THE USE OF PEER EVALUATIONS TO DIFFERENTIATE STUDENT PERFORMANCE ON TEAM-BASED DESIGN PROJECTS

John Mirth, Ph.D.
Department of Mechanical and Industrial Engineering
University of Wisconsin – Platteville
Platteville, WI 53818
mirth@uwplatt.edu

ABSTRACT

This paper presents a method to evaluate individual contributions within a team-based environment. The method relies on the ability of students to document their own contributions and evaluate the contributions of their team members. The method uses two sets of points, baseline and merit points, to avoid the need for students to negatively evaluate their peers to obtain a differentiation in grade points awarded. The result is a grading scheme whereby students feel freer to separate the performance of individuals within the design team to recognize those who have made a greater contribution.

INTRODUCTION

Teams exist in the academic environment in an attempt to mimic the team environment that students will encounter after graduation. For better or worse, the team environment in the academic world faces many of the same challenges that are found in the corporate world. One of these challenges is the evaluation of individual performance within a team. The purpose of this paper is to present one scheme for assessing individual contributions to a team effort.

The method presented relies upon students taking a leadership role in evaluating themselves and their team members and tying this evaluation to a significant portion of the course grade. The method uses two sets of points to produce an evaluation scheme that focuses on positive feedback to separate the performance of individuals. The basis for the method is the idea that students are more likely to differentiate performance in peer evaluations if the evaluations can be done in a manner where the differentiation comes from positive, rather than negative, feedback. The evaluation method is detailed in the following sections that describe the course format and grading setup, and the results of the grading format.

THE COURSE SETTING AND THE TEAM-BASED ENVIRONMENT

One possibility for defining individual contributions to a team project is to give the students some of the responsibility for evaluating themselves. This poses some challenges, as students have little desire and less incentive to perform open critiques of their classmates. One way to overcome this obstacle is to implement a self-evaluation system in which the differentiation in performance is achieved by students providing positive feedback to one another. This section describes how such a self-evaluation grading scheme was established in one project-based course.

The evaluation methods to be discussed were implemented during the spring 2003 offering of the "Mechanical Systems Design" (MSD) course at the University of Wisconsin-Platteville. The MSD course provides a look at the engineering design process with an emphasis on the design of mechanical systems. The course material is reinforced through a semester-long design-and-build project. The project is team-based and the various project related submissions typically account for 70-90% of the total course grade.

The differentiation of the performance of individuals within a group was carried out through the implementation of a self and peer evaluation system. This evaluation system counted for 25% (or 25 points out of 100 total course points) of the total course grade and required students to conduct evaluations of one another in two separate categories. The evaluation categories were "baseline points" and "special merit points." The use of each of these categories within the grading scheme is described below.

Baseline Points – The baseline points were used to define a minimum expected effort from each group member. An appropriate level for this particular course was the 80% level. Thus, each group was allocated 80% of the available self-evaluation points (in this case, 20 points per group member) to distribute within the group as they please. A group of 5 therefore had 100 points to distribute among themselves as they pleased at the end of the semester.

Special Merit Points – In addition to the baseline points, the corporation (the class as a whole) was allocated an additional salary pool of 5% of the class self-evaluation points to distribute at management's (the professor's) discretion on a competitive basis. A class of 40 students would have 25x40=1000 total self evaluation points, of which 50 (5%) are allocated to the special merit

category. Each group was asked to nominate one or more members to be considered for special merit points. The performance recommendations made by each group were reviewed by the professor and the merit points were awarded to the students with the strongest credentials.

The purpose of the separate point categories is to provide greater incentive for the students to differentiate their performance. The baseline points can be used to penalize one or more members who have made little or no contribution to the group effort. However, these points more commonly serve as "buffer points," which allow the contribution of all group members to be recognized at an equal level. The 80% level is chosen for these points to minimize their impact upon the B/C student. This level also serves notice to the higher achieving students that they must make clear and exceptional contributions to the group to elevate their grade to an "A" level through the assignment of the special merit points.

One must also note that the actual number of points available is only 21.25 per student (85%) instead of the theoretical value of 25 (100%). This restriction is used to introduce the idea of limited resources when time comes for the students to distribute their points. As such, students cannot simply assign all group members the maximum number of points (25) and circumvent the purpose of the self-evaluation grading scheme.

The two-tiered self-evaluation system provides both an incentive for a minimal level of contribution to a project and for outstanding contribution. As shall be seen in the next section on the evaluation outcomes, the existence of the merit points produced the desired differentiation between the group performances of different students.

EVALUATING THE OUTCOME

The intent of the self-evaluation grading scheme outlined above was to encourage students to honestly evaluate one another on a comparative basis. The nature of the grading system allows this to be done in a positive manner, with students rewarding one another with bonus points instead of penalizing each other by subtracting points. This section examines the outcome of the method, first looking at the student use of baseline points and then at the use of the special merit points.

Baseline Points - Every group made an equal distribution of the baseline points among their members. This likely arises from the fact that peers have little or no incentive to penalize one

another. The fact that groups evenly distributed the baseline points does not mean that the points are "wasted." These points give the students an opportunity to acknowledge to one another that they have all made significant contributions to the project. Hopefully the self-evaluation process brings out these contributions and solidifies the team.

Special Merit Points - The special merit points produced a number of different responses from the groups. Recommendations for the distribution of these points fell into three categories:

1) Identification of individuals deserving special merit: This was the intended use of these points. In these cases, one to three members of the team were recommended for bonus points.   The management honored each of these recommendations with the result that most of those receiving these merit points received enough to elevate their course grade from a "B" to an "A".

2) Equal merit bonuses for all group members: This shows good group balance and no need to differentiate individual grades. The limited number of merit points available means this recommendation is unlikely to alter the grades of these students.

3) Enough merit points to boost all group members to the next higher grade: This is a distribution scheme that is best discouraged for two reasons. First, the limited number of merit points for the class makes this recommendation almost impossible to fulfill. Secondly, such a scheme is likely to be based on "inverse merit" as it most generously rewards those individuals who have performed the worst on the individually graded assignments.

In spite of the different methods the groups chose to recommend distribution of special merit points, the total distribution of baseline and merit points worked very well to meet the objective of rewarding individual contributions to the group efforts.

CONCLUSION

Differentiating between individual efforts within team based projects can be a difficult task. The methods described above have found that student self evaluations and peer evaluations can aid greatly in separating the contributions of individuals. The success of the system described comes from its ability to use baseline points to give students a minimum level of accountability with supplemental special merit points to reward outstanding effort. In this way, the system avoids the almost impossible task of extracting negative peer evaluations from the students while still providing a basis for honest comparison through positive feedback.