ChE classroom

THE OTHER THREE Rs

Rehearsal, Recitation, and ARgument

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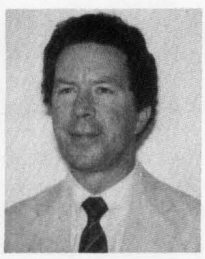
Public speaking for undergraduates is rarely mentioned in engineering curriculum lists or discussions, yet the importance of clear and concise communication and presentation has probably never been greater. To address this need, some departments offer a one-term, one-unit oral presentation class to give students an opportunity for training in the presentation of technical papers. (A summary of our NCSU senior seminar course was recently published by Richard Felder.[1])

The variety of circumstances where public speaking may be expected of our engineering graduates is considerable, ranging from short to long technical talks in conference or corporate meetings to participation on multipartisan panels in public meetings, and, even possibly, to the twenty-second to one-minute "sound bite" responses so common in televised or video-recorded conversations and interviews. In order to address this variety, as well as the controversial character and debate style implicit in some of the settings, the student must be challenged with a series of presentation opportunities, each in a distinctly different format.

Assuming that such a variety of presentations may provide both substance and spice, a one-semester senior course of one unit value has been given by the author with modest success. This paper summarizes the course content and its rationale and offers some reflections of both the students and the professor. Each class section has 6-8 students, with the senior class divided among as many faculty as are required. This group size works well for one-hour-per-week meetings on each of the presentation formats discussed below.



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Student speakers customarily use overhead transparencies, which are easily prepared and can be enhanced by color at minimal cost and effort. Transparencies also fit well into late planning and reorganization of talks. The usual short litany of guidelines for overheads is given to the students at the outset: write legibly in large print, use only key words and phrases, use no more than one transparency every two minutes of allotted time, etc.

Audience attention and participation is achieved through a simple but effective requirement: at the end of the presentation, each audience member must ask a question of the speaker. This question/response mode is usually a bit artificial and stiff for the first one or two speakers, but the students soon begin posing substantive questions after each talk. The logic behind the demand for questions is simple: students learn more from a presentation when they are obligatory participants rather than mere observers—and the speaker enjoys the pleasure (or agony) of an attentive and responsive audience. After every presentation, I never ask questions, but I do provide each student with a written set of brief comments, including such items as extent of audience engagement, voice clarity, logic of organization, and quality and content of transparencies.

The presentation formats required of each student are

- informal brief (any topic)
- technical process description
- controversial topic (technical and/or non-technical)
- town meeting
- recitation (poem)

The purpose and form of these topics are as follow:

Informal Brief (1 period of 6-8 speakers) The student must present a five-minute talk, with or without transparencies or model, etc., on any topic of personal interest. The informal mode (no fixed presentation style) is a nice way to begin the semester and to have the students learn a bit about each other. It also provides the faculty member with a survey of the student's speaking talents. Speaker interest is normally high since the student can choose a topic for which he or she has considerable involvement and knowledge. Topics usually include "last summer's job" and "my favorite hobby," occasionally spiced by a presentation of "my favorite pet" (a ferret once assisted!), a campaign statement (pro-choice or pro-life), or a comment on biological evolution (all sides).

Technical Presentation (2 periods of 3-4 speakers each) The student must summarize a technical production process, including its historical development, current process flow diagrams, product uses, and prospects for the future. This is the only "straight-arrow" presentation of the semester. Each student chooses the process to be summarized and prepares all transparencies. I insist that there must be continuity in both the visual and oral presentations: the entire talk should appear logical to an audience member who can only see or only hear.

Controversial Topic (2 weeks for reading and preparation followed by two weeks for 3-4 presentations per allotted hour) In the old high school debate classes of the 1950s (long since abandoned), controversy and argument were center stage. A student had to prepare for both sides of a given question, since the point-of-view to be defended or attacked was unknown until just prior to the debate session. One motivation for this procedure was to test the speaker's knowledge of the subject from all sides.

To prepare for our class presentations, an assortment of books (dealing with controversial but often technical topics) is offered to the students, who are then asked to pick one, read it, and present a two-part summary to the class. The first part of the summary (approximately ten minutes) should outline the issue and the author's arguments and conclusions, following the author's version and words as closely as possible. The second part (a brief three-minute presentation) should be the student's critique of the author's approach, using the student's own words. The idea is to make the student present, clearly and distinctly, both the views of others and his or her own. Some students, perhaps numbed by the problem/solution/textbook approach which characterizes so much of our curriculum, appear reluctant to present a controversial subject in a public forum. This method presents an opportunity to reverse that feeling. Some of the books we have used include Kennan's *The Nuclear Delusion,* Fallow's *National Defense,* Djerassi's *Politics of Contraception,* Ray's *Trashing the Planet,* Petroski's *To Engineer is Human,* Carson's *Silent Spring,* Meadow's *Limits to Growth,* Wade's *The Ultimate Experiment,* and Florman's *Existential Pleasures of Engineering.* These books are well-written and take strong positions. Most students find clear areas of agreement or disagreement with each author.

I am always uncertain of the students' attitudes toward this asssignment. The challenge is clearly one of presenting the author's view in only his or her own words—a situation foreign to the analyst/engineer.

Town Meeting (1 week) "Resolved: that the State of North Carolina (Wake County, or City of Raleigh, as you prefer) will site, construct, and operate a hazardous waste incinerator." The students divide into three groups of two, representing industry, local government, and concerned citizens. The stances of these groups are naturally for, ambiguous about, and against the proposition, respectively. I usually choose a seventh, strong student to act as mediator.

To set the stage at the "meeting," one student briefly introduces the RCRA and TSCA statutes which motivate the development of such a resolution. Then one student in each group gives a partisan position summary (no questions; five minutes each for three presentations). A subsequent fifteen-minute pause allows each group to frame its rebuttal (blank transparencies and marking pens are provided). Following the presentation of rebuttals (two-minute maximum), I (representing the public at large) charge the mediator and the three groups to negotiate in good faith; then I leave the room for ten minutes.

Upon my return, the mediator presents any consensus position that has been developed. This is done most easily by indicating what each group will "win" from the outcome and how each group's primary concern will be addressed by the others. The challenge to the students is, "If you, as a collection of technically educated students, cannot reach any plausible and acceptable ground on this issue, how can you expect society at large to do any better?" The students usually see that seeking a win-win-win result works and that such an outcome should leave future relationships in far better shape than any do-or-die proposition which is too rigidly promoted.

Recitation (1 week) The easiest manner to test

whether a student knows *exactly* what to say is to hear a brief (approximately one minute) recitation of a poem. This recitation also provides the ultimate example of the claim that, with care and proper editing, any story or report can be fully presented in a very short period of time. It also helps the student see that poetry is successful because of its brevity and the ease with which the listener's mind constructs a full image from a few words. Who would not agree with such a characterization for Blake's

> ***Tiger, tiger, burning bright,***
> ***in the forest of the night.***

The use of images already familiar to a technical audience is also clearly a way to maximize impact and minimize delivery time.

Even with Blake and another example or two to lighten up the prospect of the following week's poem presentations, I am always uncertain of the students' attitudes toward this assignment. The challenge is clearly one of presenting the author's view in *only* his or her own words—a situation foreign to the analyst/engineer. Not surprisingly, most students fail to rehearse sufficiently to present an unhesitant, logically continual delivery. A bright spot is that nearly all students have favorite poems. My first year's group caught me off guard: half the class recited interesting poems which they had written in high school (not college) English!

Perhaps we should try the same approach with graduate students. Would not our somnolent AIChE and ACS meetings profit by an occasional poetic rendering? As an example, a graduate student might recite *Fame's Penny-Trumpet* (Lewis Carroll, 1869) with a prelude that is still relevant for the 1990s: "Affectionately dedicated to all 'original researchers' who 'pant' for endowment." For a partisan view, we could hardly do better than the closing stanzas:

> *Deck your dull talk with pilfered shreds*
> *of learning from a nobler time,*
> *And oil each other's little heads*
> *With mutual Flattery's golden slime:*
>
> *And when the topmost height ye gain,*
> *And stand in Glory's ether clear,*
> *And grasp the prize of all your pain -*
> *So many hundred pounds a year -*
>
> *Then let Fame's banner be unfurled!*
> *Sing Paeans for a victory won!*
> *Ye tapers, that would light the worlds,*
> *And cast a shadow on the Sun -*
>
> *Who still shall pour His ray sublime,*
> *One crystal flood, from East to West,*
> *When ye have burned your little time*
> *And flickered feebly into rest!*

Doubtless, the now-attentive audience would offer other views.

FEEDBACK

"We learn by doing" seems to characterize most student evaluations; while each general assignment seemed plausible at the outset, the students usually saw the presentation possibilities and purpose much more clearly in retrospect.

What else to add? A semester of these round-robin presentations has several times led to enough group coherence that a student skit was suggested, as was the inevitable roast of the professor. In deference to pending exams, these suggestions were tabled. Clearly, I underestimated the theatrical interests of the students. Their enthusiasm for additional opportunities suggested that they may have come to look forward to oral presentations. On the next round, we will try the skit (memorize your own words), after the poems.

REFERENCES

1. Felder, R. M., "A Course on Presenting Technical Talks," *Chem. Eng. Ed.*, **22**, 84 (1988) ❐

ChE ***book review***

PROCESS DYNAMICS & CONTROL

by Dale E. Seborg, Thomas F. Edgar, and Duncan A. Mellichamp
John Wiley & Sons, New York (1989)

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Process control has been continuously evolving since its introduction in the chemical engineering curriculum during the late 1950s and early 1960s. Since then, each decade has been marked by a new textbook with significant market share. The 1965 book by Coughanowr and Koppel was perhaps the first of these. The market for this book was later split by the appearance of Luyben's book in 1973 and then largely supplanted in 1984 by Stephanopoulos.* The recent textbook by Seborg, Edgar, and Mellichamp

* By citing these, I don't mean to diminish the significant contributions of many others, including P. Buckley, N. Ceaglske, D. Eckman, P. Harriott, E. Johnson, D. Perlmutter, W. H. Ray, and T. Williams. These people and others wrote useful books that, for whatever reason, did not achieve broad acceptance as undergraduate course texts.