IMPROVING STUDENT TEAMWORK IN A COLLABORATIVE PROJECT–BASED COURSE

Edward Kapp

Abstract. While collaborative student projects can be effective in improving student learning, the failure of students to work together effectively remains a widely reported problem in collaborative learning. This article describes a team-building intervention designed to improve the students’ abilities to work together in teams successfully. The intervention consisted of an initial team-building workshop with subsequent evaluation and feedback. The results include positive student perceptions of team performance and the overall value of collaborative learning.

Keywords: collaborative learning, student projects, team building

Student collaborative projects have numerous advantages over more traditional classroom-based instruction for improved student learning. Students working cooperatively to achieve a common goal produce higher achievement and exhibit greater productivity than they do working alone (Johnson and Johnson 1999). Collaborative work can lead to improvements in intrinsic motivation, enhanced persistence on the part of students when faced with adversity, and greater transferability of the knowledge and skills acquired through the collaborative learning experience (Pfaff and Huddleston 2003). Students involved with collaborative project teams experience improved attitudes toward teamwork overall (Levi et al. 1998). Students’ communication skills, their problem-solving abilities, and their capability to work as effective members of a team, which develop and improve from collaborative learning activities, are all attributes highly valued by future employers (Dickinson 2000; Millis and Cottell 1998; Thomas and Busby 2003).

Nevertheless, the failure of students to work together effectively as teams is commonly reported in the literature (Dyer 1995; Page and Donelan 2003; Pfaff and Huddleston 2003). One of the most commonly cited problems with collaborative learning is that of “free-riding” in which one or more individual team members do not contribute their full potential, instead relying on the work of others to carry them through (Brooks and Ammons 2003; Dyer 1995; Joyce 1999). Another difficulty encountered by student learning teams is that of an individual student “hijacking,” a situation in which a member takes complete control of an assignment and aggressively directs the activities of the other students while actively discouraging their participation in any form of decision making (Pfaff and Huddleston 2003).

In this article I discuss a team-building intervention employed in a senior-level project learning course to improve the students’ abilities to work together as teams. The intervention, consisting of a one-hour team-building workshop and subsequent peer evaluations, is described and the results of the intervention presented. Further application of this approach and its limitations are also discussed.
Case Study Context: “Analysis and Design for Safety in Industrial Operations”

“Analysis and Design for Safety in Industrial Operations” is the senior capstone course in the occupational safety curriculum. The students in this course are traditional undergraduate students, male and female, ranging in age from 20 to 25 with an occasional non-traditional student enrolling. The course is designed to have students work in semi-autonomous teams to: (1) correctly apply the federal occupational safety and health standards and best industry practices for the identification of workplace hazards in actual industrial operations and (2) develop appropriate corrective measures to mitigate those hazards. The results of each phase of the project are then presented both orally and in written format to the management of the host organization. The project teams are semi-autonomous—self-managing with minimal organizational assistance provided by the instructor. Students from each team rotate through the assigned role of Team Coordinator, with each member of the team serving as Team Coordinator for a portion of the project. In addition to contributing to the content of the project, this Team Coordinator has the responsibility of serving as the single point of contact between the host company and student team coordinating the team activities.

The most difficult aspect of this course for the students historically has been the ability to work together effectively as teams. The author’s personal experiences with this course match those problems revealed in the literature as previously discussed. Additionally, perceptions of unfair distribution of work, student dissatisfaction with the experience resulting in a negative attitude toward teamwork in general and mediocre quality of team projects have also been observed. The situation in the course varied from semester to semester, with student teams ranging from marginally effective to slightly dysfunctional until the spring of 2004 when the situation became dramatically worse. Student experiences with this course in the spring of 2004 can best be expressed by the comments received on peer evaluation forms at the end of that semester from the members of one of the student teams:

Basically there was minimal participation, substandard work, and in [male student, age 21] case, he warrants a separate medical evaluation to determine if there is something wrong with him. (Male student, age 35)

It’s not that everybody didn’t participate fairly in the group, it seemed like some members’ contributions were not incorporated into the paper. (Male student, age 20)

I believe we all were getting a little frustrated at times with [male student, age 35] because he seemed to take over a lot. (Female student, age 20)

I don’t know what the other group members did. I just know for the project I participated and did the job [Male Student, Age 35] told me to do. (Male student, age 21)

What was needed was an approach to improve students’ teamwork. Any intervention needed to be expeditious so as to minimize the time taken away from the primary content of the course, but still able to maintain efficacy in improving student team functioning. With the assistance of the director of the university’s Leadership Development Center, a team-building intervention was developed for the fall of 2006 consisting of a one-hour team-building workshop and periodic structured peer evaluations.

The Team-Building Intervention

The Team-Building Workshop

Following a brief introduction by the professor and a review of the course syllabus, the remaining portion of the first class meeting of the fall semester 2004 was devoted to a team-building workshop. The team-building workshop consisted of one hour of instructor-led discussion designed to have the students: (1) examine differences in individual personalities and preferred work styles; (2) identify the opportunities and obstacles that these individual differences pose for team performance; and (3) explore ways to successfully work together to take advantage of the opportunities and avoid the obstacles to achieve successful team performance.

The workshop began with a brief introduction that established the purpose of the workshop and the agenda for the hour-long program. The first exercise of the workshop was a human continuum exercise. This exercise was designed to have the students recognize the different personal preferences and preferred work styles among their peers by having them physically place themselves on a continuum according to their preferred position between the binary responses to a series of questions such as: (1) “Does following a schedule appeal to you, or cramp your style?”; and (2) “Can you talk easily to almost anyone for as long as you have to, or find a lot to say only to certain people or under certain conditions?” Running intermittently during the human continuum exercise was an instructor-led discussion highlighting the advantages of integrating different skills and experiences in project teams. This exercise helped convey to the students the wide range of work styles that will likely be represented on their teams and the advantages that including a mix of perspectives and work styles brings to the project.

The second exercise began with the random assignment of students to their teams for the semester. Students were given a few minutes to introduce themselves to their new teammates, although most of the students had taken one or more previous classes together. They then began structured discussions of past team experiences. Each team member in turn discussed his or her past experiences with teams, both good and bad, within respective teams. Each team subsequently presented to the entire class two attributes from their collective past team experiences, one characterizing a good team experience and the other representing a dysfunctional team experience. This process was documented by the instructor via two master lists on the chalkboard and continued in round-robin fashion until no new attributes were revealed. A class discussion ensued that identified those characteristics that repeatedly appeared in the discussions of successful team experiences. A handout summarizing the characteristics of effective teams from the literature (Larson and LaFasto 1989) was then distributed to the teams to address any characteristics of effective teams that were not uncovered through the class discussion.

In the culminating exercise of the teambuilding workshop, each team created a contract for team membership. These contracts consisted of five to seven objective, measurable, individual behaviors that the team members agreed were important to team performance and to which
they were willing to commit themselves. These individual behaviors were derived through consensus of the team members. Examples included attending all scheduled team meetings, informing team members of lateness to team meetings, and completing assignments on schedule. Contracts for team membership were rendered in writing, signed by all members of the team, and delivered to the instructor at the beginning of the next class period. The instructor retained the original contract and returned copies for each team member.

Peer Evaluations

During the course of the semester, each student received three evaluations of his or her individual performance from fellow team members based on their team’s contracts. The peer evaluations were completed at the end of each phase of the project: (1) practice assessment report presentation; (2) company assessment report presentation; and (3) company design project completion. Every specified behavior from the contract was translated into a question with the response registered on a five-point Likert scale ranging from strongly agree to strongly disagree. In addition to providing the individual team members with meaningful feedback on their performance, the peer evaluations were also used by the instructor to monitor each individual team member’s contribution to the overall team performance. In the case of persistently poor evaluations, the instructor retained the right to adjust that student’s course grade to reflect their performance, a condition the students were informed of in the course syllabus.

Evaluating the Team-Building Intervention

To evaluate the effectiveness of the team development workshop and the peer evaluation process, a triangulated data approach was used (Denzin 1978) that included the students’ written responses to two open-ended questions and a comparison between the student course evaluations and the evaluations from the previous offering of the course.

Two of the six questions asked of all the students as part of the final examination were used for this analysis: (1) “Looking back at your experiences in analysis and design working as a member of a team identifying hazards and developing corrective measures, what are your impressions on how your team performed at these tasks?” and (2) “How have your perceptions on academic teams and teamwork in learning activities changed as a result of this class?” Student responses to these questions were coded both by the author and a second independent coder as positive, neutral, or negative reflecting: (1) the student’s perception of his or her team’s performance; and (2) the student’s attitude toward academic teamwork overall. Additionally, excerpts from the student responses are included in the results to provide greater insight into the specific experiences from the students’ perspectives.

As a second measure of the efficacy of the intervention, a comparison of the course evaluations to the course evaluations from the previous spring was conducted. Three items from the standard departmental 10-item course evaluation were selected for evaluative purposes. These items were: (1) “Each student is encouraged to contribute to class learning”; (2) “The climate of the class was conducive to learning”; and (3) “Assignments are of definite instructional value.” The items were all answered on a 5-point Likert scale measuring level of agreement with the statements. These items were selected because of their direct relevance to student learning as influenced by the collaborative project learning nature of the course as opposed to those items addressing instructor behavior.

Results

The results showed that 85 percent of students reported a positive perception of their team performance (i.e., 12 of 14 students), and 93 percent reported a positive attitude toward academic teamwork in general (i.e., 13 of 14 students). A summary of the coded student responses to the final exam questions and the inter-rater reliability expressed as percent agreement on positive attributions is displayed in table 1.

At least two members of every team attributed their team’s success to the team’s ability to develop a collaborative climate in which the members became familiar with each other and their preferred work styles, and learned to work together. A collaborative climate is one of the eight characteristics of effective teams (Larson and LaFasto 1989). Establishing a collaborative climate enabled the students to work together effectively, allowing them to put their full efforts into task performance. In the words of one student:

At first we weren’t familiar with how each one of us worked, but as time went on our familiarity grew making it easier to work with one another. Toward the end of the semester I felt we had become a very effective team. (Male student, age 21)

This development of a collaborative climate took time however. According to another student:

I feel that once we got a feel for each other, it was very easy to work together. We had little trouble working together in a productive manner. (Male student, age 21)

This developmental process began, or was at least fostered, with the team-building workshop, particularly the human continuum exercise. This exercise helped to convey the wide range of work styles and the inherent advantages and difficul-
ties of combining different work styles on a single team. One student explained the course of development this way:

I think that he [the workshop presenter] helped us all realize our strengths and weaknesses, and then work off of each other. (Female student, age 21)

The peer evaluations also appear to have been beneficial in establishing this collaborative climate. According to another student:

I thought that the peer evaluation helped pretty well with our team. It enabled us to look at what each other were thinking, which helped us work on or change anything that needed to be fixed. (Female student, age 20)

A set of standards that was understood by all was also reported by at least two members of each team. These shared standards allow individual team members to know what is expected of them individually and collectively. A set of high standards shared by all is another characteristic of effective teams (Larson and LaFasto 1989). One student explains the importance of shared expectations in this way:

Everyone was willing to do their part in my group to get the jobs we needed to do done. It was really nice to actually have a group like this. (Female student, age 20)

The development of these shared expectations was attributed to the contract for team membership:

I feel as though that initial writing time helped each one of us to understand the expectations that each member of the team had for one another. (Male student, age 21)

The peer evaluation system was helpful in providing team members with the feedback they needed to determine if their behavior was in line with the standards. According to one student:

This was a subtle way to let the team members know if they were doing a good job or needed to contribute more as a member of the group. (Female student, age 21)

Because of the small number of students in the course there was insufficient statistical power to confirm improved scores on the items from the student course evaluations through a comparison of means test, but descriptive statistics are provided lending support to the success of the intervention. The comparison between items on the student evaluations relevant to the effects of the team-building intervention from the spring and fall offerings of the course is displayed in table 2, along with the grand means and grand standard deviations for the entire 10-item evaluation instrument. Items on the course evaluation are measured using a 5-point Likert scale measuring the level of agreement with each items ranging from 1 (strongly disagree) to 5 (strongly agree).

**Discussion**

The purpose of this study was to evaluate a team-building intervention designed to improve the students’ abilities to work together as effective teams. By all measures the team-building intervention appears to have been successful. Students overwhelmingly reported a positive perception of their team performance and a positive attitude toward academic teamwork in general. Student commentary indicated that establishing a collaborative climate and creating shared expectations allowed the teams to work together comfortably and effectively. Success in establishing a collaborative team climate and a set of shared expectations was attributed to both the team-building workshop and the peer evaluation system by the students. The increase in the overall course evaluation and the three specific items selected for evaluative purposes lend further support to the success of the intervention.

There is a limitation to this study, namely the potential biasing effect of drawing data for the evaluation from questions included on the final examination. Students may have been overly positive in their responses to these questions in an attempt to solicit a more favorable grade on the examination from the instructor. The inclusion of multiple measures for evaluation including both the quantitative and qualitative analysis of student responses and a comparison of student course evaluations reduced the effects of this potential bias on the overall evaluation.

This study demonstrated that instructors can intercede to improve students abilities to work together effectively in teams through a targeted team-building intervention. This intervention began with a one-hour team-building workshop and included exercises that had the students (1) recognize that there are differences in

<table>
<thead>
<tr>
<th>TABLE 1. Results of Coding and Inter-rater Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rater 1</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>Perception of team performance</td>
</tr>
<tr>
<td>Positive</td>
</tr>
<tr>
<td>Negative</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
<tr>
<td>Attitude toward academic teamwork</td>
</tr>
<tr>
<td>Positive</td>
</tr>
<tr>
<td>Negative</td>
</tr>
<tr>
<td>Neutral</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE 2. Student Course Evaluation Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course evaluation items</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>Each student is encouraged to</td>
</tr>
<tr>
<td>contribute to class learning.</td>
</tr>
<tr>
<td>The climate of the class was conducive to learning</td>
</tr>
<tr>
<td>Assignments are of definite instructional value</td>
</tr>
<tr>
<td>Total mean for course evaluations</td>
</tr>
<tr>
<td>Standard deviation</td>
</tr>
</tbody>
</table>
the personalities and preferred work styles of their peers, (2) understand the potential advantages in task performance presented by including a range of different perspectives on a single team, and (3) create a contract for team membership that establishes explicit expectations for individual member performance. The team-building intervention was time efficient from the instructor’s perspective, requiring only one hour of the first class meeting to conduct the workshop and a little more than one hour spread over the duration of the semester to compile peer evaluations. This efficacious and efficient approach to building better-performing student teams can be used in other courses to achieve similarly impressive results.

REFERENCES