

Manufacturing Organizations from the Inside Out: Classrooms with a View

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Abstract

This paper examines the experience of teaching a single course, Industrial Organization, to three very different groups of students. The first group was a mixture of traditional and non-traditional students, taking the course at a satellite campus location. The second and third groups were each made up of employees of a single employer, all attending the course at their respective industrial locations. In one case a large, multi-national corporation and in the other case a small, relatively young U. S. –Japanese joint venture. The course material covered the structures and functions of modern manufacturing organizations. Because of their different circumstances and life experiences, these groups of students had widely differing perspectives on modern manufacturing practices.

Comparison of these three groups of students offers some interesting and useful insights into appropriate teaching methods and course emphasis for students presently employed in a manufacturing environment.

Introduction

Successfully teaching undergraduate students about the organizational structures and functions present in a modern manufacturing organization can be challenging. Students of typical undergraduate age often do not have any previous exposure to the manufacturing management environment, so it is sometimes difficult to give them an appreciation for the broad range of issues and concerns relevant to modern manufacturing. When, on the other hand, the students already have experience working in a manufacturing environment, the challenge for the instructor can be quite different. Students with an employment history in manufacturing have first-hand knowledge of at least one manufacturing organization. This knowledge can be a strong asset for the students, who can relate course content to actual practice, but it can also create questions when their experience does not seem to agree with the “best practices” being taught in the classroom. Non-traditional, working students often have formed opinions based on their own observations. They have already formed a perspective of manufacturing organizations and management, and they are self-confident enough to share their views with others.

Course Description

Industrial Organization is a course taught for students in the Purdue University School of Technology. The course content includes: the manufacturing environment, engineering considerations, manufacturing systems, cost control, materials flow, quality, human resources,

financial considerations, and marketing management. I taught this course through the South Bend/Elkhart regional campus location in northern Indiana during two semesters, to three groups of students. The textbook¹ and supplemental materials used for all three groups were the same. Lecture, videotapes, discussion of concepts and case studies, and group presentations were all included as part of the course instruction. In all cases, the first class session included a self-introduction by each student, consisting of the student's name, present employer and work experience.

Students

The first group of students attended classes at a regional satellite campus location. The twenty-three students were of mixed ages and work experience, most with some manufacturing experience, a few with none. Several students had worked in manufacturing for small (<20 employees) privately owned companies. Approximately half the class had worked for publicly held manufacturing firms. One student was a purchasing agent for a large German-based multinational corporation. Three students had no manufacturing experience, and one student had extensive experience including being a small business owner.

The varied experience levels of the students facilitated considerable sharing of information and many examples of students learning from one another. Younger, less-experienced students were quick to award credibility to the students who were already working in the field of manufacturing. Working students often shared examples of present or past work assignments to confirm that textbook examples did indeed represent accepted manufacturing management practices. The presence of older, experienced students was a strongly positive influence in emphasizing the relevance of the course material to the students with no previous manufacturing experience.

Because many of the students' work experience had been in small, relatively informal manufacturing companies, these students were often somewhat skeptical regarding the course information about company organization and structure. Only a few of them had experience working for a company which had formal organizational charts, job descriptions, or regular performance reviews. In response to the introduction of these concepts in the textbook, one student asked, "Do any companies really work this way?" Other students were able to share formal procedures and processes with the class, which emphasized the range of practice present in manufacturing management. Presentations by student teams included time study projects, budget approval flowcharts, and physical facilities planning examples all drawn from current, local manufacturing organizations.

The second group of students all worked for a large, US – based multinational corporation supplying low-volume, high cost parts to the aircraft industry. Through corporate mergers and takeovers these students had changed corporate identity three times in the last ten years, without changing location or fundamental business objective. The students attended classes at their place of employment, and were fully reimbursed by their employer for tuition and textbooks. Most of the fourteen students took the course as part of the Mechanical Engineering Technology curriculum. One student was an hourly employee and labor union member, the remainder were

salaried workers, primarily lab technicians. The least experience student had worked for the company for eight years.

These students had no doubts about the existence of formal structures in their manufacturing organization. They had been working with such structures for many years. For this group of students, the course material often presented ideal concepts, to which they compared their company. Often the comparisons were favorable or neutral. Formal job descriptions, organizational charts, design reviews, concurrent engineering, quality assurance methods, production planning, inventory control, preventative maintenance programs, and performance reviews were all accepted practice in their workplace. The students pointed out with some pride that “work study” methods were even being used to develop standards for routine work assignments in the Research and Development Lab.

Occasionally comparisons were made that showed their organizational structures and functions to be less than ideal. The students were heard to wonder aloud what had gone wrong with “their” organization. An example of this comparison involved the discussion of the idea of problem-solving teams as a tool for improving company productivity. According to the textbook, successful teams should: be formed in response to a real need, contain as few people as possible, have clearly defined duties, responsibility and authority, and be disbanded upon completion of the objectives for which they were formed. The students reported that at their workplace each employee had a performance objective to be a part of at least two teams per year. This objective led to many bloated, long-lived teams being formed with ill-defined goals and no specific completion criteria. The students in this group realized that changes to standard policies and procedures can be difficult in large organizations, even when there appears to be a more productive or effective approach available.

One challenge presented by this group of students was the tendency for group discussions to erode into complaining or negative comments about management decisions. The atmosphere in the classroom was further darkened by a continued threat of layoffs. It was important for me as the instructor to constantly redirect the discussion to constructive topics or case studies from other manufacturing organizations.

The third group of “Industrial Organization” students were employed by a Japanese-US joint venture company engaged primarily in supplying rubber seals and gaskets to automotive OEM customers. The joint venture was approximately five years old, and considerable reorganization and employee training had been involved as the partnership emerged from what had been a smaller, US based company. All eleven of the students were enrolled in the course as an elective in the Organizational Leadership and Supervision degree program. Their individual job functions varied widely, including purchasing agent, manufacturing manager, production supervisor, quality supervisor, and tool and die designer. The class met at their workplace, and their employer reimbursed the students for tuition and books. Without exception these “associates” as their company called them, were enthusiastic about their company’s successes and optimistic about the future.

As course topics were introduced, the students often were able to relate their experiences directly to the “best practices” as described in the textbook. The broad range of job functions represented

in the group allowed discussion about a wide range of existing company structures, practices, and policies. For most of the topics presented and discussed in the course, the students provided specific examples of implementation in their workplace. During the class meeting where problem-solving “teams” were discussed, one of the students reported that earlier that day, he had participated in the closing presentation for just such a team. The team had been formed in response to a specific need, was composed of the minimum number of employees required to deal with all the relevant issues, worked towards detailed goals under time constraints, and presented their results at a meeting which also marked the dissolution of the team. All of the students in the class seemed to be satisfied that this problem-solving team concept as described in the textbook was a useful tool for effective management of a manufacturing organization, and that their company was using this tool appropriately.

The biggest challenge for the third group of students was to expand their application of organizational structures and functions beyond their own experience. As a group, these students were well focused on their present employer’s business practices, goals and objectives. It was relatively easy for them to recognize the application of concepts and techniques from the course in their own workplace. What was often more difficult was to get them to consider and discuss how the ideas might be applied in other manufacturing environments; higher volume production, consumer product manufacturing, or integrated manufacturing involving part production and assembly processes, for example. Discussion of case studies from other types of industry was important in helping these students understand that sound organizational and management practices were useful in applications beyond their own experience.

Comparison of Teaching Approaches

Teaching the “Industrial Organization” course to three such different groups of students highlighted the need to change the emphasis and approach to teaching in response to student experiences and the composition of the class as a whole. It was important to assess the students early in the semester so that course material could be presented most effectively. It was also beneficial to structure the class sessions to take maximum advantage of the students’ own work experiences, and allow the students to learn from each other.

The mixed group of students was able to share experiences and discuss concepts like work measurement methods, design reviews, quality assurance, and human resource management from many different perspectives. The presence of younger, less experienced students meant that more class time was devoted to explaining or discussing the details of each concept than was required for the other two groups. As the instructor, I had to be careful to include the less experienced students in discussions, and not make assumptions about their knowledge that would leave gaps in their understanding. I also had to take care not to make them feel that they could not succeed in the course without the experience already possessed by the older students.

Near the end of the semester, students formed into self-selected teams and were assigned topics for team presentations. As the teams were formed, it was clear that the teams were formed of students with similar backgrounds. This meant that the less experienced students were not in teams with the older, more experienced students. I decided not to ask the students to reorganize, because I had already observed that the older students sometimes dominated class discussions,

eager to share their own experiences or observations. Team presentations by these self-selected teams were generally of two types. The teams with little or no manufacturing experience made presentations based primarily on the course material. They described situations and made explanations based on the “best practices” described in the text. These presentations demonstrated the student’s understanding of the concepts and applications of the course material. The teams with manufacturing experience typically made presentations using data or other input from their work experience to illustrate a concept or topic from the course. Several teams used flowcharts, graphs, diagrams, or other information in their presentations. One team used their collective experience to “create” an entire company, complete with a name, logo, and product line, to present a hands-on demonstration of quality control methods.

Evaluating the team presentations for this group of students was difficult. The energy level and enthusiasm of the experienced students presenting information related to their work was noticeably higher than for less-experienced students presenting theoretical information in which they had no emotional investment. Both the younger, less-experienced students and the older, experienced students had to be evaluated on their demonstrated understanding of course content and the quality of their presentation, without regard to the level of their work experience.

The two groups composed of students from a single workplace also shared experiences and discussed concepts, but did so from the perspective of a common background and history in their specific workplace. Their shared view of manufacturing organization and management concepts meant that the ideas, functions, and structures were familiar, but new perspectives had to be introduced to allow the students to relate the concepts to other manufacturing environments or to understand that not all successful organizations are formed according to a single pattern.

The students from the large, multinational corporation had a shared working experience which facilitated class discussions easy because they were already familiar with many aspects of the manufacturing environment and spoke a common corporate “language”. They were immersed in the corporate “culture”, but were not necessarily consciously aware of the features and functions of the organization. Comparison of actual practice with the text became a routine starting place for discussion of course material. For each organizational structure or function described in the text, discussion began with one or more questions like the following: Is this done here? Has it ever been done here? Is it done somewhere else in the corporation? Does it work the way it is described in the text? If it is not done here do you think that it might be useful? Why do you think that this is not an appropriate concept for your organization?

This group of students learned about their own organization from each other, as they discussed and clarified company policies and procedures. Constant comparison of their own organization to the “best practices” described in the occasionally led to negative discussions and a deterioration of the discussion into a complaint session. It was important in these situations for me to redirect the discussion to textbook case studies or other positive examples. Because the course material can be applied to many different types or sizes of manufacturing organizations, it was always possible to turn the discussion to another manufacturing situation or application. For this group of students, the course provided explanations which helped them understand their working environment, as well as an understanding and awareness of other kinds of manufacturing organizations.

The last group of students, who worked for a Japanese – U.S. joint venture company, were very aware of their own company’s organizational structures and functions. All of the employees had been through extensive orientation and training as the joint venture was formed. Their employer had done such a good job educating the students about the company’s objectives and structure and the students’ role in the company’s success that it was sometimes difficult to persuade them to discuss other applications of the course material. Some of the students were so well focused on finding and applying information that would help their company succeed that it was difficult to interest them in discussing other kinds of manufacturing environments.

Conclusions

Teaching a course in industrial organization to students with work experience requires that the instructor understand that the students already have ideas and opinions about manufacturing environments. Some students have been working in manufacturing for years without a good understanding of the “big picture”. Other students may have a clear understanding of the specific structure they are working in, without an appreciation for the variety of manufacturing organizations that exist. In order to help students learn, it is important for the instructor to assess the knowledge and viewpoints of the students, in so that the course material can be presented in a way that is perceived as relevant.

¹ Harold T. Amrine, John A. Ritchey, Colin L. Moodie, and Joseph F. Kmec, *Manufacturing Organization and Management*, Prentice Hall, 1993.

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