ChE curriculum

A COURSE ON PRESENTING TECHNICAL TALKS

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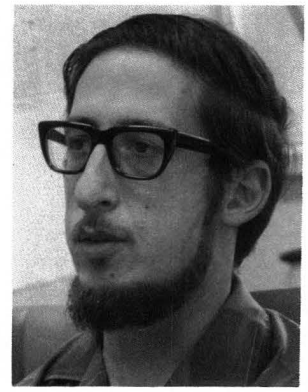

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IN THE ONGOING debate about what should be put in and taken out of the chemical engineering curriculum, one of the few points of universal agreement is that oral communication skills are essential for all practicing engineers and not enough is done to develop them in most engineering curricula.

Like many other departments, we used to have a senior seminar course in which each student presented a single 30-45 minute talk sometime during the semester. The results were not particularly impressive: the students whom you would have expected to give good talks gave them; the other talks ranged from poor to average; evaluations were superficial; and the one-shot nature of the talks provided little opportunity for individual improvement. Also, the worst of the talks, being as long as 45 minutes, were excruciating experiences for everyone involved.

When Harold Hopfenberg became Department Head eight years ago, one of the first changes he introduced was a complete reorganization of the seminar course. Under the new system the senior class is divided into groups of six to eight students and a faculty member is assigned to each group. The groups meet once a week for most of the semester. Each faculty member runs the seminar in any way he or she chooses; the next section describes a structure that has worked particularly well for the author.

COURSE STRUCTURE

Each student prepares and delivers two talks during the course. Talks in the first round are each fifteen minutes long for a 50-minute class period and twenty minutes long for a 75-minute period. Talks in the second round are ten minutes long.

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The first meeting is organizational. The instructor explains the course structure and hands out and reviews a list of suggestions for good presentations (to be given subsequently in this paper). He then lists all of the dates on which the course will meet and requests volunteers for the first two presentations, to be given two weeks from the current date. If there are volunteers the rest of the calendar can usually be filled in on a voluntary basis; if not, a lottery is used to assign presentation dates.

In the second period the instructor delivers an illustrative seminar. He begins by explaining that he has been giving technical talks for a long time and the students should not expect to be able to duplicate his skill at this stage of the game. He adds that even experienced speakers can find room for improvement, and he requests that the students take notes on things that might be improved in the presentation. He then

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proceeds to give the worst talk he can possibly give. He provides no real introduction but launches directly into a long monologue read verbatim from notes. He shows a crudely drawn flow chart with no units or streams labeled; several data plots with no apparent relationship to anything; and one transparency that looks like a facsimile of the Dead Sea Scrolls, filled from top to bottom with handwritten equations in tiny print. The talk is crammed with undefined technical jargon; no eye contact is ever made; and gum is chewed continuously and ostentatiously. The speaker concludes by fumbling around with his transparencies and then muttering, "Well, I guess that's about it."

The talk lasts for approximately eight minutes and by the end of it the students have all caught on to what is happening. The class then brainstorms the things that were wrong about the talk and what should have been done differently. The instructor subsequently gives a coherent version of the same talk, complete with introduction, body, summary, and intelligible transparencies, and the class briefly discusses the things that made a difference relative to the first presentation.

At least one week before students are scheduled to present their talk they are required to submit a topic. They may talk about published papers or about work they did on projects or summer jobs; the only ground rule is that the talks should be reasonably heavy in technical content at a level appropriate for chemical engineering seniors. The instructor reviews the chosen topics and tells the students either to go ahead with them or to find alternatives with more technical content. During the week before the presentation the students write, duplicate, and hand out seminar announcements and abstracts to the instructor and to all group members.

A typical class session begins with the presentation of the first talk. During the talk the class members jot down questions about the content and comments on the presentation. A five-minute questioning period follows the talk. The students and instructor then fill out a checklist rating various aspects of the talk (introduction, body, and summary; level of the material presented; use of time; quality of transparencies; clarity of presentation; speaking style; strong and weak points of the talk). Finally, the students and the instructor each present brief oral critiques. The checklists are given to the speaker to review and are handed in to the instructor at the following class session. The procedure is then repeated for the second speaker.

Since the course was last offered the department has acquired a videotaping facility. In the future, each talk will be taped and the students will be requested to view their presentations and critique themselves.

SUGGESTIONS TO SPEAKERS

Preparation and Organization

- **Know the technical background of your audience and gear your talk to that level. Do not use a lot of unexplained technical jargon unless you are sure the audience already knows what it means, and don't explain what a material balance is to a group of chemical engineering seniors.**
- **Make sure your talk has a distinct introduction (outline what you are going to say and why it might be important or interesting to your audience), a body, and a summary (repeat what you particularly want your audience to retain from the talk).**
- **Use overhead transparencies or slides to present main points and provide explanatory details in the talk. Transparencies work well for informal seminars, and you can easily make them yourself. Slides are more difficult to produce, but they are often more convenient for short tightly-timed presentations and they are required at some national and regional conferences.**
- **Never present a large body of information orally without summarizing its main points on a transparency.**
- **Do not present more than about eight lines on a single transparency. Transparencies crowded with information are useless. It should take about two minutes to go through a single transparency in the talk.**
- **Use large type on transparencies—a label maker or the Orator ball on a Selectric typewriter or a word processing program with variable type size. Ordinary size type doesn't look good. If you handwrite the transparency, use large block lettering with horizontal guidelines to keep your lines straight. Never use script unless you're Octave Levenspiel.**
- **If you show a process flow chart, make sure the units and streams are labeled. A bunch of unlabeled boxes and lines with arrows is worthless to the audience.**
- **Try to avoid complex equations, which can rarely be explained intelligibly in the amount of time available. If you are talking about a mathematical model, focus on what it does (input and output variables, assumptions) and provide, at most, qualitative summaries of the mathematical and computational details. (If listeners want more de-**

tails they can ask you for them in the question period.)

- **If you show data plots be sure the axes are clearly labeled.**
- **Rehearse your talk several times with a friend or in front of your mirror, and make sure the time it takes is within one minute of the time allotted for the talk. Running long can be a disaster in a formal presentation and running short may not win you any friends if you're at a meeting where consecutive talks are scheduled at set times.**

Presentation

- **Never read directly from prepared text—there is nothing more deadly to an audience.**
- **Make frequent eye contact with your audience throughout the talk. Do not stare at your notes or at the screen.**
- **Sound enthusiastic about your subject, or at least interested in it. Do not speak in a monotone. Gesture occasionally. If you seem bored by your material you can be guaranteed your audience will follow your lead.**
- **Make sure your watch is visible and check it occasionally to see how the time is runnning. If you see you are running short or long, try to adjust the speed of your presentation to compensate.**

DISCUSSION

The improvements in the student presentations as the semester progresses are clear and frequently dramatic. Almost invariably poor speakers become adequate, adequate speakers become good, and good speakers become better. During the past six years a student from our department has won the regional AIChE student chapter paper award competition three times. We can't prove it, but we are convinced that the seminar course has a lot to do with this record.

The oral critiques are a valuable and interesting part of the course. The natural student tendency is to be excessively polite, to avoid criticizing harshly lest they themselves come in for the same treatment when it's their turn to speak. As a result, in the first few sessions the principal burden of criticism falls on the instructor. However, as the semester progresses the student criticisms become more and more germane and incisive, although courtesy is always appropriately retained. (We are Southern here, after all.) By the end of the semester the instructor is almost redundant: the points he is prepared to make in his critique are usually made first by the students.

Requiring each student to give a fifteen- or twenty-minute talk and subsequently a ten-minute talk seems to work very well. It is usually difficult (even for seasoned professionals) to present a significant body of technical material in twenty minutes; having to do so provides the students with excellent practice in preparing technical seminars such as those at national AIChE meetings. Cutting the material down to ten minutes presents a whole different set of problems, as the students quickly discover. The latter exercise is good preparation for, say, company staff meetings at which many people must summarize their work in a relatively short time.

Finally, it is critically important for the course instructor to remember that the students taking the course are particularly vulnerable: they are nervous about public speaking in general and they are especially not used to being publicly critiqued. If the criticism is destructive or unduly harsh, or seemingly arbitrary and unfair, the course has the potential of doing much more harm than good. However, as long as the instructor establishes firm ground rules about criticism and takes the lead himself in creating a supportive environment, the course can be among the most positive and rewarding educational experiences the students experience in their academic careers. □

ChE book reviews

CATALYST DESIGN: PROGRESS AND PERSPECTIVES

by L.L. Hegedus, A.T. Bell, N.Y. Chen, W.O. Haag, J. Wei, R. Aris, M. Boudart, B.C. Gates, and G.B. Somorjai

John Wiley & Sons, Somerset, NJ 08873; 288 pages, $47.50 (1987)

Reviewed by
R. J. Gorte
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While there are a number of books on catalysis, it is very difficult to find a book which gives a balanced presentation of the many topics in this field. The problem is that everyone working in catalysis has a different view of what the subject is and what is important. People working in surface physics view catalysts as adsorption on single crystals in ultra-high vacuum, mathematical modellers view it as concentration and temperature gradients across a catalyst pellet, and traditional workers in catalysis view it as the turnover number or selectivity for a reaction carried out over a fixed bed. While not written specifically as a textbook, *Catalyst Design: Progress and Perspectives* has tried to give an overview of work carried out by