Peer assessment in large group projects: forming professional attitudes in IT students

Richard Raban and **Andrew Litchfield**
Faculty of Information Technology, University of Technology, Sydney, Australia
richard@it.uts.edu.au ajl@it.uts.edu.au

Abstract: *The ability to assess the work of others is one of the core skills for IT professionals. Developing this graduate-attribute requires the learning of peer evaluation, feedback and review skills by students. This paper discusses the changing design of peer assessment and the impact of a new groupwork support tool within a capstone undergraduate subject with large student numbers - Systems Development Project – in the Faculty of IT at UTS. From 1998 to 2005 by implementing different support strategies for peer assessment of individual contributions, the distribution of the students marks has markedly widened, and now more reflect the reality of differing team member contributions. This substantial change has occurred with the use of an online tool which supports the development of student evaluation, feedback and review skills when peer assessing individual contributions to large group projects. In use since 2004 the groupwork support tool is called Team Contribution Tracking - TeCTra.*

Introduction

In many disciplines tertiary courses include significant capstone subjects involving projects that require large student teams. When facilitating peer assessment with a holistic approach (Schechtman 1992; Schechtman and Godfried 1993), the common assessment strategy for groupwork of allocating the same mark to all team members (Rosen 1996; Lejk and Wyvill 2001; Kennedy 2005) is not adequate as the project tasks are extensive, the teams are large in number (more than four members), extend for the whole semester and groupwork can constitute 100% of the final student assessment. The subject coordinator has limited opportunities to observe and assess the complex group and teamwork dynamics that are taking place. A peer-assessment and review strategy is required which is ideally formative, diagnostic and summative (Goldfinch 1994; Gatfield 1999). This ideal has been difficult to achieve (Lejk and Wyvill 2001; Li 2001) and remains as an important and unresolved feedback and assessment issue.

Peer assessment has been shown to support not only students learning but also improve their understanding of the assessment processes themselves (Bloxham and West 2004). Peer assessment is also required to assess individual contributions to group assignments (Johnston and Miles 2004). The development of the evaluation, feedback and review skills required to peer assess these complex teamwork processes is a key learning objective of such large project-based capstone subjects. These are skills every professional should possess and be able to use for different purposes. It is also important for the novice professional to experience being on the receiving end of peer assessment and to learn to benefit from any feedback received.

Subject description

Systems Development Project (SDP) is a capstone subject in the Bachelor of Science in Information Technology at UTS with 350-400 students each year. In SDP the students experience working in a team and learn how to apply their pre-requisite knowledge to a practical system development problem. Before undertaking the subject the students do not have any prior experience in large-group university projects. The project involves developing a system from specifications to a working software product.

SDP involves groups of ten students in a major project that takes 50% of their study time (12 credit points) for a full-time student for one semester of 15 weeks. Groups are selected by the Subject Coordinator to ensure that each group has a mix of local and international students and that students

enrolled in different courses are represented in each group. No teamwork skills or suitability for different team roles are tested and used in group forming. So in effect groups are selected at random and have a great degree of autonomy. They are responsible for planning and allocating project tasks and organizing work in the groups. Staff members, usually project managers from the industry, are Project Managers responsible for overseeing the groups' progress and attending to problems with group dynamics and project work.

Peer assessment in the project

Students are required to undertake a number of peer assessment activities. Firstly, they review other groups' work at the two project milestones – a mid-semester review and a end-of-semester final review. Secondly group members are asked to assess the individual contribution made by each member. This assessment is done formatively and progressively during the semester, and then summatively during the mark allocation of the mid-semester and final reviews.

The project outcomes as assessed by the peer and staff reviews produce an overall mark for the group effort. This mark is then multiplied by the number of students in the group and the result becomes a pool of marks that the group members must distribute amongst themselves according to their assessment of individual contributions to the project. Guided by instructions given to them in the assessment policies and procedures a meeting of all the team members is convened to discuss the mark allocation. The groups are advised to start the meeting with a round of statements by the team members about their respective contributions to the project. Then through discussion and negotiation the group arrives at an allocation of the marks that all team members can agree on. The results are then presented to the Project Manager, a staff member, for approval. Once the consensus on the mark allocation is confirmed the individual marks are accepted.

Supporting peer assessment of individual contributions

In capstone subjects with large group projects students are often given responsibility to allocate individual marks according to the perceived individual contributions made by each team member. This responsibility has proven too difficult for students to distribute and has resulted in an equal distribution of marks irrespective of the actual contributions (Rosen 1996; Lejk and Wyvill 2001; Kennedy 2005). Good students are dissatisfied with their summative grade while poor performers receive undeserved rewards.

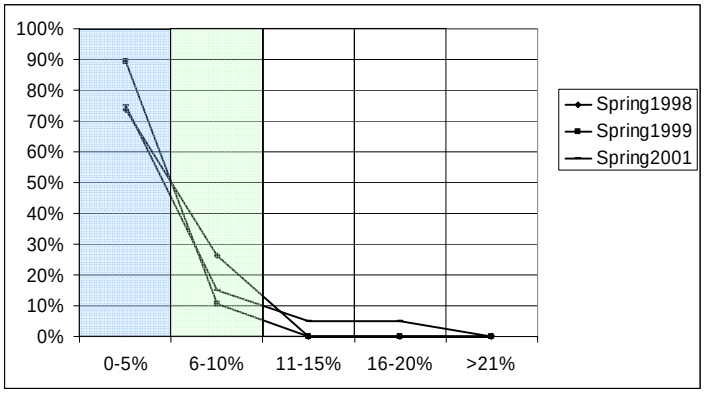
During the eight years of running SDP since 1998 the students have been supported in allocating individual marks in various ways. An analysis of mark distribution patterns has been conducted across three different periods in which the peer assessment was supported by:

- A set of rules and policies (Period A),
- Time records accumulated on a weekly basis across the whole projects (Period B), and
- Time records and individual contribution ratings are accumulated on a weekly-basis across the whole project (Period C).

The analysis was performed only for semesters with more than ten groups. For each group, a coefficient of standard deviation of the final individual marks was calculated. It indicates to what extent the group was able to diversify individual contributions. For each semester a graph showing the percentage of groups that differentiated their contributions by 0-5%, 6-10%, 11-15%, 16-20% and 21+ were plotted.

Results for Period A

In period A the students had to rely on their own records and recollections of individual contributions in allocating individual marks. The support given was a set of rules and policies that spelt out a range of good practices for peer assessment. As a result in semesters Spring 1998, Spring 1999 and Spring 2001, the distribution of peer marks were diversified as shown in Figure 1.



Period A analysis[a,b]

	CoVar
Chi-Square	3.975
df	2
Asymp. Sig.	.137

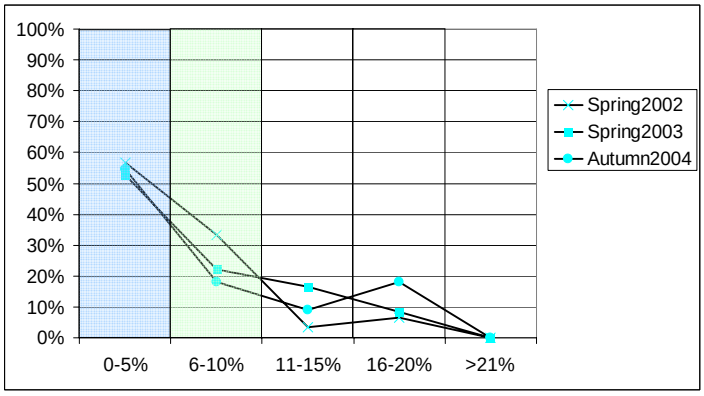
[a] Kruskal Wallis Test
[b] S1998, S1999, S2001

Figure 1. Period A results

A Kruskal Wallis test indicates in Period A there was no evidence of any significant differences in marks differentiation in the three semesters studied (p=.137 > 0.05). In each semester between 75% to 90% of all groups opted for almost equal marks distribution. This was not plausible as in groups of ten students one would expect there would be a wider range of contributions.

Results for Period B

In order to better support peer assessment of individual contributions the students used an online tool for progressive accumulation of individual time spent on the project. Time records make individual contributions visible to the team members and thus inform their decision on how to assess individuals. Time records were collected on a weekly basis, stored in the system and made available to all the team members and facilitated the assessment of contributions that were valuable but not visible in the final product and easily forgotten at the summative mark allocation. As a result in semesters Spring 2002, Spring 2003 and Autumn 2004, the distribution of peer marks were diversified as shown in Figure 2.



Period B analysis[a,b]

	CoVar
Chi-Square	.745
df	2
Asymp. Sig.	.689

[a] Kruskal Wallis Test
[b] S2002, S2003, A2004

Periods A&B analysis[a,b]

	CoVar
Chi-Square	17.521
df	5
Asymp. Sig.	.004

[a] Kruskal Wallis Test
[b] S1998, S1999, S2001, S2002, S2003, A2004

Figure 2. Period B results

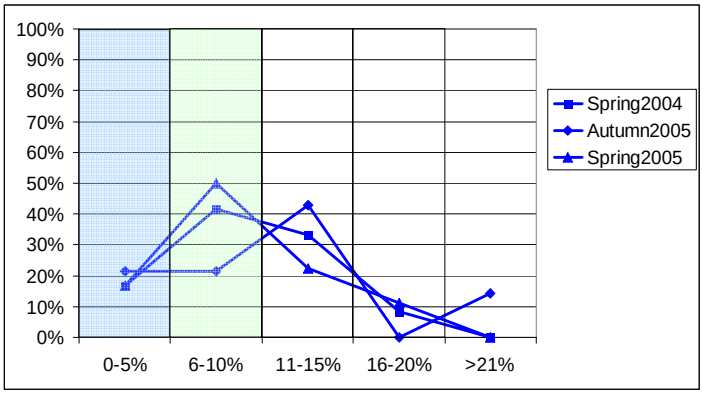
A Kruskal Wallis test indicates in Period B there was no evidence of any significant differences in marks differentiation in the three semesters studied (p=.689 > 0.05). However, there was a

statistically significant difference between Periods A and B (p=.004 < 0.05) as demonstrated in the analysis of both periods. Figure Two shows that the time recording tool reduced the percentage of groups electing to give everybody equal or almost equal marks to some 55%. This was an improvement on Period A yet the general pattern of distribution still indicated a lot of reluctance to differentiate marks for individuals within the groups.

Results for Period C

For the three semesters since Spring 2004 to better support peer assessment of individual contributions the students have used an online groupwork support tool – *TeCTra* – to progressively evaluate and provide feedback on individual performances.

In addition to the time-recording system, two elements were added to facilitate a progressive, weekly individual contribution assessment. Firstly an individual weekly contribution quantitative rating is made; secondly a confidential individual feedback qualitative comment that the students write to explain their ratings. The time spent on the project and the ratings are used to calculate a progressive weighted individual contribution factor for each student in the group. As a result in semesters Spring 2004, Autumn 2005 and Spring 2005, the distribution of peer marks were diversified as shown in Figure 3.



Period C analysis[a,b]

	CoVar
Chi-Square	1.765
df	2
Asymp. Sig.	.414

[a] Kruskal Wallis Test
[b] S2004, A2005, S2005

Periods B&C analysis [a,b]

	CoVar
Chi-Square	21.154
df	5
Asymp. Sig.	.001

[a] Kruskal Wallis Test
[b] S2002, S2003, A2004, S2004, A2005, S2005

Figure 3. Period C results

A Kruskal Wallis test indicates that in Period C there was no evidence of any significant differences in marks differentiation in the three semesters studied (p=0.414 > 0.05). However, there was a statistically significant difference between Periods B and C (p=0.001 < 0.05) as demonstrated in the analysis of both periods. The introduction of *TeCTra* produced a dramatic change in students peer assessment of individual contributions. Only 20% of groups allocated marks with little or no diversification and 65-75% of groups diversified marks by 6-15%. This is most likely an accurate reflection of the range of individual contributions to the project. The students are not obliged to use the TeCTra calculated individual contribution factors in allocating summative marks so it seems that progressiveness and visibility of peer evaluation, feedback and review empowers individuals to claim their rightful share of the marks. Non-performers are exposed early through the formative assessment of their peers and they have two options, either to improve or to receive lower summative marks from their peers.

Conclusion

TeCTra supports peer evaluation and feedback – both a quantitative rating and qualitative comment – throughout the duration of the project and thus formatively influences individual contributions and behaviours within the team. The improved capacity for peer review facilitates diagnostic attributes and thus influences the project management process and outcomes.

TeCTra supports the development in students of the ability to review and assess the work of others, to make professional judgments, to articulate well justified decisions and to communicate in a non-confrontational manner to their peers – core skills for IT professionals. Knowledgeable yet inexperienced individuals are enabled to act professionally and take responsibility for and accept the consequences of their own contributions to a large group project.

References

Bloxham, S. and West, A. (2004) Understanding the Rules of the game: making peer assessment as a medium for developing students' conceptions of assessment. *Assessment and Evaluation in Higher Education*, **29**(6), 721–733.

Gatfield, T. (1999). Examining student satisfaction with Group Projects and Peer Assessment. *Assessment and Evaluation in Higher Education*, **24**(4), 365–377.

Goldfinch, J. (1994) Further Developments in Peer assessment of Group Projects. *Assessment and Evaluation in Higher Education*, **19**(1), 29–35.

Johnston, L. and Miles, L. (2004) Assessing contributions to group assignments. *Assessment and Evaluation in Higher Education*, **29**(6), 751–768.

Kennedy, G.J. (2005) *Peer-assessment in Group Projects: Is it worth it?* The Australian Computing Education Conference 2005, Newcastle Australia.

Li, L. (2001) Some Refinements on Peer assessment of Group Projects. *Assessment and Evaluation in Higher Education*, **26**(1), 5–18.

Lejk, M. and Wyvill, M. (2001) Peer assessment of Contributions to a Group Project: a comparison of holistic and category-based approaches. *Assessment and Evaluation in Higher Education*, **26**(1), 19–39.

Rosen, C.C.H. (1996) Individual assessment of group projects in software engineering: A facilitated peer assessment approach. Proceedings of the 9th Conference on Software Engineering Education, 68–77, Daytone Beach, Florida. IEEE.

Schechtman, Z. (1992) A revised group assessment procedure administered in several academic settings. *Journal of Personal Evaluation in Education*, **6**, 31–39.

Schechtman, Z. and Godfried, L. (1993) Assessing the performance and personal traits of teacher education students by group assessment procedure: a study of concurrent and construct validity. *Journal of Teacher Education*, **44**(2), 130–138.