all members of a group). It can be observed from these tables that some the teams have improved their teamwork skills over the duration of the module while some did not (R1 is the first team assessment and R2 is the final team assessment). Groups A, B, H & K experienced a decrease in effectiveness whereas groups D, E, G & J perceived an improvement in their effectiveness.

Table 3. Average mid and final assessment rating for each group

	R1*		R2*		
Group	Mean	No of Response/ Group size	Mean	No of Response/ Group size	% Difference
A	4.73	(2/3)	4.62	(3/3)	-2
B	5.00	(4/4)	4.89	(4/4)	-2
C	4.62	(3/3)	4.44	(3/3)	-4
D	4.60	(3/4)	4.78	(4/4)	4
E	4.47	(3/3)	4.87	(3/3)	8
G	4.44	(4/4)	4.90	(4/4)	9
H	4.20	(3/4)	4.09	2/4	-2
I	-	(0/4)	5.00	(4/4)	
J	4.89	(3/3)	4.98	(3/3)	2
K	4.83	(2/3)	4.58	(3/3)	-5
L	-	(0/4)	5.00	(4/4)	

Note: * R1 – First raring R2- Final rating

First 'team assessment' (performed during the second week of the module) was processed and students were given their performance on each of the five criteria. Table 4 presents the average first 'team assessment rating' scores for some of the students (Column - R1). The intention of this was to provide formative feed back and help students to identify where the team felt they are lacking or doing well. First 'team assessment' scores provide more insight when it is compared to the final 'team assessment' (Table 4 - Column 2). The first and final 'team assessment' scores will indicate to students where they have room for improvement and help to identify what made the improvement or deterioration of their team performance during the module. Observe student 5 (Group B) and Student 19 (Group G) in Table 4. In the first case the student has come down on the final rating indicating the team working performance of the student in the latter half of the module is not as it was at the beginning. This also means this student has not performed up to the expectations of the other team members. In the latter case the student has shown improvement in this team work performance based on his first formative team assessment. These 'team assessment' can be very useful, as formative and summative tool, to map how the team members perceive about their colleague performance and by providing the students with a positive learning experience.

Table 4. Individual student 'team assessment' score (Mean value)

Group	Case	Participate in meeting discussions		Degree of preparation for group meeting/ Discussions		Fulfills responsibilities allocated at group meetings		Communicates well with the group		Makes a positive contribution to group dynamics		Overall	
		R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
B	4	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	5	5.0	5.0	5.0	4.0	5.0	4.3	5.0	4.5	5.0	5.0	5.0	4.6
	6	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
	7	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
C	8	3.7	3.3	4.3	4.3	5.0	4.7	4.7	4.3	5.0	4.7	4.5	4.3
	9	5.0	4.7	4.0	4.0	4.7	4.3	4.7	4.7	4.3	4.3	4.5	4.4
	10	5.0	5.0	4.3	4.0	4.7	5.0	5.0	4.7	5.0	4.7	4.8	4.7
G	18	4.8	5.0	4.5	4.8	4.5	5.0	4.8	4.8	4.8	4.8	4.7	4.9
	19	4.0	4.8	4.3	4.8	4.5	4.8	4.3	4.8	4.5	5.0	4.3	4.8
	20	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.8	5.0	5.0	5.0	5.0
	21	3.3	5.0	3.3	5.0	3.5	5.0	4.5	5.0	4.5	5.0	3.8	5.0
K	33	5.0	5.0	4.5	4.3	4.5	4.0	5.0	5.0	5.0	4.7	4.8	4.6
	34	5.0	4.7	4.5	3.7	5.0	4.7	5.0	4.7	4.5	5.0	4.8	4.5
	35	4.5	4.7	5.0	4.7	5.0	4.7	5.0	4.3	5.0	4.7	4.9	4.6

5. The Group assessment ratings and final product assessment marks

The relationship between the final assessment product marks and average 'team assessment' scores for each member provides an interesting insight. Majority of the students, through their evaluations, indicate they are effective as a team and have produced an industry standard product. However, the correlation analysis of final assessment product marks and the team assessment scores did not indicate any correlation ($R2 = 0.31006$). This result indicates that some of the teams who claimed high team skill ratings (e.g. 5 or 4.9) did not produce a quality final assessment product. In the evaluation of the logs it was observed that the groups with poor product outcomes also submitted poorly maintained logs. The logs of these groups also indicated poor decision making processes based on uninformed decision making. These groups' actions plans were not properly formulated or the formulated action plans were not followed in the following meetings, this evidencing poor management and process skills.

6. Reflections on the tool

This tool evaluates the team process through a multiple perspective approach and did achieve the goal of demonstrating to the students how their teamwork could improve. However, the analysis indicated that the final assessment products were not to the standard the 'team assessment' scores claimed. It can be observed from Table 5 where 86% of the students are claimed their group performance is superior with a score of 4.5 or above, only 21% actually produced a quality final product. The inflated ratings could exist for the following reasons:

1. Lack understanding or confidence in conducting self and peer evaluations based on prescriptive criteria
2. The evaluation criteria that express the quality of the contribution of the individual during the project
3. The rating scale descriptions are too precise and not enough variability
4. Students have not acknowledged industry practice and therefore did not benchmark their level of performance
5. Students deliberately inflated their evaluation hoping to gain better marks, demonstrating a lack of understanding of the assessment process.

Although students rating did not correlate with the final product quality, this is very valuable tool and improvements to address the above mentioned problems will make this tool robust. The first three identified issues can be addressed by improving the implementation of the project with students. Despite the assessment method being successfully implemented with Science and technology

programs it would appear that students in this program requiring further contextualization. The proposed steps will be introduced at the next implementation:

1. Conduct peer evaluation training
2. Expand the number of evaluation criteria
3. Use an expanded scale with satisfaction rating – A score of 1 indicating low-level of satisfaction and 10 indicating high level of satisfaction

Table 5. An conceptual indication of the product quality and the team rating

Product Assessment			Team Assessment		
Assessment Product Rating (In comparison to industy standard)	**NO**	**%**	**Rating Bamds**	**NO**	**%**
Excellent standard	0	0	**5**	14	36
Good standard	8	21	**4.5 to < 5**	18	46
Average standard	20	51	**4 to 4.5**	5	13
Minimum acceptable standard	11	28	**3 to 4**	2	5
Below standard	0	0	**Below 3**	0	0
Total	**39**	**100**		**39**	100

Addressing issue 4 will require students receiving a prescriptive demonstration of the relationship of procedure to project outcome and how the assessment process accommodates this in evaluation of student performance. There is also the potential for role play to be used to develop student understanding of group process.

7. Conclusion

The introduction of this assessment model into the program did achieve a range of positive outcomes. These include:

- Students did gain skills in team project development
- Students were provided comprehensive feedback as part of the formative assessment process
- Students' have a heightened awareness of their responsibility in a team project

The assessment method will be introduced to a new module in the coming semester, with the proposed changes. This module will be of fourteen week duration and will provide more opportunity to provide students with formative assessment feedback. The opportunity to provide students with the correlation between process and the project outcome did lead to positive discussions and students who were involved in this project will have a greater appreciation of teamwork skills and protocols.

References

Broome, B.J., Chen, M., 1992, Guidelines for Computer Assisted Group Problem Solving: Meeting the Challenges of Complex Issues, Small Group Research, Vol. 23, No. 2, pp 216-236.

Cooley, E., 1994, Training an Interdisciplinary Team in Communication and Decision Making Skills, Small Group Research, Vol. 25, No. 1, pp 5-25.

Cross, N., 1983, The Relevance of Cognitive Styles in Design Education, Design Methods and Theories, Vol. 17, No. 1, 1983, pp 35-70.

Gibbs, G., 1995, Assessing Student Centred Courses, The Oxford Centre for Staff Development, Oxford Brookes University, Oxford.

Olsen, G.M. et al, 1992, Small Group Design Meetings: an Analysis of Collaboration., Human Computer Interaction, Vol. 7, pp 347-374.

Anthony Williams
University of Newcastle, School of Architecture and Built Environment
Callaghan, N.S.W., Australia, 2308
Telephone: 61 2 49215865, Telefax: 61 2 49216913
E-mail: tony.williams@newcastle.edu.au