

Seminar In Engineering Management – Letting the Course Follow the Topic

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Abstract

This paper chronicles an experiment in teaching a graduate level seminar in engineering management. In the experiment the students developed the syllabus details to include which subjects to address and the grading scheme. Thus the course addressed topics of interest to the students and for which they were in turn required to find appropriate reading and research material. At the conclusion of the course, a discussion of the way the course was conducted was used to reinforce the many of the concepts covered during the course.

Background

In the winter 2000 semester I was assigned to teach a graduate seminar in engineering management for the first time. I was at that time a tenure-track assistant professor in a startup manufacturing engineering department and was to teach this course for the industrial engineering department whose faculty did my tenure and promotion review.

The course is an elective in two overlapping master's programs – one in industrial engineering and one in engineering management. The course was to be offered off-campus over a 12-week period. Each class was a three hour and twenty minute block that was to start at 6:00 PM. The catalog's course description of the course was as follows:

“ISE 622 Industrial Supervision Seminar (3-0)
3 hrs
An analysis of the writings, literature, and philosophy concerning line supervision and employee direction in manufacturing industries. Prerequisite: IME 600 or permission of the instructor”¹

The course's title had been changed to Engineering Management Seminar since the catalog was published and its description had been expanded to include advanced engineering management topics such as change management. The prerequisite course is titled “Concepts and Principles of Engineering Management” and is a required course in the engineering management program. Discussions with the professor who normally teaches both the course and its prerequisite, and who is the course coordinator, were very helpful. I was offered his reading packet for the course but was given the option to develop my own reading/reference material. We agreed that no specific topics needed to be covered during the course.

The course was one I was eager to teach, but one which I would probably only teach once every few years. I was familiar with teaching courses off-campus in the 12-week / three and a third hour scheme. I had taught students in these master's programs before and had some feel for their expectations from a course. These expectations/preferences included relevance to their current employment situation and immediate applicability.

Planning

With the ground rules for the course established I set down to develop a syllabus. I quickly developed a set of course objectives, a syllabus, a grading scheme, and a reading plan for the course based on what I thought would be interesting and valuable to the students taking the course. At this point my 20 years as an engineering manager kicked in and I started to rethink my plan. I also came to the conclusion that my research interest – improving the likelihood of successful outcomes in the introduction of new technologies – was applicable to structuring the course.

The first step was to rethink the course's presentation. What is a seminar? Webster defines it as follows:

“seminar...1 a group of supervised students doing research or advanced study, as at a university, 2 a) a course for such a group, or any of its sessions b) a room where the group meets 3 any similar group discussion”²

Discussion, research, and advanced study seemed to be the key concepts in both the course and in a seminar style of presentation.

The next step was to consider the students in the class. The typical students in the other four graduate courses I had taught in these programs were working professionals with several years experience as individual contributors. Some had started supervising professional employees but many had not. The students in earlier courses seemed most interested in concepts that they could immediately apply on their current assignment.

The next step was to review those graduate courses I had taken over a 15-year period and determine what had appealed to me as a practicing engineering manager. I particularly remembered an upper level course Dr. Al Miller presented at The Ohio State University in which he started the course with a question about what the students wanted to cover or get out of the course. He then proceeded to work these elements into his lecture and assignments for the course. This approach made a lasting impression on me.

The last step was to review how I would address making assignments in an industrial setting to engineers and engineering managers - state my perception of the task and ask for input on solutions to address the task (or to redefine the problem and thus the task). The team who would be assigned the task would then develop a plan (who, what, when) with which both the team and I could all agree.

“Could this be done effectively in an academic setting?” became my experiment's question. I thought it could be done. I saw several potential benefits and several potential pitfalls. The benefits included student buy-in to the course, higher student satisfaction, practitioner-relevant

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topic selection, reduced instructor workload in reading-material preparation, and increased student involvement in classroom discussions. The potential pitfalls included inappropriate topic selection, increased preparation to cover student-selected topics outside my expertise, an unreasonable evaluation plan, and a student resistance to the concept of setting their own plan of study. The potential benefits were seen to outweigh the potential pitfalls.

The resulting experiment was to manage the course as an engineering manager should manage an engineering department with the team setting the goals and project plan subject to managerial approval.

Execution

The first night of class I arrived with a syllabus which contained the basics – course description, details of when the course met, my grading philosophy, my contact information (this was especially helpful since the course was taught off campus and 40 miles from my office), and my office hours. The only class topic on the syllabus was that night – “Introduction and Course Development”. After introducing myself to the class, since few had been in a class I had taught, I offered them the opportunity to develop the remainder of the syllabus for the course based on the class’s needs and desires, subject to the provisions that the class meet, accomplish the course description, and that a grade be assigned by the instructor. The other option being that I could publish my original syllabus (which I did not bring to class) and we would follow it.

To get started in setting up the course plan I asked the students what they wanted to get out of the class besides a grade and meeting a degree requirement. This led to a subdued discussion with the consensus that they wanted to get something they could use out of the course. From here we started listing the board topics and concepts they were interested in studying. A fairly large list was developed which was then grouped into general headings using typical brainstorming techniques.

Next we discussed how we were going to cover these topics. I offered the idea that the students pick the materials to read on the course topics. After discussion it was agreed that each student would find three articles on each night’s topic and at the least one of the articles would be from a refereed journal. This required each student to do his or her own research on the topic and to find articles they found interesting. In turn at each class there would both small group and class discussion of the topics, the articles, differing opinions, and how to apply the material at work. I agreed to supplement their research with brief presentations of material that I believed were important, such as change management. I agreed to lecture in week two and they would bring in one article on the topic. This allowed the class some time to get their articles and to try out the class format and my expectations.

I then asked for grading suggestions. After we went through the inevitable suggestion of all getting an “A”, we discussed the merits of purely subjective – the instructor would somehow pick one – and a mix of objective and subjective – you do something, I’ll publish expectations prior to the assignment, and I’ll judge how you did. The mix was the unanimous choice. The final class decision was 30% for participation (getting the three articles, being in class, being ready to discuss the topic, and actively being in the discussions), 20% for a short report and its subsequent presentation (to allow the students to calibrate the grader), and 50% for a long report

and its subsequent presentation (to allow the students to demonstrate their ability to apply what they learned in the class).

The resulting class meetings were lively with small group discussions of their articles (and very seldom did two people have the same article) and opinions in those articles, class discussions of the group sense of their articles, instructor lead discussions of the topic's implications for engineering managers, and question and answer periods to the instructor on topics that grew from the earlier segments of the class.

The short paper and presentation were on a "new" or "current" concept in management that the student would like to introduce into their specific company. The long paper and presentation were on how they would/will go about introducing their concept into their specific company with particular emphasis on obstacles and how they would be addressed and conditions which support implementation and how they will be taken advantage of.

With one exception the papers were very good to excellent as were the presentations. Both the students and the instructor critiqued the presentations. One question asked of the students was their willingness to be involved in the presentation. This question drove home the requirement to sell a program to the audience in its presentation.

This driving home a point was discussed the last night of class. After the grades were handed out and the student course evaluations were completed, I made a brief presentation of why I did what I did during the course and what I wanted them to take away from the course. The students were then free to leave, but I offered to stay and open the floor to questions – no one left. We continued the discussion for over an hour before losing any of the students. Two students talked for about two hours.

Evaluation

The final course evaluations were well above average and slightly better than the results I see from a "traditional" course presentation. The grade pattern was also higher than normal but expectations were exceeded in all but two cases. In one case the student's performance was noticeably less than the others. In the second case the student did not turn in one assignment, missed several classes (to include two while on vacation), and was late with the long report. The second student was assigned a grade that will require the student to repeat the course.

On reflection I would teach the course the same, if I had been assigned it again. I enjoyed the class and so did the students. I learned and the students seemed to also.

Recommendations

This format worked well with mature, motivated graduate students. I would personally hesitate to use this approach with undergraduates. The approach worked well for me since I have a background in both the theory and practice of engineering management and try to stay current via readings and conference attendance.

The class was small (13 students) and as the size increases the effectiveness may suffer. The small size allowed groups of four or five students for discussion. This allowed the instructor to listen in on all the groups during part of their small group discussions. It also allowed everyone a chance to participate in the full class discussions of the topics.

Teaching a graduate level course in this manner can be challenging - the instructor has to be willing to risk getting topics, which will require research on his/her part if the students want to go outside your comfort zone. This is an inherent risk in letting the students set the agenda within a wide set of boundaries.

Finally, the lesson voiced by General Von Stuben from his training of American troops in the Revolutionary War still holds true today. It is not enough to tell Americans what to do – you must tell them why they are doing it. In the class format discussed in this paper the instructor must explain why the assignments are given, what the students should expect to get out of them, and how what we did in the class applies to the students' every day work.

Bibliography

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