

Assessment and Discussion Versus Lecture

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Introduction

This paper will present several different uses of class time other than a traditional lecture to facilitate learning. The methods are designed to facilitate communication between students and the instructor so that a clearer understanding of areas for emphasis is obtained. The work, *How People Learn*, by John Bransford, Ph.D. at Vanderbilt University emphasized the importance of the context of information as well as the use of modules to develop “just in time learning”. In engineering, critical thinking skills are considered to be essential. The teaching methods of Dan Apple, Ph.D., which are part of Process Education Methodology from Pacific Crest, emphasize the use of critical thinking skills in classroom communication. The methods to be discussed are:

- Formal Teams
- Critical Thinking Questions
- SII Assessments
- SII Self-Assessments
- Spot Lectures

Of the above, the **SII** Assessments may not be familiar. Assessments need to be positive growth experiences. During the assessment process of an activity, the assessor needs to identify **Strengths** of the assessee demonstrated during the activity so that they are reinforced. The next need is to identify areas for **Improvement**. The assessor should try to provide a plan for the improvement rather than just observations. The last part is the assessment is **Insights**. The assessor may be able to generalize the something they have seen to a wider range of applications. The use of this format provides a very positive environment, which gives a much stronger probability for improvement.

The results of using the various methods, based on both instructor and student comments, will be provided.

Background

The students in this course had all successfully completed the foundation courses of static, particle dynamics, rigid-body dynamics, strength of materials, and fluid mechanics. The initial set of statics problems revealed that a relatively small percentage could solve the classic problem presented. The majority of the students did not use the methodology provided in the past courses and they were unable to adjust to problem statements from other authors.

From the initial discussions with the students, it was learned that the students had treated the material in the previous courses as word problems from high school, where their critical thinking was focused on key words and matching an equation to use all the numbers provided in the

problem. The focus of the course changed to solving realistic problem with many numbers available and problems that had a lack of key words.

The initial offering of the course resulted in affect difficulties for the top students because their approaches to the problems did not work. These problems were dealt with by:

- Using teams of students to solve and present problems.
- Having teams develop questions for the classroom about the material
- Having the students assess the other student's work
- Having students self-assess their progress on a regular basis

Traditional lectures

In traditional lectures, the professor presents the material from his/her own context. Since we have students with a wide range of backgrounds, some students are lost on the first concept and others are board. Unfortunately, students tend to ask less questions than in past years. The lack of feedback from the lectures limits the faculty from understanding what information is being learned in a way that it is useful.

Methods

This section contains the tools that were used to improve communication and discovery.

a. Formal Teams

Group activities with clearly defined roles are another essential part of process education. The essential roles for each group are:

- i. Captain – This individual is responsible for all management functions for the group. The responsibilities include task identification and assignment, meeting planning to meet project time requirements, and group affect management to get full group participation.
- ii. Recorder – This individual is responsible for the written documentation of the group. The responsibilities include preparation and delivery of meeting agendas, meeting minutes, and the development of the final project report.
- iii. Spokesperson – This individual is responsible for all oral communication for the group. The responsibilities include the group responses to in-class questions and the project oral presentation. Additionally, the individual serves as the editor for the final draft of the written report.
- iv. Reflector – This individual is responsible for observing and assessing group and individual performance. The individual also assists the team captain on affect management during group activities.

These roles are rotated within the group for every major project so that every individual can assess their skills for the various tasks.

b. Critical Thinking Questions

As a contrast to the reading material, the class was started with critical thinking questions for the teams. Answers were recorded and then the information was provided from the reading material using a linked PowerPoint presentation. The questions were a progression from factual replies to convergent and divergent questions to increase the level of learning and response. Each response had to

have a context provide for the answer, which allowed the students to increase their communication skills.

c. SII Assessment

Assessments are an essential part of the PE application. The assessment format (SII) requires the following:

- i. Identification of two strengths of a particular activity and why they are strengths and when they were demonstrated. An example, based on a presentation, might be that the individual effectively used pause during the presentation so the audience had time to process the information. During the explanation of ---, the pause allowed a good question to be formulated by the audience, which the speaker was able to use to emphasize an important point.
- ii. A short-term and long-term plan to achieve the improvement in at least two areas with information on why the improvement is needed.
- iii. Insights gained from this reflective process.

The steps require the student to provide a higher level of knowledge and a greater acceptance of external assessment.

d. Self-Assessment

The course self-assessments were also done using the SII method. The additional areas included the students affective mood so they could see the relationship between mood and performance. At the end of the course, the students were asked to assess their self-assessments to see if progress had been made.

e. Spot Lectures

When good questions were provided by the teams at the beginning of class, spot lectures on the material were provided so that the time spent on the lecture was optimized.

Outcomes

The initial offerings of this course were in the spring of 2001. The two sections were comprised of a section of juniors and a section of seniors. Although the material was identical, the student responses were very different. The seniors ranked the course a 3.6 of 5.0 while the junior ranked the course 2.5 of 5.0. The senior ranked 14 of 22 questions above 4.0, while the juniors did not rank any question above 4.0. Because this was the first offering and there was a constant set of new insights for the instructor, both groups had complaints about the organization. Both groups were pushed out of their comfort zone because the material required efforts beyond their current learning methods, however, the senior demonstrated a superior affective ability to handle the stress of learning new strategies. In the current offering, an initial transition is being provided for the junior, but the target outcomes remain the same.

1. **Teams** – The use of the teams promoted cooperative learning and provided an atmosphere similar to industry. Because of the individual roles assigned for each module, individual grades could be factored into the project grade. The team captain had to provide meeting agendas, project plans, and was responsible for due dates, the team recorder was responsible for the quality of the reports, the team spokesperson was responsible for the team presentations, and the team reflector was responsible for the

reflector report on the functioning of the team. Team projects allow for much more complex projects without a significant increase in the time for evaluation.

The teams were very responsive in class to critical thinking questions. Since people lose focus about every 15 minutes, the use of a question for a 2-minute team discussion with then a class discussion provided a much clearer understanding of the class learning levels. Team assessments of the courses were much more informative than from individuals because of the private discussions and reduced fear.

2. **Assessments** – The assessments of other teamwork provided significant and rapid improvements in team projects. Criteria for the assessments were provided. The use of the SII method allowed much greater acceptance of getting feedback and the use of student assessments reduced the faculty time involvements. The biggest gains were from the assessment of other work rather than from the assessments provided.
3. **Self-Assessments** – The use of self-assessments required the students to step back and analyze the source of their course difficulties. It was done in a limited sense in this course, but the method will be used more in the current course. It is hoped that this will help with affect management.
4. **Spot Lectures** – Before class, each individual was required to develop 3 questions that they felt needed answers from the reading assignment. In class, the teams discussed the questions and reduced the number to 3 team questions. During the discussion, other team members answered most questions. The remaining questions became the basis of the spot lectures. The combination of feedback to the instructor and class focus resulted in significantly improved performance.
5. **Content Results** – The performance of students of realistic problems was dramatically improved. The students were able to judge whether their answers were an over or under estimate and the testing they would do for validation. They developed an insight on the physics of problem before jumping to analysis. The students learned to question computer models and examine if answers were reasonable. Based on established criteria, almost all students would have failed initially and the majority received an A at the completion of the course.

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