Teaching Freshman Students to Assess Team Performance

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Abstract

This paper describes an approach to teaching teaming that has been used in a freshman engineering design course for the past three years. The approach includes three components. First, provide students with a variety of teaming experiences. Second, teach students some basics of team functioning. Finally, establish a culture in which self-assessment and evaluation of others is expected. The paper briefly describes the use of the following class activities: 1) a survey designed to establish a baseline of team functioning for each individual, 2) jigsaw exercises related to team roles, stages of team development and typical team problems, 3) a team-readiness self-assessment essay, and 4) periodic team assessment reports. Through these activities each student demonstrates the ability to evaluate teaming skills.

I. Introduction

Mercer University’s School of Engineering has taken the opportunity provided by the transition from the quarter system to the semester system to engage in a two-year-long curriculum renewal effort. As part of this effort, our quarter-long freshman Introduction to Engineering course (EGR 103) was expanded to a semester-long course (EGR 107).

The quarter-long Introduction to Engineering Design course became a required part of the freshman curriculum at Mercer University in 1987. The overall objective of EGR 103 was to introduce engineering students to the design process. In this course, teams of students were assigned an open-ended project in which they were required to design, build, and test a simple device. Although the projects were somewhat open-ended, the course was highly structured. The students were guided through the design process through the use of specific deliverables and concrete due dates. The course also emphasized the importance of communication; student teams were required to deliver oral and written design reviews at the middle of the project and at the end of the project. A detailed description of the evolution of the quarter-long freshman design course is included in a previous paper. ¹

II. Course Development

Although the basic goals of the Introduction to Engineering Design course remained the same, the curriculum was revised somewhat during the switch from quarters to semesters. The students were still required to work together in teams to design, build and test a working prototype. However, as course coordinator, the author made two basic changes to the curriculum. First, several lessons on teaming skills (the teaming module) were added. Second, the grading scheme was modified to include an individual team participation component.
Several books and articles 2-7 were especially useful to the author when developing the new curriculum. Thus, the module was designed with the following assumptions:

- Students learn by doing ➔ center lessons around active learning principles
- Students learn by experiencing ➔ require students to work in groups
- Students learn by observing themselves and others ➔ require students to evaluate their behavior
- Students learn by writing ➔ include many writing exercises in the module

III. The Teaming Module - Theory

The teamwork module includes the following class activities: 1) a survey designed to establish a baseline of team functioning for each individual, 2) small team design activities (ping pong ball launcher, rubber band car, etc., 3) jigsaw exercises related to team roles, stages of team development and typical team problems, 4) a team-readiness self-assessment essay, and 5) periodic team assessment reports.

The design of the teamwork module encourages students to use a combination of cognition, reflection and experience to improve their teamwork skills. The Venn diagram below shows how the three relate.

![Figure 1. The Teamwork Module](image)

The section marked W represents a combination of cognition and experience. The W activities include jigsaw exercises, individual group quizzes, and individual/group forced choice exercises related to team roles, stages, and performance. The section marked Y represents a combination of cognition and reflection. The Y activity is a self-assessment questionnaire based on ideal team behaviors listed in The Team Handbook ². The section marked Z represents a combination of experience and reflection. The Z activities include group discussions and journals written after completing the mini-design projects as well as periodic team assessment reports delivered during the major design project. Finally, the section marked X represents the intersection of all three variables. At the end of the teamwork module, students
write a team-readiness essay in which they are instructed to reflect upon their present ability to
perform well on a team.

IV. The Teaming Module - Results

Assessment of Self - By the end of the teaming module, each student had participated in four
different groups. In two of the groups the students designed rubber-band powered cars and
participated in a friendly competition to determine the "best" design. Students were grouped
together on two different occasions when they participated in "jigsaw" activities based on
information from The Team Handbook. Although these activities were too short to allow the
students to form a team in the truest sense of the word, the activities did give the students an
opportunity to observe their behavior when working in a group. Students were instructed to
write their team-readiness essay based on the knowledge and insights gained during the
module. They were also encouraged to reflect upon their performance in other groups and
teams they had participated in before enrolling in EGR 107.

Many students showed significant insight as they wrote their essays. For example:

"As time has gone on and I have been placed on many teams, I have noticed that I am becoming more
talkative and expressing more of my ideas or concerns. I always helped the group to carry out and make
the projects as much as I could in the past, although I would not contribute many ideas on how to do
them. By realizing that some of my ideas are not as dumb as I used to think they all were, I am making a
conscience effort to speak out more and give more mental help to my group to complement my physical
efforts."

Another student writes,

"My position on a team depends on the other team members. I am capable of taking over any of the
positions. …I usually take what is left simply because I want everyone else to be happy. Generally there
is no job that I completely hate. My goal is to get the job done and watch the team excel. Sometimes I
think that I am one of those team members that just wants to rush to accomplishment. Now I realize even
more that this is not good. Rushing to get the job done is one of my biggest weaknesses."

However, some students did not show any insight as they wrote their reflective papers. Their
team readiness self-assessments more closely resembled an academic essay on teamwork. In
spite of the fact that they had been instructed to reflect on their own behavior, their reports
included a lot of declarative statements and few "I" statements. This is an excerpt from one
such report,

"Team readiness is an important part of working in a group. If one is not ready to work in a group, he/she
cannot easily complete the task that is at hand. I believe that I have been taught the proper way to work
in a group. I have learned that there are four main characterizations for the progress of a team. These
help team members to realize where they stand as a group. They are: forming, storming, norming and
closing. Forming is when…"

Assessment of Others - Once the major design project began, team members were required to
complete periodic team assessment forms. These forms were submitted to the instructor and
held in confidence. Through these reports, the instructor was able to monitor team performance
and intervene, when necessary, in extreme cases. Due to the confidentiality agreement listed on
Another interesting feature of the team assessment forms is the requirement that team members "pay" themselves $1000 for the work done since the last form was submitted. Each team member confidentially divided the salary among the team members. No duplications were allowed; each team member must be given a different amount of money or the forms were returned for revision. Perhaps due to the confidentiality of the forms, students were not reluctant to give a "slacker" a small amount of money. Occasionally a student received $0 for the pay period. However, no student has ever been awarded $0 for the entire reporting period. Information from these reports was used to help the instructor award the individual participation grade that was part of the final course grade.

Reaction to Module - During the end-of-the-course briefing, the course coordinator met with the other faculty members who had taught EGR 107 that term in order to evaluate the apparent effectiveness of the teaming module. Student course evaluations were also reviewed. Reaction to the teaming module was mixed on the part of faculty as well as students. Some students and faculty expressed an interest in eliminating the "non-design" components of the course so the students would have sufficient time to design and build their devices. Other faculty members felt that the addition of the teaming module improved the course. At the present time the module is still an important part of EGR 107. We will continue to get feedback from students and faculty and modify the module as needed.

V. Conclusion

Generally speaking, the Introduction to Engineering Design course has been a success since its inception in 1987. The course gives students an opportunity to learn about the process of design as well as the art of working together in a team. The freshman design course helps students to see that engineering can be rewarding as well as challenging. In fact, many students tell us that this course helped them confirm their choice of engineering as a career. Hopefully, the addition of a teamwork module that emphasizes assessment of self and others has made the course even more valuable.

References

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