Enhancing Student Learning -- Students "Teaching" Students

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Abstract

The scope of this paper deals with promoting effective student learning through the use of Cooperative Teaching. The basic principle of the Theory of Cooperative Teaching states that teaching others is the most effective method to learn subject material. Based on this premise, students should take an active role in "teaching" course material, including: 1) the preparation and presentation of lecture material, 2) the development and grading of homework assignments, and 3) course assessment and evaluation. It is anticipated that this interactive and innovative style of teaching should allow students to gain valuable experience in: teamwork, organizing and delivering presentations, critical peer evaluation, and a better overall understanding the academic process. The contents of this paper document the procedures used to incorporate and integrate this approach into the instructional sequence of an existing course in construction management. Conclusions are formulated as a result of this "experiment in education."

I. Introduction

"CME 425 - Risk Management and Decision Support" is a senior level course offered by the Division of Construction Management within the Department of Civil Engineering and Construction at North Dakota State University. During the 1998 spring semester, twenty-nine (29) students enrolled in the course. The majority of the students were construction management majors, however, there were some construction engineers and architecture students. As part of the course deliverables, students are required to perform a group assignment. The group assignment consisted of forming student teams and having the student teams present material related to risk management from the course textbook. The students were unaware of the nature and scope of the group assignment at the beginning of the semester. This was done so that the instructor wouldn't "scare off" the students. Gradually, throughout the first third of the semester, the instructor presented material related to effective student learning, teamwork, and teaching styles. Eventually, the audience was in a frame of mind to accept and actually look forward to doing some of their own "teaching." The basic objective of this experiment was to promote effective student learning by using innovative instructional methods.

II. The Theory of Cooperative Teaching

There exist several suggested methods and "theories" that describe how to approach the subject of involving students in the delivery mechanisms related to presenting course material[1,2]. During in class discussions concerning the group project, it was decided that we (the students and the instructor) should develop our own system for CME 425 - Risk Management and Decision Support. We were aware that we may be reinventing the wheel, but we felt that this would give us the opportunity to "learn by doing" and to use the "classroom as a laboratory" approach to improving student learning, thus we developed the "Theory of Cooperative Teaching."

The axioms of our Theory of Cooperative Teaching state that:

- the course is the property of both the instructor and the students.
- the students and the instructor have a vested interest in promoting effective learning.
- teaching others is the most effective method to learn subject material.
- the students are responsible for organizing and teaching the course material.

The basic methodology used in the course, as outlined below, was developed by the students and the instructor during a classroom lecture period.

- the instructor acts as the course facilitator.
- all students take an active role in teaching preparation, presentation, and grading.
- the instructor and the students are evaluated based on individual and group assessments.

III. The Group Assignment

As indicated in the course syllabus, the group assignment reflects 25 percent of course grade. The responsibilities and sequence of the group assignment were developed by the course instructor and are listed below.

1. Students will be divided into teaching teams, consisting of three students each. One team will consist of two students.

2. Each team will be assigned a section of "Practical Risk Management in the Construction Industry"[3].

3. The team will then decide on the "best" way to present (teach) the material to the class.

4. The team will then prepare a 20 minute classroom presentation for the assigned material.

5. The team will prepare a homework assignment which covers their instructional material.

6. Immediately after the presentation, members of the audience will evaluate the presentations.

7. Members of the audience (students and instructor) must complete the homework assignment.

8. The student team is responsible for collecting, evaluating, and recording the grades for the homework assignment.

9. After the assignment is returned, the team will once again be evaluated by the rest of the class with regard to the homework assignment.

10. At the conclusion of this "experiment in education" everyone must complete the "Educational Experience" evaluation.

IV. Data Collection and Evaluation Tools

In order to effectively evaluate and determine a composite grade for the group assignment, grading criteria were established. The grading criteria considered the performance of both the team and the individual. The basic criterion for the composite grade is given below.

In order to "get credit" for the classroom presentation, each team must:

- prepare a presentation.
- be present for, and deliver the presentation.
- prepare, collect, and grade a homework assignment.

For the classroom presentations, each team was evaluated by the audience based on preparation, delivery, response to questions, and overall professionalism. The teams were also evaluated on the homework assignment based on: 1) the value of the assignment as a tool for learning and understanding the material, and 2) the overall quality and organization of the homework assignment. Individuals (members of the audience) "received credit" for the classroom presentations by:

- attending the presentations and submitting a signed evaluation form to the instructor.
- completing the homework assignment.
- submitting a signed homework evaluation form to the instructor.
- submitting an "Educational Experience" evaluation at the conclusion of this experiment.

The course instructor was assigned several tasks and deliverables. The instructor was an equal partner in this experiment. The instructor had to attend all presentations, submit all of the homework assignments for a grade assigned by the student teams, and complete all of the required evaluations. The evaluation of the instructor was averaged with all other evaluations and did not carry any additional weight. The instructor had to develop a summary report of the results of the evaluations and homework grades for each team member in each group. The teams did not receive copies of the original evaluation sheets (classroom presentation and homework assignment). The instructor summarized the results in the report in order to protect the anonymity of the evaluators.

The grading criteria were established by the instructor, however, the actual percentages for each of the grading criterion was established by the students during a lecture period prior to the start of the presentations. There was much student discussion concerning the percentages assigned. A vote was taken and the percentages were assigned by simple majority, as indicated in Table 1.

Table 1 Grading Criteria for the Group Assignment

TEAM GRADES	Percent
Presentation (based on the peer evaluations)	40%
Homework Assignment (based on the peer evaluations)	20%
INDIVIDUAL GRADES	Percent
Composite grade for the 10 homework assignments	25%
Presentation Evaluations (total of 10)	5%
Homework Assignment Evaluations (total of 10)	5%
Overall "Educational Experience" Evaluation	5%
TOTAL	100%

Three separate evaluations were conducted for this experiment. One was for the actual student presentations, the second for the homework assignments, and the third for the overall educational experience. The evaluations consisted of questions and a rating scale.

For the classroom presentations:

- What did you like best about the presentation?
- What did you like least about the presentation?
- What suggestions do you for the group to improve the presentation?
- Based on a scale from 1 to 5, how would rate the presentation of this group?
  - 1 = poor (they were totally unprepared and delivered a lousy presentation)
  - 2 = fair (they did just what they had to do, but they could have put in a lot more effort)
  - 3 = good (they were OK, I learned something but was tempted to take a nap)
  - 4 = very good (I liked what they did - they really held my interest)
  - 5 = excellent (Wow - this group really knows how to make a presentation)

For the homework assignments:

- Did this assignment contribute to your understanding of the material?
- What suggestions do you have for improving this homework assignment?
- Any additional comments?

  Based on a scale from 1 to 5, how would rate the presentation of this group?
  - 1 = poor (this was a totally bogus assignment - a real waste of time)
  - 2 = fair (a little more thought and effort are needed, but it was OK)
  - 3 = good (this assignment did make me think a bit and I learned something)
  - 4 = very good (this assignment really related well to the material in the book)
  - 5 = excellent (how did they think this up -- it was a great assignment)

For the overall educational experience:

- Do you believe the overall group assignment was a beneficial educational experience? (explain why or why not, did you learn anything?)
- Based on what you (and your group) did for this project, what would you (as an individual or a group) do differently?

- What suggestions do you have (for the instructor) for improving this group project?
- Now that this experiment has concluded, would you do it all over again?

V. Student Presentations and Homework Assignments

Most of the student teams elected to present the material in a standard instructional format, i.e., overheads with a mixture of chalkboard diagrams. Two teams did prepare and present their material on a computer platform using Microsoft Power Point. One team created a video depicting construction related risks. Some teams attempted to mix interactive learning and classroom participation thought the use of in class questions and group / workshop activities.

The homework assignments were quite varied although, in general, not very challenging. Some assignments were the basic multiple choice / true false / fill-in-the-blank format, while others contained some short answer and short problems. Part of one assignment consisted of a type of crossword puzzle where you had to locate and circle the solutions to the questions within the block of letters that were provided. Another assignment required that the students access "on-line" information related to construction accidents and identification of construction hazards.

VI. Data Summary

The team evaluations of the classroom presentations and the homework assignments were compiled and averaged by the course instructor, as shown in Table 2. Group 6 was rated the highest in both categories (this was the group that developed the video tape of risks).

Table 2 Team Evaluations (Classroom Presentation and Homework Assignment)

Group Number	Classroom Presentation	Homework Assignment
Group 1	3.2	3.6
Group 2	3.5	3.8
Group 3	3.5	3.7
Group 4	3.6	3.7
Group 5	3.5	3.8
Group 6	4.6	4.1
Group 7	3.2	3.3
Group 8	3.6	3.4
Group 9	3.7	3.8
Group 10	3.7	3.5
Average	3.61	3.67

Student response to questions one and three for the educational experience evaluation are given in Table 3. Student comments and suggestions obtained from this evaluation are included the conclusion section of this paper.

Table 3 Student Response to Educational Experience Evaluation

No.	Evaluation Questions	Yes	No
1.	Beneficial Learning Experience?	27	2
3.	Would you want to do it again?	28	1

The compiled grades for each group and individual were included in the summary report that was distributed to each group. An example calculation for an individual student is presented in Table 4. As shown in the table, this student received a raw score of 3.5 and a 3.6 for the peer evaluations for the team presentation and team homework assignment, based on the 1 to 5 scale. The raw score for the individual homework grade was calculated as an average of all of the student grades assignments. Since there were ten groups, each homework assignment carried a weight of 10 percent. Submitted evaluations for the presentations and homeworks were worth 10 points each. The overall evaluation was worth 100 points. Each of the evaluations was weighted at 5 percent.

Table 4 Example Calculation for the Compiled Student Grade

	Grading Criteria (%)	Raw Score	Weighted Score
TEAM GRADES			
Presentation Evaluation	0.40	3.5	28
Homework Evaluation	0.20	3.6	14.4
INDIVIDUAL GRADES			
Homework Grade	0.25	93	23.25
Presentation Evaluation	0.05	100	5
Homework Evaluation	0.05	100	5
Overall Evaluation	0.05	100	5
TOTAL GRADE			**80.7**

VII. Conclusions

Student comments concerning the overall evaluation of this experiment indicated that the overwhelming majority found this approach to student learning to be a beneficial educational experience. However, most qualified this by stating that they learned much more about their own material than from other student presentations. Approximately 50 percent indicated that the

homework assignments reflected a positive reinforcement of the material covered in the lectures. The other 50 percent felt that the homework assignments were a waste of time, and stated that the assignments were not given enough thought and reflected poor organization.

Virtually all of the overall evaluations stated that they would try and "spice up" their presentations to make them more interesting. Only a few of the students gave some concrete ways in which to achieve this goal. Some of the suggestions included: more outside research in our topic area instead of just the material contained in the book; develop some "real-life" examples for our presentation; develop an in class work session that would get students involved in the presentation; and spend a little more time on preparing and practicing our presentation.

Without exception, the students evaluated the presentations and the homework assignments much more severely than the instructor. The average grade from the instructor for the presentations and the homework assignments was 4.6 and 4.3, respectively, as compared to the student evaluations of approximately 3.6 for both the presentations and the assignments. This was due, in part, to the 1 to 5 rating scale imposed by the instructor. Since the student imposed grading criteria carried a weight of 60 percent for the presentation and the homework assignment, this virtually assured that no student would get an "A" for this component of the course. The instructor realized this prior to the start of the presentations and was faced with two options: 1) change the rating scale, or 2) adjust the grading criterion percentages. The instructor decided hold to the rating scale and allowed the students the option of reevaluating and adjusting their designated percentages at the conclusion of this experiment.

Once all the final grades were compiled, the instructor presented this scenario to the class. Once the students realized how the rating scale would convert to a grade (i.e., a 3.5 converts to 70% which reflects a letter grade of "C"), they decided that an adjustment was necessary. Instead of adjusting the percentages, the class decided that the preferred option was to "add one" to the presentation and homework evaluations. For example, a 3.5 would now convert to a 4.5 and basically be worth and "A" instead of a "C." The instructor assigned these revised values and the average numerical student grade was now 90.5. From the instructors point of view, the grade was irrelevant. The learning experience of the students and instructor was the focal point of this entire endeavor.

Based on the results of this experiment, several benefits to this type of approach to enhanced students learning were formulated, as outlined below.

- Although difficult to quantify, students did gain some valuable experience in: teamwork preparing presentations, and delivering a formal presentation.

- Based on the response of the students, there was an improvement in student learning and retention for the material that they were assigned. It is the instructor's opinion that this was based more on individual learning style and effort, rather than a team-based approach to learning.

- Students did gain some insight and an increased understanding the academic environment, and the problems associated with "teaching" (i.e., How should I grade this

assignment? What is the due date for the assignment and what should I do when someone turns it in late? What am I supposed to do with a messy disorganized assignment that I can't even read?).

- Since most of the students in this class will eventually assume management roles in construction and engineering, critical peer evaluation was a main component of this experiment. As indicated in the evaluations, the critiques of the presentations and the assignments were more thoughtful near the conclusion of this experiment than at the start. As students gained experience in evaluating others, there was a clear indication of a desire to "help" other students better prepare and deliver the material, rather than just a basic rating of good or bad.

- This innovative approach to learning increased faculty and student interaction, promoted the "classroom as a laboratory" approach, and assisted in course assessment and evaluation.

To the surprise of both the students and the instructor, and contrary to typical academic endeavors, this experiment in education actually turned out to be "fun" for both the students and the instructor.

Bibliography

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