

The Development of a Peer Marking System for Group Assignments

Neil Comins and Peter Fitzgibbon
Information Systems & Computing
Faculty of Business
UNITEC Institute of Technology
Auckland, NZ
email: ncomins@unitec.ac.nz
fitzgibbon@unitec.ac.nz

Raewyn Boersen
Integrated Business Academic Group
Faculty of Commerce
Auckland Institute of Technology
Auckland, NZ
email: raewyn.boersen@ait.ac.nz

Abstract

Group assignments and the fair allocation of assessment marks has led to the development of this easy to administer system.

The system involves two forms that have to be completed by the students as a part of their assignment. One of them is a summary of tasks-by-student which is completed by the group as a whole, and the other is a measure of peer participation which is completed confidentially by individual group members. These forms are non-threatening and feedback from students in the use of these forms has generally been positive. The hard workers get to have their work recognised, while those who contribute little are rewarded accordingly.

Processing of the forms to achieve the required variation of individual marks can be done either manually or via a spreadsheet. An example of the spreadsheet method has been used in this paper. (An explanation of the manual process is available on request.)

This system is considered to be suitable for any degree course after the first semester, after some group learning theory has been taught. It also requires that the students are familiar with the assessment environment.

Although the process attempts to quantify a student's contribution to the whole task of creating an assignment, the objective must always be to assess what learning has taken place. A student may not have directly created any of the assessment submission, and yet can be deemed to know the content because of their involvement.

The Development of the Process

Much of the work in the IT industry is done as projects, and so we attempt to duplicate that by providing our graduates with many group working experiences. Also, our search for ways to reduce workload indicated that group assignments would be one way to reduce the marking load. We were also faced with the criticism from many students about the unfairness of the allocation of equal marks to all members of a group.

This Paper describes one of the approaches to a peer marking system, currently in use at UNITEC in the Department of Information Systems and Computing. There are several approaches in use at present, which have been developed to cater for different situations and lecturer preferences. (For example, for a smaller class (say 10-30) or bigger groups (of say 5-6) and manual methods are used to calculate an individual's rating; versus a larger number of usually smaller groups where a



spreadsheet and formulae are used to attempt automation of the process.) The base for all these variations in delivery is the same, and so we will keep the following explanation to just one of these delivery methods.

The lecturer's assessment of each group's assignment provides a starting-point mark for the group (hereafter called the Group Mark). This mark is then adjusted by applying values from a contribution assessment (supplied by the group) and an individual peer assessment (for and by each team member). The output from this process is a set of individual marks for all group members with the average of these marks still being equal to the Group Mark.

In the NDBC's 80% pass, 95% merit system it was possible to allocate individual marks from a group assignment so that a very good student could achieve a merit score and a poor student could be required to do a "resit" from the same assignment. Under our new degree structure with the 50% pass, a similar wide range of scores can be achieved, but the lower scoring student can still achieve an overall pass provided they perform very well in the final exam.

We do not recommend that an automated system such as this be used if the weighting of the assignment is a significant factor. It provides adequate checks for a small part of the course, but a more rigorous system (such as AIT's) would be required if a group assignment were to be used to pass/fail an individual student.

Contribution Assessment

Many lecturers use different versions of the Team Activity Breakdown form (Figure 2) to identify who-did-what, and so this is just a continuation of that idea. However, although a student may have done the initial information gathering and word-processing for a section, this does not measure the true participation in a group sense. It also gives no information on how much a student might know of the other sections that they did not directly create. Students are not very good at identifying partial contributions via this form, even when given the opportunity to show percentages as per our version.

Peer Assessment

The original version of the Peer Review form (Figure 3) came from a form in use at AIT in 1992. Raewyn Boersen and Rachel Stevenson at AIT continued a parallel development and have developed a different and more sophisticated version for a specific degree level course, where more rigour is required as students need to pass a group project to pass a course and as there is more potential for appeal. The UNITEC approach was to develop a simpler generic system.

At UNITEC the original draft form (considerably modified from the AIT sample) went through a peer review process. On this first version we decided to use a percentage scoring system for each side-heading. However, this resulted in inconsistent student scoring (too wide a range of scores) and so subsequent reviews and fine tuning has resulted in the current simplified scoring system. Changes have also been made to the assessment criteria. It is interesting to note that the current form has evolved back to a format very similar to the AIT original.

Although not realised at the time, we were following an informal Action Research process. Many variations in approach have been tried, and this research is ongoing, but we are coming closer to a common system within UNITEC.

The System

There are three stages to the system. Stage one is the delivery of the two forms to the students and their completion as a part of the assignment activity. Stage two is the lecturer's evaluation of the detail supplied by the forms to determine a student's percentage participation. Stage three is the addition of any extra individual activity to arrive at a final grade for each student.

Stage 1: Completion of the Forms

Initially there was a need to explain the process to the students, at the time of handing out the assignment, and repeating the explanation at about the time the assignment was due. However, the current method of explaining the process on the Assignment Handout (Figure 1) plus the explanations on the forms themselves seems to be sufficient, with only the occasional student enquiry to be dealt with. Also, at least one of the early compulsory courses covers theory on group work and so the students are generally familiar with the concepts being measured on the Peer Assessment form.

The group collaborate to create their "Team Activity Breakdown" form first, at the completion of the assignment deliverables (it must be included in the report folder). The "Peer Contribution Review" form is expected to be completed later by individuals, and they are permitted a later delivery time for this. This will allow for an individual to make comments if they feel that they have been disadvantaged by the group's evaluation of contribution, and permit a confidential submission.

How the group allocate the tasks can also be an issue. In our case the courses are often a pre-requisite to a later course. How can we be sure that a student does know the material contributed by other group members? It could be possible for a student to gain credit for material that they do not know, and which could then cause them problems with a later course. In the assignment shown in Figure 1, we attempted to address this issue by requiring each student to also submit an individual Synopsis of the group report. In other assignments individuals have to participate in a summative presentation of their report.

Stage 2: The Marking Process

Stage two of the system commences with the lecturer's normal process of marking of the assignment. This assessment of the Group Mark is done without any reference to the "participation" forms, to achieve the starting-point mark.

If an individual synopsis is also required, this is marked in comparison with the appropriate group report, but the total kept separate until the group mark has been converted to individual scores. (This marking of the synopsis can be delayed until later if you wish.)

The Group Mark must then be modified by evaluation of the "participation" forms. Originally this evaluation was a manual process, which still remains an option for small classes. However, the advent of very large classes has resulted in the development of a spreadsheet system.

Stage 3: Addition of any Individual Item

The individual marks (in this example a synopsis mark) are then added. This individual mark helps add further variability to the marking, and can also allow an individual (who has for some reason not performed well in the group situation) to improve their final score.

Team Activity Breakdown Form

The first form (Figure 2) is fairly simple, is compulsory, and is to be completed by the group's chairperson (with group input). This form does need to be tailored for each assignment to list the major items expected to be completed. (An alternate approach has been to allow the students to provide their own item headings, but that has tended to supply less information than is desirable.)

It is important that the sections here should be related to activities and content for best results. Activities should be of about a similar duration or content. The group members come to an agreement on how the work is to be shared, and this form allows for that to be shown.

Although a portion of the assignment (in this case a particular question) may be assigned to an individual, there is often major input from the other members when it comes to the review of an individual's draft contribution and the compilation of the final report. (In rare cases a group can decide to not split the task into separate questions but work through the whole process as a team, with one member acting as the scribe.) There is also space for them to indicate other activities - previous versions have allowed more space for this item but students very rarely do indicate other tasks.

All group members are required to sign the form to confirm acceptance of their contribution. If not signed, equal contribution is enforced by the lecturer, unless a suspected (or reported) situation requires that the lecturer call a meeting of the group to arbitrate.

No attempt is made to go back to the assignment report and to award marks by task by student. Although this extra effort by the lecturer may appear to be valid, it is possible that last minute 'changes' to the report may have been made by other than the 'tasked' individual. Since the finished report is a team effort, it is considered that the shared group mark is relevant as the basis for individual rating by the contribution and peer review.

The Peer Review Form

The second form (Figure 3) is more detailed, but is a standard form that can be used for any assignment. This form also needs to be compulsory for the best results from the spreadsheet formulae. If a student did not submit a form then individual ratings would rely more and more heavily on the review of those that do respond; and this can invalidate the ratings. (For a manual processing approach the completion of this form by individual students can be made optional - if they do not submit a form then they are assumed to be prepared to accept what their peers say about them.)

This form is designed to measure the group process and how each individual has been perceived to perform. This must be completed on an individual basis to avoid peer pressure. The side-headings have been chosen to identify the issues we need to know. (e.g. high "Involvement with final review process" would indicate that there is a very good chance that the student would understand most of the content, while a low score for "Information well organised" for a section that is well organised would indicate that someone else has reworked it and probably upgraded it.)

If students collude to provide the same peer marking (even if that be 100%), that must merely be an indication that they are happy to all share the same Group Mark; so be it. As their assessment is by their peers it's their call.

The "Own Score" column is compulsory. There is a set formula which converts the peer marks to an individual mark, and there is a problem if (for instance) one group member has a range of marks in the sixties and another ranges theirs in the nineties. If the own score is excluded, then it has the effect of inflating the average mark for the group member who marks in the lower range, and vice versa. Inclusion of the own score in the average provides a counter to this problem.

In practice, it has not been found that students will over-inflate their own score as a matter of course. In fact the reverse is often the case. An over-inflated mark is normally very obvious when the data is entered. As averages are used in the calculation, the effect of this is reduced. If the lecturer considers that the 'inflated' student has been advantaged then note that the Peer Review form states: "I may ask you to explain your assessment and if it is not justified, I reserve the right to modify or disregard it".

The Contribution and Peer Marks are then processed as below.

Spreadsheet Conversion of Peer Marking to an Individual Mark

The effort/significance of all 'Tasks' on the contribution review form are compared. Sometimes the lecturer has to downgrade a task's weighting. For instance, it would be inappropriate to give one student '100' for five hours of 'topic research' and another student '100' for five minutes of 'spell checking'.

All marks are then transposed from the forms into the spreadsheet as per our worked example (see Figure 4).

Notes

1. There is a minimum Contribution Ratio shown. This is to reduce the significance of the contribution review. For instance a minimum of 0.75 means that the Contribution Ratio may range from 0.75 (if this student did nothing) up to 1.25 (if this student did it all). Making this minimum 0.0 (i.e. do nothing, get nothing) sounds valid but in practice it was found that this gives too much significance to 'contribution' at the expense of the 'peer' assessment. The mark for the student who really does nothing is made nothing by a manual override!
2. There is a ceiling on each individual's 'After Review' mark to the 'Maximum Group Mark Possible'. A mark of 85/80 is inappropriate. In this case the individual must have done a large share of the work and kept on side with peers at the same time - a 100% mark for the group content of the assignment is considered reward enough!.
3. In practice, it has been found that in using this method the range of before and after review marks is generally no more than plus or minus 10% of the maximum possible group mark. This 20% spread can allow, for example, both a 'B' and a 'D' from within the same group.



UNITEC
INSTITUTE of TECHNOLOGY
Te Kura Puukenga o Wairaka

Faculty of Business
Department of Information Systems
and Computing

Assignment 1
06.xxx BCS Course nnn
Semester 1, 1998

Due Date **8 May 1998**
Total Marks **100**
Course Weighting **25%**

This assignment is to be completed as a group. Group members are as set up in class at the beginning of the course.

Delivery

Two items are to be delivered by the due date:-

1. A group assignment as detailed below.
 2. Each member of the group to separately supply a synopsis.
1. As a group, you should submit the following items in a folder with a standard cover sheet, **before 1:00pm on Friday 8th May**. (See the DISC Student Handbook for standard assignment requirements and cover sheet format.)

Your folder must include:-

- The ...
 -
 -
 - The Team Activity Breakdown sheet. (The assignment will not be marked unless it is accompanied by the attached team activity breakdown sheet.)
2. Each student must separately and independently create a one-page synopsis of the above assignment, in their own words. These must be clearly named, no larger than 12-point font, and single-spaced lines. Your synopsis should be submitted in a separate envelope, and must be delivered **before 1:00pm on Friday 8th May**.
3. You have been provided with an individual Peer Review form (attached) which you are *required* to fill in and present to your tutor **by 1:00pm on Monday 11th May**. If you do not do so you (individually) will be penalised 10 marks.
-
-
-
-

Figure 1:

TEAM ACTIVITY BREAKDOWN

Group Names:

Student Name	Contribution %							SUM of columns 1-7	Other tasks (e.g. chairperson, report collator, etc.)
	Q. 1	Q. 2	Q. 3	Q. 4	Q. 5	Q. 6	Q. 7		
N1	100				20		20	140	
N2		25	50		40		20	135	
N3		25	50		40		20	135	
N4		25		80		50	20	175	
N5		25		20		50	20	115	
Total (should equal 100%)	100	100	100	100	100	100	100		

Comments:

Signatures:

Figure 2 Team Activity Breakdown Form

Assignment - Peer Review

Your group's mark will be used as the basis of your individual mark and modified by the combined assessment of your group's evaluation of your individual performance within the group as per the following score sheet. **The scores that you provide will be treated confidentially.**

Each person in the group is to deposit their individual Peer Review form in your tutor's assignment slot on the day after your presentation. **IF YOU DO NOT HAND IN A COMPLETED REVIEW FORM (ON TIME), YOU WILL BE PENALISED 10 MARKS FOR THIS ASSIGNMENT.**

It is not acceptable to award equal weightings to all members of the group unless this can be fully justified. Rarely if ever do individuals perform to an equal standard in terms of the quality of their contribution to a group activity. I may ask you to explain your assessment and if justified, I reserve the right to modify or disregard it. Note a $5/10$ (or $2.5/5$) represents a *barely adequate job*, whereas a $9/10$ (or $4.5/5$) is *brilliant in nearly every respect*.

	0 is lowest	Your Name	Other Members Names				
		N1	N2	N3	N4	N5	
A: PARTICIPATION							
1. Attendance at Group Meetings	0 to 10	8	10	10	10	10	
2. Involvement with final review and compilation process	0 to 10	8	10	10	10	8	
3. Group involvement:							
a) suggests ideas	0 to 5	5	5	5	5	4	
b) listens to other's issues and ideas	0 to 5	5	4	4	5	4	
c) asks questions and seeks clarification of issues and ideas	0 to 5	4	4	5	5	3	
d) keeps to the task	0 to 5	4	4	5	5	3	
e) negotiates and accepts compromise where necessary	0 to 5	3	4	4	4	3	
f) gives and accepts critical comment appropriately and graciously	0 to 5	4	4	4	4	3	
B: ASSIGNED WORK							
1. Self-starter (able to do assigned work with minimum of help)	0 to 10	8	7	8	10	6	
2. Completes work on time	0 to 10	8	9	10	10	7	
3. Work is on topic and links to other people's work	0 to 10	8	8	8	8	6	
4. Work is appropriately formatted and presented	0 to 10	8	8	9	10	7	
5. Work and content is well organised	0 to 10	8	7	8	10	6	
TOTAL	0 to 100	81	84	90	96	70	

Any Other Comments:-

Figure 7: Peer Review Form

Individual Contribution Review														
Name	1	2	3	4	5	6	7	8	9	10	Contr Sum	Raw Contr Ratio	Contr Ratio	Approx Loss/Gain in Marks
N1	100				20		20				140	1.00	1.00	0.0
N2		25	50		40		20				135	0.96	0.99	-0.6
N3		25	50		40		20				135	0.96	0.99	-0.6
N4		25		80		50	20				175	1.25	1.06	3.9
N5		25		20		50	20				115	0.82	0.96	-2.8
n/a														
Total Contributions											700			
Average Contribution											140			
Contr Ratio = $\text{MinPossContrRatio} + (\text{thisPersonsSum}/\text{average}(\text{allSums}) * (1-\text{MinPossContrRatio}))$, where $\text{MinPossContrRatio} = 0.75$														
Minimum Contribution Ratio spreads the maximum range of contribution ratios from 0.75 to 1.25 (otherwise; it tends to be far too significant in the results)														
Peer Review														
Name	Own Mark	Others Mark for me 1	Others Mark for me 2	Others Mark for me 3	Others Mark for me 4	Others Mark for me 5	Others Mark for me 6	Average of Others Marks for me	Average of All Marks for me	Raw Peer Ratio	Peer Ratio	Approx Loss/Gain in Marks		
N1	81		85	80	60	80		78.8	79.2	0.96	0.96	-2.4		
N2	91	84		83	65			80.5	82.6	1.00	1.00	0.1		
N3	85	90	86		72	95		85.8	85.6	1.04	1.04	2.4		
N4	68	96	100	95		95		95.8	90.2	1.09	1.09	5.8		
N5	80	70	73	80	60			70.8	74.6	0.90	0.90	-5.9		
n/a														
Average All Peer Marks								82.3	82.4					
Raw Peer Ratio = $\text{Average of All Marks for me}/\text{Ave all peer marks incl own marks}$														
Peer Ratio = $\text{MinPossPeerRatio} + (\text{thisPersonsRawPeerRatio} * (1-\text{MinPossPeerRatio}))$, where $\text{MinPossPeerRatio} = 0$														
Minimum Peer Ratio spreads the maximum range of peer ratios from 0 to 2, (sounds too great a range - but has been OK)														
Name	Group Mark	Contr Ratio	Peer Ratio	After Review	Loss or Gain in Marks									
N1	62.0	1.00	0.96	59.6	-2.4									
N2	62.0	0.99	1.00	61.6	-0.4									
N3	62.0	0.99	1.04	63.8	1.8									
N4	62.0	1.06	1.09	72.1	10.1									
N5	62.0	0.96	0.90	53.6	-8.4									
n/a														
The Group Mark is the assessed score of the group's combined response =					62									
After Review = $\text{MinimumOf}(\text{MaximumMark}, \text{GroupMark} * \text{ContrRatio} * \text{PeerRatio})$														
The Maximum Mark is the 100% mark allocation for any group =					80									

Figure 4

Some Further Notes

1. Once a set (publicised) range was tried (e.g. '10 marks for Peer Review'). But there was a problem when a whole group colluded to 100% each, and another group seriously assessed themselves to (say) 80%. Should you give all the first group 10 out of 10 and the second group only average to 8 out of 10? For this reason a mid-range mark was allocated to '100%'ers. The Peer Review mark was then $\text{Range} / 2 * \text{PeerRatio}$, but the variability was found to be insufficient. Although, it would have been possible to stretch the Peer Review mark to cover the whole range, it was considered no better (and in some ways worse - what if the '100%'ers really were worth 10 out of 10?), and so this method was discarded.
2. Group dynamics is still a problem, even for the more experienced students. However, that is seen as an issue independent of this grading system.
3. We expect that the problem of the non-performer will always be an issue. There is an impression that some non-performers move into that mode when their group lacks direction. A more focused group may retain their confidence and involvement. However, this system does pro-actively encourage group participation - the students are aware from the outset that their performance within the group is going to be assessed by their peers.
4. Coupled with the non-performer, there has occasionally been a self-professed over-performer. This can cause problems in several ways.
 - Friction in the group can lead to complete group breakdown. The lecturer needs to be open to approaches from individual group members regarding this and arbitrate where necessary. Once, this problem was unreported (apparently through cultural embarrassment) and the members each produced an individual assignment. This increased the workload of both student and lecturer, which wasn't the intention of this system.
 - Some members have their ideas and work ignored which may mean a higher (and sometimes lower!) Group Mark than otherwise. The system relies upon group members having the maturity to stand up for themselves (or to inform the lecturer).
5. How the group allocates the tasks can also be an issue. In our case the courses are often a pre-requisite to a later course. How can we be sure that a student does know the material contributed by other group members? It could be possible for a student to gain credit for material that they do not know, and which could then cause them problems with a later course. In the assignment shown, we attempted to address this issue by requiring each student to also submit an individual Synopsis of the group report.
6. At UNITEC we have not yet had to justify our scoring in an appeal situation, although there is the potential for that to happen. We're still thinking about that. Raewyn's system at AIT has the ability to handle an appeal process built in.

THE SYSTEM REVIEW PROCESS

Initially, the proposed system was reviewed by peers, who provided useful comments. After each use of the system, the way the students responded was evaluated, and minor changes made. Slight variations have been tried, but the system is now in a stable format. All assessments pass through Peer Moderation and Internal Moderation processes. Variations in delivery have been permitted to suit different assessment items, but the base system stays the same.

Feedback from students has generally been informal, either verbal or by using the “Comments” space on the forms. Usually comments about the process have been positive. The most negative has been concerning the need for peer review (i.e. This person considered that “Everyone shared the work.....” and that “<peer review> did not promote teamwork”, but it was interesting to note that all his peers gave different ratings for each other.) One student who was strongly anti any group-work at the start of the course, making a point of coming back to comment that “it was the best group assessment that she had experienced”, and “why don’t all the lecturers use this approach?”

POTENTIAL DEVELOPMENTS

It may be advantageous to evaluate formally what students think of the process and to ascertain whether they believe it to be fair.

Similarly, there is opportunity for a student to inflate their own performance and although we believe that this is balanced out in the calculations, it may be relevant to test this more formally.

The use of a Likert-type scale (e.g. always, often, sometimes, never, etc.) could be explored where students are assessing each other’s contribution. Although this scale would then need to be converted to numbers for inclusion in the spreadsheet, it may lead to more differentiation between contributions.

CONCLUSION

This system has been with us for many years and has settled into a fairly stable format. It is easy for the students to use, and simplifies the lecturer’s work in deciding how to allocate different marks to students.

Apart from avoiding its use until students have been exposed to group work theory, we see this as a generic system suitable for any group assignment situation.