A Study of deriving Individual Marks from a Group

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Abstract

Methods of deriving individual marks from a project done by a group of students were studied. The author had conducted a survey on a class of building engineering students. Four students formed a group in a building design project. They were taking up the duties of electrical & mechanical engineer, architect, financial controller and quantity surveyor of a building team. It is hoped that they could learn from the process. Each group was required to submit a set of documents prepared by the group at the end of the academic year for assessment. The documents included a written report, meeting minutes, diary and drawings. An oral presentation was assessed by a group of tutors. The project carried a highly weighted factor for their final year curriculum and lasted for an academic year. The assessment components include writing skills, operational skills, presentation skill, and professional competence. The difficulty of assessment is not only quantity of work, but also quality of work. Literature review has suggested a number of approaches. Common methods are weighting factor, pool of marks, peer-assessment factor (PA) and contribution factor. This paper critically reviews these methods and evaluates the method adopted in the project. It also discusses some observations on peer assessment and raises some issues for debate and future study. The paper had a trial on three methods which have been reported.

Introduction

Group learning is generally regarded as an effective way of teaching and learning in higher education. Students are actively involved in investigation of authentic problems. Group project learning was frequently incorporated in engineering curriculum since 80's [1]. The popularity of students working in small groups can be traced to the fact that group work provides a number of benefits. It allows students to gain practical experience with genuine setting of a building team. Team spirit can be developed during the course of project execution. Many problems will not be discovered in a classroom lecture, but it does happen from time to time in group-work. Communication skills, mediation and liaison technique can also be developed in the design process.

Despite all of the benefits of group work in building design process, the use of groups is fraught with problems. The first one is to understand the strengths and weaknesses of individuals. Groups can achieve more than individuals, and individual weaknesses tended to be covered by the strengths of group members [2]. It imposes difficulty for improvement of individual skills. The second one is the conflict among members. Students complained that awarding the same marks to all group members was often not a fair reflection of individual contribution. Many groups are unable to manage internal conflict that arises within the group on their own or involvement of their group tutor. The problem falls on assessment of individual contribution to the project. It is often the case that tutors set group project and intend to derive individual marks for students within the group. Students feel more comfortable with different grades awarded with regard to individual contributions. There are several approaches to derive individual's marks.

Method I: Multiplication of group marks by individual weighting factor

The method was reported by Goldfinch & Raeside [3], and it was then modified by Conway [4] and Goldfinch [5]. This method was based on the allocation of a group marks by the group tutor to the work produced by the group and manipulation of this group mark to derive a mark for the individuals. The details of the assessment form is shown in Table 1. The peer assessment factor allows for a percentage of the group mark to be given to every group member and the rest of a student's marks to reflect the contribution made by that student. Conway [4] used a different form (Table 2) which was more task-related than Goldfinch's

one. It does not include any self-assessment. Group members were asked to assess the other group members. Students had to compete for a high rating from their colleagues.

Method II: Distribution of a pool of marks

This kind of assessment was firstly introduced by Habeshaw [2]. It allowed students to split up a group mark to individuals. For example, student A, B, C and D received a group mark of 70%. The total marks given to the group were 280%. Members had to allocate this 280% among group individuals. They might have an agreement of allocation or weighted factor beforehand. They knew better than anyone what individuals contributed to the project. It was a form of peer-assessment. Internal conflict might create. It was similar to method I, but the sum of marks of the group could not exceed the amount awarded (280%).

Method III: Group mark plus or minus contribution marks

This method was also firstly introduced by Habeshaw [2] whereby the group members peer-assessed each other according to certain group working aspects. It is rated as 'major', 'average' and 'small'. These comments were converted to numbers. The corresponding numbers are 0, −1, −2…….to −6. There were six assessment components. They were 'leadership and direction', organisation and management', 'ideas and suggestions', 'data collection', 'data analysis' and 'report writing'. The 'report writing' was regarded as the most important element. The marks for each student were averaged and then deducted from the group mark. Student made a major contribution in all areas would not receive marks reduction. Student made no contribution would receive a maximum of 20 marks deduction. The criteria could be negotiated with the students or determined by themselves. A variation could be made for a positive contribution to the total marks. A wider distribution of marks was expected for a positive and negative contribution.

Method IV: Equally shared mark with exceptional tutor intervention

This scheme was proposed by Mello [6]. It was very similar to method III. All group members received the same grade, unless there were problems with group members. The tutor took an active role looking at any problem arising within the group. Mello encouraged students to write comments about the group process. Penalty could be imposed if members were seen to be unproductive. The penalty was decided by the tutor and agreed by group members. An alternative was for the tutor to call a meeting of a group which was having

problems. The latter process was time-consuming and required good mediation skills on the part of the tutor.

Method V: Staff and peer assessment

This scheme was proposed by Earl [1]. The assessment components included formal oral presentation skills, group interactive and report writing skills. The group activities were first assessed. The base marks and the peer marks were equally weighted. The base marks were common to all group members that each student would receive the same marks. It was devised to reflect deliberately the collaborative nature of the modelling activity in which the students were taking part. Base marks were given by tutors on what they had observed during the group activities. Peer marks weight equally to base marks in group activities that were submitted by individual student in the group.

Method VI: Modified staff and peer-assessment implemented by the author

This method was implemented in the project. It is very similar to method V, but the peer-assessment part is further sub-divided into two elements. It is hoped that it can truly reflect the ability of students in different areas. It is a modified version of method II and V. There were four assessment components; regular meeting, written report, data collection & analysis, and oral presentation. Regular meeting, and data collection & analysis were graded by peer-assessment. The marks were given by three members of the same group. The marks were counted to 60% of the total. The oral presentation was assessed by a group of tutors with a weighted factor of 40%. The respective group tutors would not assess their own groups of students. This enabled an objective assessment of students' performance. The respective supervising tutor assessed the written report done by the group. It was then used as the base mark. The peer-assessment and presentation marks were used as PA factors. The PA factors were then multiplied with the report's marks to obtain the final marks. The assessment relied partly on the peer-assessment of individual's contribution throughout the course. An additional component is the factor coming from a group of tutors. It gave an objective element that could reduce the influence of internal conflict. Details can refer to Appendix A.

Pros and Cons of peer assessment

Fineman [7] argued against tutor dominance assessment. He had incorporated peer-assessment into the assessment scheme. Fineman believed that the scheme provided

opportunities to measure what happened outside the formal class. This was the prime objective of peer-assessment. Their group members knew better the work distribution and outcomes than any other person.

Literature review on peer-assessment often raises the issue "students feel responsible in making peer assessments, but not necessarily comfortable in doing so" [8]. Placing the burden of sharing marks upon the students seemed unreasonable unless group compromise had arrived. Students will compete for a higher grade and make an attack upon group mates' work. Flynn [9] argued that students were insufficiently rigorous in the assessment of arguments. Flynn devised precise critiquing sheets for students to record their assessment. There were objective criteria for assessment so that the drawback of prejudice was minimised.

The within group problem is the narrow range of marks normally resulting when group marks are given [2]. The conditions need further investigation. Plus or minus marks with a relative large scale is a solution to the problem. However, a fair assessment is sought for this arrangement. Tutor group assessment can be a solution to reduce the anxiety of students. The author had employed this approach in the oral presentation and diary assessment, but it involves intensive manpower. Care should be taken over the relative weighting of the PA factors and base marks. If PA factors are weighted highly, a subtraction scale will likely fail students unless their groups achieve very good base marks. On the other hand, low weighting does not cause impact on the overall marks. A cluster of grades would result. The peer assessment approach is suitable for a large class of students because the effect of prejudice can be minimised. However, individual contribution to project work still requires in-group assessment.

Conclusion

There are various methods for assessing the contribution of individuals to a group project. Choosing between alternative methods is to some extent a subjective process as there is no absolute standard against which resulting marks can be the best. The reasons given for accepting or rejecting particular approach may not be appropriate for all purposes. It depends on the nature of the project and components to be assessed. Regression analysis of peer-assessment between two PA elements shows a good relationship with R^2 of 0.81. The agreement between tutors' assessment and PA elements is not as good as peer-assessment. The regression coefficients are 0.63 and 0.79. The reason accounts for this phenomenon may

be due to the impression of their classmates. The peer-assessment is not related to their performance in particular areas. It sticks to the overall impression of their classmates. The other side of the coin; the performance of students is consistent so that they perform the same standard in the two areas. It needs further study and research. The results also show that the average marks, and standard deviation of the final marks are very close to each other. The most interesting result is method VI. The results are identical to method II, but the scheme had incorporated an objective element; tutors' group. Students might feel that it is fair to invite third party assessing their work. Method VI also has a wide dispersal of marks with normalised values from 0.72 to unity. The standard deviation of this scheme is also greater than method V.

In conclusion, this scheme (method VI) appears to surmount the difficulty of awarding marks to individual members of groups, allowing the benefits of group work while providing assessment that meets the criteria of practicable and fair, and students feel comfortable to it.

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About the author

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Table 1: Peer assessment form by Goldfinch [5]

Write the names of the other group members in the blank boxes on this row	Yourself				
Level of enthusiasm / participation					
Suggesting ideas					
Understanding what was required					
Helping the group to function well as a team					
Organising the group and ensuring things got done					
Performing tasks efficiently					

Individual student's mark = Peer-assessment factor × Group mark

Table 2: Peer assessment form by Conway [4]

Group members names			
(1) Literature search			
(2) Literature analysis			
(3) Report writing			
(4) Group presentation			

Table 3: Distribution of pooled marks (Conway *et al.*, 1993)

	Student A	Student B	Student C
Student A gives			
Students B gives			
Students C gives			

Table 4: Assessment matrix by Habeshaw [2]

	Major contribution	Some contribution	Little contribution
(1) Leadership & direction	0	−1	−2
(2) Organisation & management	0	−1	−2
(3) Ideas & suggestions	0	−1	−2
(4) Data collection	0	−2	−4
(5) Data analysis	0	−2	−4
(6) Report writing	0	−3	−6

Table 5: Assessment matrix by the author

	Tutor assess	Peer assess
Regular meeting assessed by group members (20%)		√
Data collection & analysis assessed by group members (40%)		√
Oral presentation and diary assessed by a group of tutors (40%)	√	
Written report submitted by the group assessed by the tutor (Reference)	√	

Appendix A

Raw marks of four students

	Regular meeting (20%) PA	Data collection & Analysis (40%) PA	Oral Presentation (40%) tutors' group	Group report assessed by respective group tutor
Student W	15	30	26	68
Student X	13	24	26	
Student Y	14	30	28	
Student Z	10	22	20	

Final marks by method II [2]

	PA factor	Final marks awarded	Normalised values
Student W	1.10	74.8	0.98
Student X	0.98	66.6	0.87
Student Y	1.12	76.2	1.00
Student Z	0.81	55.1	0.72

Note: The base mark is 68

Final marks by method V [1]

	PA marks	Base marks (0.5×68)	Final marks	Normalised values
Student W	35.5	34	69.5	0.99
Student X	31.5	34	65.5	0.94
Student Y	36	34	70	1.00
Student Z	26	34	60	0.86

Marks: 34 + PA (The weight for each part is 50%)

Final marks by Method VI

	Regular meeting (20%) PA	Data collection & Analysis (40%) PA	Oral Presentation (40%)	Total marks	Normalised Values
Student W	15.7	30.8	28.3	74.8	0.98
Student X	13.6	24.6	28.3	66.5	0.88
Student Y	14.6	30.8	30.5	75.8	1.00
Student Z	10.5	22.6	21.8	54.9	0.72

Regular meeting marks: $0.2 \times 68 \times 4 \times [\% \div (30 + 26 + 28 + 20)]$

Data collection & analysis: $0.4 \times 68 \times 4 \times [\% \div (30 + 24 + 30 + 22)]$

Oral presentation: $0.4 \times 68 \times 4 \times [\% \div (26 + 26 + 28 + 20)]$

Comparison of different approaches

	Method II	Method V	Method VI
Student W (ranking)	2	2	2
Student X (ranking)	3	3	3
Student Y (ranking)	1	1	1
Student Z (ranking)	4	4	4
Average	68.18	66.25	68.00
Standard deviation	9.69	4.63	9.68
Normalised values range	0.72 ~ 1	0.86 ~ 1	0.72 ~ 1

Note: Same raw marks