

Free Riding in Group Projects and the Effects of Timing, Frequency, and Specificity of Criteria in Peer Assessments

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The benefits of collaborative learning and student-centered learning in higher education are widely recognized in academic literature. Collaborative learning can provide students with a peer group outside of class with whom they can discuss new concepts and assimilate new ideas. Furthermore, many businesses rely on teamwork, and many recruiters ask students about their experience with working in team settings (Ravenscroft, 1997). However, many students have a negative perception of group projects that is based on their experience with groups that did not function well together (Fiechtner & Davis, 1985).

The free-rider problem, also known as social loafing, is the focus of many complaints voiced by students regarding unsatisfactory group-work experiences (Mello, 1993; Strong & Anderson, 1990; Williams, Beard, & Rymer, 1991). To ameliorate this problem, some instructors use peer evaluations to instill accountability for individual contributions. Often, instructors cannot observe first-hand each group member's contributions to collaborative project work. When students or course facilitators want grading of group work to take into account individual contributions to a group project, students must have a role in assessment. However, the outcomes cited in the literature are mixed

ABSTRACT. The free-rider problem, also known as social loafing, occurs when one or more members of a group do not do their fair share of the work on a group project. In this article, the authors present a group evaluation instrument characterized by early implementation, multiple evaluation points, and the use of specific evaluative criteria. They tested their assessment method on a sample of 330 undergraduate students enrolled in an introductory, crossdisciplinary business course. The results suggest that the use of this instrument can mitigate free-rider problems and improve students' perceptions about groups and group projects.

in terms of student perceptions of peer assessment and the reliability of peer evaluations (Cheng & Warren, 1999).

Most peer evaluation processes involve confidential, end-of-the-term-only peer evaluations (Bacon, Stewart, & Silver, 1999). This type of feedback may actually encourage undesirable behaviors by group members. Rather than confront each other about those behaviors, students tolerate the behavior, thinking that they can "burn" the poor performers at the end of the term on the peer evaluations (Bacon, Stewart, & Silver, 1999). The finding by some researchers that peer evaluations are the least effective tool for improving group performance may not surprise (Strong & Anderson, 1990); this perception of

ineffectiveness may have limited the extent to which educators have used peer evaluations (Falchikov & Goldfinch, 2000; Macpherson, 1999).

To overcome some of the drawbacks associated with group evaluation instruments, we have developed an assessment procedure that features (a) early implementation, (b) multiple evaluation points, and (c) specific evaluative criteria. In this article, we describe our evaluation process and examine students' responses to our assessment system. The responses include changes in both behaviors and perceptions about the evaluation process and group work.

The Free-Rider Problem

Research has demonstrated that peer ratings can affect individuals' perceptions about the cohesiveness and performance of their groups (DeNisi, Randolph, & Blencoe, 1983). In a meta-analysis of studies that examined group evaluation, Karau and Williams (1993) discovered that the *potential* evaluation of individual contributions to group work had an "especially strong influence" in ensuring that each team member did a fair share of the work. Also, Druskat and Wolff (1999) found that peer appraisals can have a positive influence on a group's ability to work well together and on team members'

satisfaction with the group. We used these ideas to formulate the following two hypotheses concerning the free-rider problem:

H1: Group evaluations can reduce free-rider problems.

H2: A reduction in free-rider problems will result in (a) the perception that group projects are a good way to learn and (b) the perception that members of a team are working well together.

Timing, Frequency, and Specificity of Criteria in Group Evaluations

Druskat and Wolff (1999) found that the benefits provided by group assessments are dependent on timing. Thus, they suggested that evaluations should be conducted while groups are deciding how to conduct their work and which roles team members will be performing. Other research indicates that the mere exposure to an evaluation instrument can lead to improvement in an individual's contributions to the group (Reilly, Smither, & Vasilopoulos, 1996; Smither et al., 1995). Dominick, Reilly, and McGourty (1997) suggested that the process of completing evaluation instruments gives team members a chance to consider their own contributions to the group and set their own objectives for improvement. Those results of these studies provide impetus for conducting peer evaluations early during a group project. Furthermore, introducing peer evaluations early gives students greater practice with the technique and may increase the reliability of peer assessments.

However, in the context of a traditional, one-time assessment, the early completion of the evaluation instrument does not allow group members to evaluate team members over the full course of a project. Fiechtner and Davis (1992) suggested that providing feedback to students on their performance at multiple stages allows lagging students the chance to improve. Thus, the early completion of the *only* evaluation during a project might remove the motivating force associated with the assessment process and reduce opportunities for improved communication that might occur with multi-

ple stages of feedback. Though the literature suggests that students benefit from peer evaluations because the feedback promotes interactions between team members, studies typically do not test this empirically (Cramer, 1994; Johnson, Johnson, & Smith, 1991; Young & Henquinet, 2000). Druskat and Wolff (1999) provided empirical evidence that peer appraisals are associated with group members' perceptions of improved communication and reduced free riding. However, they studied only developmental peer assessments, which are used for feedback only rather than for evaluative (grading) purposes. Our peer evaluations were used for both developmental and evaluative purposes. We argue that the most effective way to reduce free riding involves completing student evaluations early in a project and at multiple points during longer projects.

In addition to the timing and frequency of peer assessments, the specificity of performance criteria in the evaluation instrument may also be an important aspect of the group evaluation process. Many educators suggest that an assessment instrument that contains specific evaluation criteria can provide individuals with clearer indications of expected behaviors (Bloom, Hastings, & Madaus, 1971; Van Velsor & Leslie, 1991; Young & Henquinet, 2000). Erez and Somech (1996) have documented higher performance for groups that are given specific goals establishing clear standards for assessment, and Harkins (1987) found that team member performance improved when individual contributions were evaluated relative to identified criteria. Thus, the completion of evaluation instruments that contain specific criteria can provide team members with more effective feedback than global measures of performance and may help reduce free-rider problems. This led us to the following hypotheses concerning the perceived impact of the three characteristics of our evaluation process:

H3: Early group evaluations will be perceived as useful for reducing the free-rider problem.

H4: Multiple group evaluations over the course of a project will be perceived as useful for reducing the free-rider problem.

H5: Providing specific criteria in an evaluation instrument will be perceived as useful for reducing the free-rider problem.

We propose a group evaluation system that is characterized by early implementation, assessments at multiple time points, and the use of specific criteria and suggest that these aspects of the peer evaluation system will reduce free-rider problems and subsequently lead to positive perceptions among students about their groups and group projects. To our knowledge, the potential benefits of evaluative peer assessments have not been tested under these circumstances.

The Proposed Evaluation System

We developed this evaluation system for a required, introductory, crossdisciplinary business course. The course comprised a 2-week introduction followed by three 4-week modules—accounting, marketing, and management—each taught by a different instructor. We used a business simulation game as an integrating pedagogical tool; throughout the semester, students worked in groups, making decisions about the operation of their simulated firm.

During each module, students completed a team project and made an in-class presentation about it. In the accounting module, the team project focused on creation of a balanced scorecard strategy map for its firm. In the marketing module, each group designed a marketing plan for the launch of a new product; and in the management module, each group designed a strategic plan. Overall, these projects accounted for 31.25% of each student's course grade.

The peer evaluation packet consisted of a cover sheet (see Appendix) that offered instructions on how to complete the packet and explained that the evaluations would be anonymously shared with their group members. The second page of the peer evaluation packet was an illustration of a completed feedback grid (see Table 1). Subsequent pages in the packet contained blank feedback grids that the rater could complete for each member of the team; the rater would also complete one evaluating himself or herself. We held discussions with students

TABLE 1. Sample Sheet in Team Member Evaluation Packet

Team Member's Name: Sample Team Member

Evaluation criteria	For each criterion, rate this team member on a scale of 1 (<i>never</i>) to 5 (<i>always</i>)	Provide comments and constructive feedback in the spaces provided below.
Prompt in attendance at team meetings.	5	
Delivered agreed-upon parts of project in a complete fashion.	5	
Met deadlines.	3	Sample team member was late completing the PowerPoint presentation. He was supposed to complete it on Wednesday afternoon, but he didn't finish until late Thursday night.
Volunteered appropriately during team meetings when tasks needed to be accomplished.	4	Sample Team Member was always at the meeting, but he was not always prepared for the meetings and hardly ever had anything to contribute. Sometimes, he just sat there.
Pulled fair share with regard to overall workload.	5	
Showed enthusiastic and positive attitude about team activities and fellow team members.	5	Sample Team Member was always enthusiastic about how our company was doing financially.

Overall Evaluation

Based on the points available for the team, I would "pay" this person 85 for his/her share of the team points.

Overall Feedback (this is mandatory):

Sample Team Member was really motivated at first, but at the end of the module, he let the team down when he was late with the PowerPoint. When he missed his deadline, the entire team had to stay up all night rehearsing our presentation. Once Sample Team Member knew that he was having trouble with his part of the assignment, he should have asked for help.

who had taken the previous year's course to gather information on their team members' desirable and undesirable behaviors; we used this information to establish our assessment criteria.

At the end of each module (every 4 weeks), the students completed a peer evaluation packet. Thus, students within a group reviewed each other at three different points. Each student completed an evaluation packet outside of classroom hours, placed the evaluation packet in a sealed envelope, and gave that envelope to the module instructor after the completion of the group project and presentation.

After receiving the packet, the instructors and a graduate assistant first verified that the correct total number of points (equal to the number of team members times 100) was distributed among all team members and that the rating given to an individual on the cover sheet matched the rating given to

that same student on the feedback grid. We then reassembled the evaluations so that students would receive their own cover sheet, their feedback grids completed by their teammates, and their own self-evaluation. We recorded the average of the scores for each individual on the bottom of his or her cover sheet, and we used this average to weight the instructor's evaluation of the group's performance. If a group earned a 90 on its project, and a particular student in that group received an average peer assessment of 90 points, then that individual received an 81 as a grade on the project. In some cases, students received grades in excess of 100 points.

Method

Sample

During the semester in which the data were collected, we taught 12 sections of

the course, with a total enrollment of 340 students. Each section had 5 student groups (with 4 to 7 members in each group), for a total of 60 teams. At three points during the semester (at the end of each module), the students completed a self-evaluation and an evaluation for each of their team members. Also, at the end of the semester, students completed a questionnaire concerning the course and the group evaluation instrument. Three hundred and thirty of the 340 students enrolled in the course completed the questionnaire. Thirty-six percent of the respondents were female, and 64% were male.

The course was required for all business majors in the first semester of their freshman year; upper-level transfer students were usually waived out of the course. Of the students included in the sample, 89.5% were freshmen, 8.7% were sophomores, and 1.9% were juniors. According to major classifica-

tion, 35.3% of the students were business-undecided majors; 16.8% were management/entrepreneurship majors; 15.0% were marketing/advertising majors; 8.0% were computer information systems majors; 7.4% were accounting majors; 6.5% were finance majors; 6.2% were international business majors; and the remaining 5.6% were other majors.

Results

To test the hypothesis (H1) that group evaluations can reduce free-rider problems, we examined changes in peer evaluations over the three time periods. When all group members are contributing equally to the project, each member of the group should receive an evaluation score of 100, and the variance of evaluation scores should be zero. Therefore, if the evaluation procedure reduced the free-rider problem, the variance in group evaluation scores should decrease over time. Variance of evaluation scores from the first administration for the assessment instrument was 140.249 ($n = 340$). Variance of scores on the second administration of the assessment instrument dropped to 78.023 ($n = 340$). Levene's test for equality of variances indicated that this 62.226 point drop in variance was significant (Levene statistic = 20.894, $p = .000$). The variance of evaluations from the third administration was 78.781 and was not significantly different from the variance of the second administration (Levene statistic = 0.093, $p = .760$). When we considered multiple administrations of the assessment instrument, a second application of evaluations did significantly reduce the free-rider problem. However, we found no evidence of change in the degree of the free-rider problem between the second and third evaluations.

We used linear regression to test the hypothesis that a reduction of the free-rider problem would be positively associated with the desirable outcomes: (a) students' feeling that team projects are a good way to learn (H2a) and (b) the perception that teams were working well together (H2b). In the first model, TEAMPROJ (team projects are a good way to learn) was the

dependent variable and REDUCEFREE (the team evaluation process reduced free-rider problems) was the independent variable. Consistent with H2a, REDUCEFREE was a significant predictor of TEAMPROJ, with an unstandardized/standardized β of .364/.432 ($t = 8.631$, $p = .000$, Adj. $R^2 = .184$). When students perceived that the evaluation process reduced the occurrence of free-rider problems, they were more likely to feel that team projects were a good way to learn. In the second model, WORKWELL (our group worked well together) was the dependent variable and REDUCEFREE was the independent variable. H2b was supported; REDUCEFREE was a significant predictor of WORKWELL with an unstandardized/standardized β of .416/.539 ($t = 11.526$, $p = .000$, Adj. $R^2 = .288$). Again, the more that students perceived the evaluation process as helpful in reducing the free-rider problem, the more they felt that their groups worked well together.

To examine the impact of early evaluation (EARLY), multiple evaluations (MULTI), and specific criteria (SPECIFIC) on REDUCEFREE, we used linear regression. In the model, REDUCEFREE was the dependent variable, and EARLY (H3), MULTI (H4), and SPECIFIC (H5) were the independent variables. We found that all three independent variables, EARLY (unstandardized/standardized β of .289/.249, $t = 4.533$, $p = .000$), MULTI (unstandardized/standardized β of .153/.134, $t = 2.401$, $p = .017$), and SPECIFIC (unstandardized/standardized β of .519/.384, $t = 7.733$, $p = .000$), were significant predictors of REDUCEFREE (Adj. $R^2 = .382$). Students perceived that free-rider problems were reduced when evaluations that provided specific feedback were conducted early in a project and several times during that project.

Discussion

The assessment system that we have proposed was intended to make group experiences more successful by helping students develop the capacity to assess their peers, by deterring a common form of dysfunctional behavior (free riding),

and by encouraging reflection on how to improve individual contributions to group projects. Our results indicate that an evaluation system that provides feedback on specific criteria at both early and multiple points during a group project can reduce free-rider problems and lead students to view group experiences in a more positive light. The mitigating effect of our evaluation system on free riding was evident in students' perceptions as well as their behaviors, as demonstrated by the decline in the variance of peer ratings between the first and second assessments.

Assessment and feedback mechanisms can in themselves be means of providing learning. If the feedback allows students to identify aspects of poor performance and ways to improve it, students can improve their peer evaluations. This is an increasingly important skill as educators move from traditional to more active learning and student-centered endeavors. Peer assessment procedures may have a role in shaping the attitudes that students have toward their work. If students have a positive reaction to this assessment process and become accustomed to it at an early stage (freshman year), we may enable them to transfer their peer-assessment ability to other experiences and thus create more effective partnerships among their group members in subsequent educational and professional settings.

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APPENDIX

COVER SHEET FOR TEAM MEMBER EVALUATION PACKET

Name:
Group Name:
Section:
Date:

At three different times during the semester (near the end of each module), you will evaluate each of the members of your team. Fill in an evaluation sheet for each of your team members. All responses should be typed and then printed out.

Your evaluation and the evaluations from other members of your group will be returned to the person that is being evaluated. In order for these evaluations to be meaningful, you need to provide your team members with constructive feedback. Let your team members know what they are doing well and what they are not doing well. Also, let them know how they can improve their performance. When the forms are returned to your team members, they will not see your name associated with your comments on their performance.

Place your completed Team Member Evaluation Packet in a sealed envelope with your name, your group name, and your SB 101 section letter indicated on the outside of the envelope. The envelope should be turned in on the last day of the module.

The points that you award each team member will be used in determining that team member's grade on that module's

group project. Team members that do not do their fair share of the work may lose points on group work, and team members that do more than their fair share of the work may get extra points added to their group work.

On the overall evaluation, you will be "paying" each of your team members with points. You will have 100 points to allocate for each member of your team. For example, if you have 6 members on your team, you have 600 points to allocate. If everyone contributed equally and did his or her fair share of the work, then each member of the team should receive 100 points. If someone did more than his or her fair share of the work, that person should receive more than 100 points. Likewise, if someone did less, that person should receive less than 100 points.

After you have completed the individual evaluation forms (including a page for yourself), complete a Summary Table. To make the Summary Table, create one column for each group member, including yourself, and title these columns with each member's name in type. Include a final column titled "Total Team Points." Under each group member's name, place the number of points that that person should receive; this number should match the "pay" that you indicated at the bottom of each person's individual page. Add up the points that you have allocated across the columns and put this number in the last column. This number should equal 500 points if you have 5 team members or 600 points if you have 6 team members.

Create another, smaller table titled "Your Group Evaluation Average." Leave it blank; it will be used for recording the average of the scores that you received from all team members. If you do not feel that your group evaluation average accurately reflects the work that you completed on your group project, you should set up a meeting and talk with your team members. After talking with your team members, if you still do not feel that you have been evaluated fairly, you and your team should schedule a meeting with that module's professor.