

ASPECTS OF ENGINEERING PRACTICE

Examining Value and Behaviors in Organizations

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Since 1995, the School of Engineering and Applied Sciences at the University of Virginia has offered an elective course that examines human values and practices in engineering organizations. The course is available to all fourth-year engineering students and is taken by 40 to 50 students each year. It is taught by the Brenton S. Halsey Visiting Professor of Chemical Engineering, who is selected annually from individuals with high-level experience in industry. Support for the Chair comes from a generous endowment by The James River Corporation in honor of its founding CEO, Brenton Halsey. Previous Halsey Professors and their affiliations are given in Table 1.

The details of the course content and execution are left to the discretion of the Halsey Professor, but its core objective is to provide engineering students with significant insight into the professional and nontechnical aspects of engineering practice. The intention is to better prepare the University of Virginia engineering graduates to succeed in the business and technical world that they will be entering after graduation. This paper describes the course materials, assignments, and assessments for the spring semester of 2001, which is representative of recent offerings.

DEVELOPING THE COURSE

The teaching experiences of previous Halsey Professors contributed significantly to the current course content. Although the objectives have remained the same, there is now more emphasis on the students reading and analyzing information prior to class. This information is generally in the form of Harvard Business School (HBS) Cases and Notes. The result of this approach is more in-depth discussion in class.

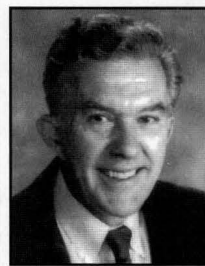
I built the course syllabus around the HBS Cases and Notes. Harvard Business School Publishing^[1] offers an Index of Cases and Notes available for purchase. I suggest one HBS

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Case and two HBS Notes per week, requiring about nine hours of homework (reading and writing a summary) per week. Lectures to reinforce and elaborate upon the major themes of the course are strongly recommended. We have found that many of these should be given by outside speakers from business and government in order to emphasize the broad applicability of the concepts being discussed. Finally, additional reading material can be used to round out the course.

COURSE STRATEGY AND TEACHING METHOD

I developed the syllabus to follow the chronological order of the professional and business career of an engineering graduate. Selecting the first employer is the starting point, followed by early career assignments and culminating with the complex organizational, personal, and business challenges of a senior manager. HBS Cases provide a well-written plat-



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form that describes specific situations with no direct answers or outcomes.

The additional reading assignment consisted mainly of HBS Notes, which provided a conceptual framework for the students to analyze the cases with some knowledge of basic concepts on business practices, interpersonal behavior, and human values. The students were all expected to read two books: *Getting to Yes*^[2] and *The Seven Habits of Highly Effective People*.^[3]

The classes were designed to be highly interactive, with the bulk of the time spent discussing the HBS Cases and Notes. In addition, there were lectures on

- *Styles of communicating and interacting*
- *Individual competencies*

TABLE 1
Halsey Professors
at the University of Virginia

<i>Year</i>	<i>Name</i>	<i>Company/Position</i>
1995	N.H. Prater	Mobay/CEO
1996	J.M. Trice, Jr.	Monsanto/Director-HR
1997	R.A. Moore, Jr.	International Paper/VP
1998	D.L. Ashcraft	Temple-Island/VP
1999	J.D. Stein	BASF/CEO
2000	V.A. Russo	Scott Paper/VP
2001	R.L. Espino	Exxon/R&D Manager
2002	A.R. Hirsig	ARCO Chemical/CEO

TABLE 2
HBS Cases

<i>Title</i>	<i>Topic</i>
Kevin Simpson	Interviewing and selecting your employer
Elizabeth Fisher	Dual career decisions
Lisa Benton	Conflicts in your first assignment
Amelia Rodgers	First group-leader assignment
Anne Livingston	Changing jobs and new leadership role
Tech Transfer at...	Conflict between development and production
Thurgood Marshall...	Leader of middle-level managers
Conflict in a diverse...	Harassment and social conflict
David Fletcher	Hiring your ideal business team
MOD IV Product...	Effective teamwork
PPG-Developing...	Risks and rewards of empowerment
John Smithers at Sigtek	Leading a quality process initiative
Jenssen Shoes	Managing a diversity conflict
Corning Glass Works	Leadership during a business downturn

- *Conflict management*
- *Teams and team performance*
- *Strategic planning*
- *Developing a personal career plan*

Six outside speakers led discussions on various aspects of their business careers. These included

- *Managing family and business life*
- *How to improve leadership skills*
- *Conflict management and negotiation*
- *Working with consulting companies*
- *Attending business school*
- *Reinforcing organizational values*

A detailed outline of the course is presented in Table 3 (next page). The two 75-minute class periods each week allowed adequate time for discussion of the Case and the Notes, as well as for the lectures given by the Halsey Professor or by invited speakers.

LEARNING THROUGH THE HBS CASES

The “Case Method” is based on real-life situations that represent the kind of challenges that engineers and managers are likely to face during their work life. The cases helped students sharpen their analytical skills, their ability to communicate clearly and forcefully, and most importantly, helped them to develop their problem-solving abilities. Table 2 indicates the topic being discussed in each case.

The students were assigned the HBS Case a week in advance. They were required to write a 3-to-4-page summary of their assessment of the situation and their proposed solution(s). They were also asked to document the key learnings they had derived from the case. It was gratifying to observe their increasing sophistication in analysis and problem solving during the course of the semester.

There were a number of interesting observations that resulted from discussion of the HBS Cases. The students paid a lot of attention to the interpersonal style of the protagonists and were quite sensitive to antisocial behavior. They were, to my surprise, expecting to experience such behavior in the workplace. This applied even to harassment situations. Another class-wide attitude was to view most conflicts as rooted in poor communication, and it took a lot of discussion for them to see poor communication simply as the external manifestation of a more profound conflict.

LEARNING KEY CONCEPTS THROUGH THE HBS NOTES

The course provides an introduction to a number of critical competencies engineers need in order to succeed in organizations. These were provided mainly through reading and discussion of HBS Notes. The Notes were also given to the students a week in advance of the class discussion. There

was a close coupling between the teachings in the Notes and the Case being discussed in parallel. This worked well, as confirmed by the frequent references to concepts presented in the Notes in the students' analyses of Cases. It is unrealistic to expect the students to fully master all the concepts, but it was clear that they became very aware of their importance. The hope is that when they are confronted with similar situations, they will refer to these Notes for guidance.

We discussed the differences between management and leadership and the many complex and ambiguous issues that

most managers face. We spent very productive time on the influence of culture and history on subtle but important differences in managers' behavior in the USA, Europe, Japan, India, China, and Latin America. Having some students from outside the USA gave immediacy to these discussions.

As expected, issues of business ethics grabbed the students' attention and elicited strong and quite varied opinions. In fact, I was surprised at the diversity of viewpoints, how strongly they were held, and that there was no correlation with gender, race, or economic background.

TABLE 3
Course Outline

Week 1

Homework/Class Discussion • HBS Notes on "Learning by the case method" and "How to choose a leadership pattern"
Lecture • Individual and team competencies

Week 2

Homework/Class Discussion • HBS Notes on "Understanding context" and "Conflicting responsibilities"
HBS Case "Kevin Simpson"
Lecture • Styles of communicating and interacting

Week 3

Homework/Class Discussion • HBS Notes on "Managing your career"
HBS Case "Elizabeth Fisher"
Lecture • Invited Speaker—Managing family and business life

Week 4

Homework/Class Discussion • HBS Notes on "Power dynamics in organizations"
HBS Case "Lisa Benton"
Lecture • The seven habits of highly effective people

Week 5

Homework/Class Discussion • HBS Notes on "Managing your boss" and "Exercising influence"
HBS Case "Amelia Rodgers"
Lecture • Invited Speaker—Improving your leadership skills

Week 6

Homework/Class Discussion • HBS Notes on "Evaluating an action plan" and "Understanding communications in one-to-one relationships"
HBS Case "Ann Livingston and Power Max Systems"
Lecture • The seven habits of highly effective people

Week 7

Homework/Class Discussion • HBS Notes on "Beyond the myth of a perfect mentor" and "Managing networks"
HBS Case "Technology transfer at a defense contractor"
Lecture • Invited Speaker—Conflict management and negotiation

Week 8

Homework/Class Discussion • HBS Notes on "Power dependence and effective management" and "Influence tactics"
HBS case "Thurgood Marshall High School"
Lecture • Conflict management styles

Week 9

Homework/Class Discussion • HBS Notes on "Integrity management" and "Managing a task-force"
HBS Case "Managing conflict in a diverse environment"
Lecture • Invited Speaker—Working in a consulting company

Week 10

Homework/Class Discussion • HBS Notes on "Barriers and gateways to communications" and "On good communications"
HBS Case "David Fletcher"
Lecture • Invited Speaker—Should you get an MBA?

Week 11

Homework/Class Discussion • HBS Notes on "The power of talk" and "The discipline of teams"
HBS case "Mod IV product development team"
Lecture • Getting to Yes

Week 12

Homework/Class Discussion • HBS Notes on "The challenge of commitment" and "A note on high-commitment work systems"
HBS Case "PPG—Developing a self-directed workforce"
Lecture • Strategic planning

Week 13

Homework/Class Discussion • HBS Notes on "Organization structure," "Organization effectiveness," and "The challenge of change"
HBS Case "John Smithers at Sigtek"
Lecture • Invited Speaker—Reinforcing organizational values

Week 14

Homework/Class Discussion • HBS Notes on "Business ethics: the view from the trenches," "Ethics without a sermon," and "Ways of thinking about and across differences"
HBS Case "Jenssen Shoes"
Lecture • Developing a personal career plan

Week 15

Final Homework:
• A personal career plan
• Analysis of the "Most admired company..."
• Group report of HBS Case "Corning Glass Works"

I was disappointed in the students' lack of interest in learning about team building, task-force management, and building commitment in the workplace. The students felt that they knew about these topics and that they were already proficient. I do not believe I ever convinced them there was a lot for them to learn and that success in these areas requires skills they actually did not possess.

OTHER FEATURES OF THE COURSE

The students were given a three-part final homework assignment. One element was a personal mission statement with an associated five-year career development plan. The plan could also include other facets of their life, such as family, health, religion, community involvement, etc. For each of the elements they were encouraged to follow a disciplined approach that included short-term (6 months), midterm (2-3 years), and long-term (5 years) plans. For each time period, they were asked to state goals and specific objectives and to define strategies and action steps. They were initially unenthusiastic about this task, but the final product indicates that they thought hard about it and put together a realistic and credible plan.

The second element of the final homework was a team project. Groups of four students were asked to analyze a fairly complex HBS Case of a Corning Glass Works Division undergoing a change in management during a business downturn. They were asked to devise strategies and specific action plans for the division as well as a self-assessment of their team performance. The reports indicated a wide range of team performance, with the key problems being an inability to agree on an action plan, finding time to work together, and uneven participation by team members. This assignment came at the very end of the semester, which was too late to refute their earlier assertions that "teamwork was something they knew how to handle."

The third element of the final homework was an analysis of a company's performance during the last four years. Each student selected a company from those reviewed by *Fortune Magazine* in its annual publication of "America's Most Admired Companies."^{4,5} They were asked to analyze the performance of the company they chose, to identify reasons for any change in rankings during the four-year period, and to forecast future trends.

The objective of this exercise was to allow the students to apply to a specific company-wide situation what they had learned about effective management, leadership, and manag-

ing change. The companies chosen reflected the students' wide range of career interests and included, among others, entertainment, communications, financial, computer technology, oil and chemicals, consumer products. They were asked to suggest the future direction the company needed to take to improve performance. A majority suggested expanding global reach and more technology investment, while only a few focused on improving cost competitiveness.

STUDENT ASSESSMENT AND FEEDBACK

During the semester, the students were asked to provide feedback on course content and to assess its effectiveness. The data are summarized in Table 4 and show that the majority of the class found the course very useful. They rated the discussions of HBS Cases and Notes, my work experiences and personal stories, and the outside speakers the highest. They were less enthusiastic about the other reading material, perhaps because they were not used to this amount of reading in an engineering course.

SUMMARY

The objective of the course was to increase student awareness of the nontechnical competencies they should possess in order to succeed in the work world. It is unrealistic to expect that at the end of a semester they would have mastered all these competencies, but it was evident that they were much more sensitive to the importance of such skills and had grasped the essentials. Also, they were left with an excellent collection of HBS Cases and Notes that could serve them well when confronted with similar situations. As I frequently indicated to them, I wished that I had such a learning experience in my engineering schooling and early career.

The main reason for writing this article is to encourage other colleges and universities to consider offering a course along the general outline that I have described. I also encourage experienced business practitioners to teach such a course. The Halsey Professors are unanimous: it was an exciting and gratifying experience to share what you have learned with the next generation of engineering and business leaders.

REFERENCES

1. Harvard Business School Publishing, 60 Harvard Way, Boston MA 02163
2. Fisher, R., W. Ury, and B. Patton, *Getting to Yes*, 2nd ed., Penguin Books
3. Covey, S.R., *The 7 Habits of Highly Effective People* Simon and Schuster
4. *Fortune Magazine*, March 6, 1997
5. *Fortune Magazine*, February 21, 2001 □

	Not Useful	1	2	3	4	5	6	7	8	Very Useful
February %	-	-	-	-	-	25	45	30		
March %	-	-	-	-	3	29	50	18		
April %	-	-	-	-	3	25	37	35		