

## **AC 2007-2326: PIE IN THE SKY: MODELING MANAGEMENT IN THE CLASSROOM**

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## PIE in the Sky: Modeling Management in the Classroom

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### *Introduction*

When faculty members throw conventional practice to the wind for an entirely unexpected pedagogy, it is not done lightly! Perhaps unadvisedly, but not lightly. Abandoning the comfort of usual classroom pedagogical customs is fraught with peril when student evaluation constitutes 40 – 60% of the professor's annual assessment. However, in an effort to bring greater realism to the Engineering Management class and to make the class structure itself an instrument of instruction, the authors have taken active learning to the basics.

In Fall of 2001, the Engineering Management course went as planned and the students at the University of Wisconsin-Platteville covered the expected topics (management theory, management figures, current trends in management) in the expected manner (lectures, reports, assignments, exams). Fall of 2002, all that changed.

In fall semester of 2002, the class was totally reorganized in an attempt to bring more realism to the classroom. Something was missing from the real world skill set needed for success.

An analysis of topics currently covered in class, required for accreditation, for the curriculum, and for application to life was considered. The faculty team also looked for ways to increase student interest and commitment to the learning goals of the class. There are a number of pedagogical techniques that could be applied and were examined.

The faculty decided to try a new pedagogy for the class. The class was organized into a 'company.' All students were considered new-hires for the company, Pioneer Industrial Engineering or PIE.

### *Course Objectives*

Defining the objectives of the course seemed the logical place to start to redesign the course and its presentation. Regardless of the presentation, certain course and curricular objectives were required of the course. As currently stated, the objectives were appropriately vague and left much to the imagination and discretion of the instructor to define on a semester by semester basis.

The course needed to address certain basic issues:

- Management functions

- Skills needed for today's business climate

- Safety management

- Communication skills
- Ethical decision making
- Team skills
- Professional development and responsibility
- Career planning

Although these are covered in many other courses in the curriculum, the engineering Management course provides an important aspect of the education in each vital area that could not be slighted in coverage.

Coverage, however, did not require use of lecture, written assignment, and exams. In fact, more memorable mechanisms would be preferred. It was determined that a combination of pedagogical techniques could be used to advantage and a syllabus constructed that relied heavily on:

- Class discussion
- Case studies
- Independent and group research and presentation
- Review and critique of current literature
- Group project completion

Each assignment would be structured as closely as possible to an assignment that might be given by a manager while employed and, as with employees, work would be evaluated against both an absolute as well as relative to the performance of others.

### ***Class Structure***

The goal of increasing applicability and realism of the class and the inherent material were not addressed by any standard technique. Rather than dwelling on textbooks and predictable case studies, a new class structure and syllabus were devised and implemented.

With a stated goal of avoiding lecture entirely and a promise of no exams, the class joined the effort to recreate as many aspects of the business environment as possible within the confines of the classroom.

Because the students are already taxed with travel and on-site industrial projects, getting into the “real world” of business seemed an unmanageable burden on all involved: students, faculty searching for projects, and local business within a reasonable commute. Understandably, too, many businesses are reluctant to hand over managerial aspects of their concern to undergraduate students as a one semester project. Thus, the decision to concentrate our efforts on recreating the work environment within the University was an easy one.

In fall 2002, the initial class was organized as a training class of new-hires in a management training program. Students were handed a folder of employment information similar to what they would receive on their first days of work. The folders include materials ranging from the “Training Goals” to the “Equal Employment

Opportunity” Statement. All students are classified as “Engineering Manager Trainee.” They were told that they were in training to become managers within the larger “company.” The company, named Pioneer Industrial Engineering, Inc., (PIE), is entirely fictitious but has ongoing projects to provide community support and is always looking for new opportunities to serve.

### *Grading in the New Millennium*

The next aspect of the class to be addressed was the grading structure. No one gives multiple choice exams on the job or even true false or matching for that matter, so we couldn’t use the familiar evaluation techniques for the class. In truth, one often has no idea of how one’s effort is perceived on the job until the yearly evaluation. Depending upon the manager, then it may have little to do with the year’s work. This vagueness may be tolerated in the workplace but was not considered acceptable to the class.

To address the students’ desire for a grading scale they could more easily understand and discuss, a performance scale similar to some seen in industry was devised as shown in Figure 1. Although it is not perfect, it--like most performance appraisal systems--is still evolving. Student input is invited at the beginning of each semester to help refine the instrument, a practice not unheard of in more enlightened companies. This aspect is tied closely to the performance review system utilized each semester and discussed below.

**Figure 1: Performance Evaluation:**

	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Job Performance (60%)</b>	Work both incorrect and incomplete	Work barely acceptable	Work meets minimum standards rarely exceeds	Work usually exceeds minimum standards
<b>Department Service (10%)</b>	Rarely available for meetings or is disruptive/hostile	Attends meetings but fails to contribute	Attends meetings/participates/contributes at least 50% of the time	Volunteers/works to improve the department.
<b>Community Service (10%)</b>	Fails to contribute to community in any way	Restricts service to social clubs	Provides service to community of at least 10 hours during the training session	Works with group to identify community need and organizes to fill the need
<b>Professional Development (10%)</b>	Fails to work at professional development in any way	Reads magazines/journals/books	Attends meetings, reads	Attends meetings, serves as officer/committee.
<b>360 Evaluation (10%)</b>	Generally not desired as team member or leader.	Generally considered desirable as team member but not leader	Generally considered desirable for any position on team	Is honest in assessment of self and others. A leader.

Evaluation of worker job performance is multi-faceted depending on more than mere attendance and recall of knowledge. The manager who is rating an employee may include their initiative, contribution to the team efforts, actual ability to excel on the job, and representation within the larger community. This last aspect is often unstated but commonly considered and is included to emphasize the fact to the students that they will be evaluated on more than their job performance. This usually brings to discussion several points within the semester the perception of inequity which we are able to address more openly and fully than is usually common in industry.

### ***Class Goal Setting***

After discussion of grades and allaying fears, the next step is to set performance goals for the class and for individual students. There are a number of topics which must be covered each semester: safety/OSHA, management theory, ethics, and planning. The rest is left open to discussion and selection by the students to include topics of concern to them. Invariably, a number of topics are volunteered:

- Leadership
- Team Building
- Communication
- Working with Difficult People
- Motivation
- Performance Appraisal
- Discipline
- New Management Theory
- Managing Engineers Vs. Other Workers
- Promotion from the Ranks
- Managing Innovation
- Personnel Selection
- Time Management

All these topics are expected each semester; others vary with the class. Sometimes students are concerned about planning for retirement (always a surprise when the class average age is 22!), negotiating salary, interviewing skills, advantages of larger or smaller employers, starting your own business, or the benefits of professional registration.

Each of these suggested topics is added to our growing list on the board at the beginning of the semester and slated for coverage. Because management is a broad field so is our list. Because the class's concerns are eclectic, so is our list. Because the topics are of interest, so is the class. At least that is the plan.

In this manner, the goals for the class are set.

## **Personal Goal Setting**

Each student then privately sets his own goals for the semester. These goals are highly personal and, therefore, variable. The goals are defined in terms of long and short-range goals and turned in to the instructor. They provide the basis for comparison of activity toward goals and job performance assessment.

Goals vary somewhat from semester to semester and student to student but there are a number of recurring themes given their current state in life:

- Finish a degree—usually in Industrial Engineering
- Find a job—co-op, internship, or full-time after graduation
- Find an acceptable “significant other”
- Plan a wedding
- Buy a car
- Pass a dreaded but required course

Other goals

- Plan for retirement
- Buy a house
- Speak up in class at least once before the semester ends
- Have perfect attendance at class for the first time ever
- Have a perfect 4.0 GPA

These goals are discussed along with suggested verbiage to make them broader and more similar to the goals included in many annual evaluation processes.

Personal goals are necessary to allow engineers to become better managers. They require honesty and a frank assessment of an individual’s skills strengths and weaknesses.

## **Textbooks**

Beyond grading and course scope, textbook selection is integral to the success of the course. Again, reliance on actual management practice is a primary consideration. Rarely do managers go hunt up a textbook covering a broad introduction to management for suggestions to their problems. Similarly, most of the “managing engineers and scientists” books encountered are pristinely displayed on shelves or can be found in wastebaskets late at night. A general text aimed at engineers is used as a general reference and to assure that all students have access to a common book. Similarly, a common ethics book was added recently to allow access to common cases and theory discussion.

Special topic literature is, however, the order of the day. As any engineer would, we research the topics of interest. All topics can be covered in a variety of ways and

coverage varies from semester to semester. The majority of the topics are commonly expected in the course so most can be included without any disruption to even a more conventional management course. More significantly, they are all routinely addressed in current business literature that can be included in the course and compared to traditional management rationale on the subject.

Discussion, role-playing, and group presentations have all been used to advantage. Coupling each topic to a new book is more appealing than reading a single chapter in a textbook even though the chapter is invariably shorter! The newer references also allow the student to develop a working knowledge of current topics and authors and to converse intelligently about current best-sellers. Current business bestseller lists are posted prominently as a reminder to all students to maintain currency in their field.

The reading list changes each semester and draws heavily from current literature including articles from *The Wall Street Journal*, *Harvard Business Review*, *Industrial Manager*, *IIE Solutions*, as well as daily newspapers and monthly business magazines. Because a part of the student's grade is dependent upon "professional development" and reading and discussing current literature in the field is one way to demonstrate that activity, students are quite diligent in their search for material to help illuminate topics in class.

Two recent topics of interest have been managing to create a culture which encourages innovation and diversity. Spurred by interest in these topics, they have been added with references culled from current publications. Activities vary widely between semesters based on class make-up and disposition. Presentation or group-led activities are commonly implemented including a time-limited innovation assignment.

## **Status Reports**

In some semesters, each student is required to turn in a weekly status report. A staple of many or even most managerial/engineering positions, the status report allows the student to log their progress or lack of progress on goal achievement. In other, busier semesters, students report their progress in a weekly status meeting and turn in a monthly status report. As with any business or manager, they can be required to report status on their projects at any time.

The status report requires an update on each stated personal goal. Usually the shorter-range goals are more commonly addressed but, more often than expected, the status report will include an update on the student's social aspirations as well. In addition to the personal goals set early in the semester, students report on their progress on group projects assigned for the class, class goals, and note any problem areas for which the "manager" i.e. the instructor, could provide assistance.

Each area of the performance evaluation criteria was to be addressed in each status report. Community service posed the greatest challenge for some; professional

development provided the same challenge for others. Some semesters a number of the class will commit to a common project coordinated by Habitat for Humanity or the Humane Society. Each student is urged to begin finding an area of need about which they feel strongly and to dedicate approximately 20 hours over the course of the semester. Because many students are already committed to volunteering with youth groups in local schools or back home, most students are able to easily fulfill the requirement.

### **Personal Rating and Skills Development Program**

Constructed from elements of a number of performance review programs in industry and published literature, the performance review system has elements in common with application in industry. Like industry, too, the system is changed frequently in an ongoing attempt to find the perfect instrument.

In a recent version of the performance appraisal process, students were divided into project teams. They worked with the same team on a number of projects throughout the semester. Each team elected one member to be the 'team lead.' The team leader was subsequently named 'Supervisor' for the group and acted as the point of contact for the instructor/manager communication with the group.

Students each filled out their performance appraisal/goal setting forms near the beginning of the semester. A form similar to that in Figure 2 was supplied in electronic format and results were reviewed by the team supervisor. All forms—including those for the supervisor—were reviewed by the instructor.

Evaluation is an integral part of managerial positions. Good managers are continually evaluating employee performance to determine training needs and provide feedback to employees as needed rather than waiting for the end of the evaluation period. In order to model this concept, evaluation is an ongoing process within the class, too.

Students are given feedback on their performance in a number of ways: personal memos at mid-term and end of the semester; informal meetings in the office, hall, or labs; or through posted numerical feedback as all assignments are acknowledged on the electronic course management system. In addition to being evaluated by the instructor/training manager, each student is evaluated by the members of any teams in which they participate during the class just as they assess the performance of all other team members.

Finally, near the end of the semester all students perform an addition self-evaluation in which they address their performance on each aspect of the job criteria as discussed in the first days of the class. This is often done in the same manner as the previous evaluation and goal recording exercise using the same PRSDP form. The student's honesty and candor in their status reports and self-evaluations has been surprising and gratifying as they pinpoint their own weaknesses and describe goals to strengthen those areas.

**Figure 2: Performance Review and Skill Development Plan (PRSDP)**

Fill out each of the following areas as completely as you can.

<b>Name</b>	<b>Date</b>
<b>Position</b>	<b>Supervisor</b>

<b>Functional Objectives (Write your major objectives and achievements for this class in this column.)</b>	<b>Supervisor comments</b>

<b>Evaluate yourself on each of the parameters below. Give an example if possible to show your progress in that area.</b>	<b>Supervisor comments</b>
<b>Teamwork</b>	
<b>Integrity</b>	
<b>Leadership</b>	
<b>Innovation</b>	

Fill out the table below by considering your strengths as well as your weaknesses. Be as complete as possible in your answers and give any concrete examples you feel will be beneficial.

<b>Strengths—Your assessment</b>	<b>Supervisor Comments</b>
<b>Areas for Improvement</b>	<b>Supervisor Comments</b>

As additional practice in assessment methods, a 360° evaluation process is also implemented. Supervisors are evaluated throughout the semester by the instructor but all teams evaluate all other team members as well as the team lead.

### **Personnel Activities**

Difficulties with workers and other personnel issues are always of concern to students. Decisions involving increasing or decreasing the size of the workforce through hiring or elimination of workers must also be addressed. Because we cannot 'add' employees (students) to the class mid-semester, hiring decisions are handled primarily through case studies and role playing activities.

A final exercise for all classes is the "downsizing exercise." In this exercise, each student is asked to select one employee who would not be retained if one position had to be eliminated. Any answer is accepted but they must be explained and be logically founded. In the past, students have "fired" workers for tardiness, not meeting deadlines, failure to contribute, not supporting the group, and even for being unpleasant and difficult to work with.

No one but the instructor sees these assessments and they do not contribute to any assessment except that of the writer.

### **Conclusion**

First the good:

Students have regularly commented favorably on the PIE organization as a useful simulation to business experience. Thus, acceptance of the course structure has been surprisingly good. Although some students find the course to be "homework heavy," they are generally willing to balance that against the "test light" aspects to the positive. Many students have found the regular status reports a welcome way to make sure that someone knows what is going on with their lives. Students have enjoyed the open atmosphere to discuss rather than listen to lectures and frequently have remarked on the ability to use more creative abilities in the context of the class than is provided in most classes.

Although the course began with the intent of having all students work on several teams on the different projects, it became necessary to re-evaluate this decision. Students tended to form compatible teams early in the semester, work out scheduling difficulties between members and were reluctant to dissolve the teams to form new ones for the next project. With a semester time frame, their suggestion to form one team for the duration was implemented and is currently in place.

Other students have found the format sufficiently rewarding to recommend that it be extended to the Project Management course taught in the following semester.

Then the bad:

Negative comments include the students who would, no doubt, be able to quietly sit in class, read the text, research a reasonable paper, and ace the tests well enough to make an “A.” A few of these students are unable to adjust to the changed requirements of the course and end up with a lower grade. Understandably, they are upset. Unfortunately, management does not often involve studying a text and regurgitating the boldfaced words to fill in the blanks.

In general, acceptance has been good. Negative comments primarily center on those characteristics of the course which mirror the realities of work life—and, admittedly, uncertainty is part of life and most of us don’t like it!

In all, the concept is well-received and effective. Continued assessment of the student achievement of learning goals is planned with necessary amendments to the plan as a result.