ChE views and opinions

ACCREDITATION
Plus or Minus

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IN A RECENT "Views and Opinions" article in *Chemical Engineering Education*,* Professor James Wei asks, "Are We Participants or Victims?" The underlying issue is accreditation—the criteria, the process, and the application. The basic question is whether the current accreditation system is serving the profession well through the education offered students in chemical engineering programs. This accreditation system is jointly administered by the Accreditation Board for Engineering and Technology (ABET) and AICHE—it is a joint effort. The person who quipped, "But these are our organizations that we depend upon. If we can't fix them, who else would do it?", is right. AICHE has several direct influences on the accreditation process.

Perhaps I should review the organizational structure of the accreditation process. AICHE, as well as other engineering societies, has representatives on ABET—the policy-establishing organization for accreditation procedures. ABET has established three commissions which handle the actual accreditation evaluations and actions. These commissions are the Engineering Accreditation Commission (EAC), the Technology Accreditation Commission (TAC), and Related Accreditation Commission (RAC). The EAC is the body that acts on accreditation for our chemical engineering programs. EAC derives its membership from AICHE and the other participating engineering societies. We have four standing members of EAC and four ABET board members. The AICHE representatives are chosen from participants in chemical engineering accreditation activities both as a program evaluator and membership on the Education and Accreditation Committee (E&A) of AICHE. Your current representatives to ABET and the EAC are

ABET Board of Directors
Bryce Anderson, Southeastern Massachusetts University
Robert Greenkorn, Purdue University
James Knudsen, Oregon State University
William Manogue, E. I. du Pont

EAC
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So much for the gruesome organizational details.

Apparently at question are the ABET/EAC accreditation criteria and their application to specific programs. A substantive argument against having criteria is not likely—the schools need criteria for guidance as to what is expected, and those doing the evaluation need a standard against which judgments can be made. Uniform application, stringency, "bean counting," interpretation, and final judgments become the issues. The criteria are dynamic, not static . . . constantly changing to reflect changes in the profession. If the criteria themselves are in contention, they can be changed. But those who want them changed must trumpet their cause—not in the Exxon suite but with AICHE's representatives to the EAC and ABET, or even as a representative (but be prepared to do a lot of work!).

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The judgmental process can not and should not be written out of the system. It has been my experience that AICHE's representatives have constantly resisted attempts toward over-specification of criteria ("bean counting"). And yet evaluators are torn between consistency and fairness to all institutions re-

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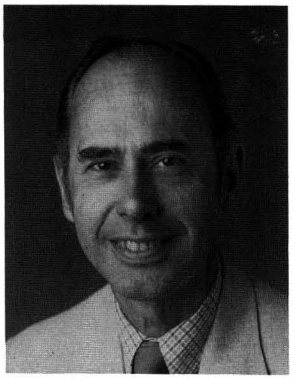

Robert R. Furgason received his BS and MS in chemical engineering from the University of Idaho (in 1956 and 1958, respectively) and his PhD in chemical engineering from Northwestern University in 1961. He is presently Vice Chancellor for Academic Affairs and Professor of Chemical Engineering at the University of Nebraska-Lincoln.

gardless of their perceived reputation, and a need to promote, not inhibit, innovation and desirable change. Perhaps a two-tiered or multi-tiered system could be devised to address the mission and thrust of different universities. I suspect that such an approach would be very difficult to develop and that it would be a constant source of contention as to how a particular institution would be classified. Remember, the accreditation process applies exclusively to the undergraduate program and has only an indirect relationship to the research and graduate mission of the institution. AICHE has consistently opposed advanced level accreditation of chemical engineering programs. If the amount of design material in the curriculum is the issue, nothing is necessarily sacred. The amount can be changed, up or down, and interpretations refined. But to condemn the system and cast doubts on the motives of the people involved usually generates resentment, not resolution. Any group action is, by definition, political and will remain so even if new organizations and players are involved. Participation is the name of the game and victimization not the object.

I wonder how many critics have read Section IV of the *Criteria for Accrediting Programs in Engineering in the United States*, especially the Curricular Objectives and Content section. Since the design component seems to be a major issue, let me extract the exact wording from the *Criteria* document related to engineering design.

"(3) Engineering Design.

(a) Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing, and evaluation. The engineering design component of a curriculum must include at least some of the following features: development of student creativity, use of open-ended problems, development and use of design methodology, formulation of design problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. Further, it is desirable to include a variety of realistic constraints such as economic factors, safety, reliability, aesthetics, ethics, and social impact.

(b) Courses that contain engineering design normally are taught at the upper-division level of the engineering program. Some portion of this requirement must be satisfied by at least one course which is primarily design, preferably at the senior level, and predicated on the accumulated background of the curricular components.

(c) Coursework devoted to developing drafting skills may not be used to satisfy the engineering design requirement."

Obviously this language leaves a lot of room for interpretation. It does not say, for example, that a course in chemical kinetics and reactor design is, or isn't, necessarily all design. The criteria spell out what is expected in a course if it is to be classified as design and certainly provide for portions of a course to fit into more than one category. But it would be difficult to stretch the interpretation to include a basic FORTRAN programming course as design, although more than one institution has tried. I suspect some people do not thoroughly read the criteria and do not have these requirements well in mind when they prepare for an accreditation visit.

I recommend reading the entire document as the wording has been carefully selected and there is a standing committee whose job is revising the criteria. Significant changes have occurred. For example, several years ago the use of beginning foreign language courses was not permitted to satisfy the humanities and social sciences requirements. Now the H-SS criteria allow, ". . . and foreign languages other than a student's native language(s)." This is a meaningful change and relates in part to the recognition that an engineer's perspective must be international and that ABET/EAC should encourage engineering students to take foreign languages, not to impede this study as part of their education. I was a vocal proponent of this change and served on the Criteria Committee of EAC when it was instituted.

Maybe accreditation is unimportant to some institutions. Nothing compels the institution to be subjected to the process—EAC program evaluators par-

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tive" or "very effective" in teaching process control. The bulk of the remaining responses rated it "OK." Virtually all students agreed that the sacrifice of lecture time for the use of ACS was well worthwhile. We are confident that their responses would differ from those of the engineers who participated in the *Chemical Engineering* magazine survey. At both Purdue and Waterloo, other indicators of positive student reaction were

- **Students worked at a faster pace than anticipated by the instructor. Only ten units were originally planned for the introductory course; the last four had to be added to keep up with the students.**
- **Students arrived as much as half an hour early, even for sessions scheduled at 7:30 AM, explaining that they wanted the additional time to experiment in greater depth.**
- **The original enrollment limit for the follow-up elective course was set at 38 students. Due to demand, this had to be increased, and even the larger figure was quickly oversubscribed. This is particularly unusual for process control, which is regarded as one of the most difficult subjects in the curriculum.**
- **The ACS facility was visited by over a score of industrial recruiters, on a "drop in" basis. They indicated their interest was spurred by the comments of their student interviewees, who almost invariably listed it as one of their favorite educational experiences.**

SUMMARY AND FUTURE WORK

We are enthusiastic and excited over the use of ACS in the undergraduate process control course. Our future plans are focused on the development of a wider base of process simulations for additional senior process control courses, and making the coursework modules available to any other universities desiring them.

Plans are already being implemented to make ACS and the study guides available to the chemical engineering department at Northwestern University and to the pulp and paper technology department at the University of Wisconsin-Stevens Point, both by remote dial-up to the Purdue facility. Other ACS sites now include Louisiana State University, Imperial College (England) and Queensland University (Australia).

The authors are grateful to the many people at IBM and IBM Canada Ltd. whose steadfast and enthusiastic support has made this valuable tool available to the chemical engineering academic community. Specific acknowledgment is given to Ross M. Aiken at Purdue as well as to Jerry van de Hoef and Blair Thompson at Waterloo for their dedicated system and tutorial support. □

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ticipate only by invitation. Some university administrators would be delighted to see accreditation disappear. Who needs those interlopers putting more heat on for scarce resources for their favorite discipline? Who cares whether someone else likes the curriculum? I suppose the answer is that our profession is collectively interested in knowing what type of graduate is being produced beyond a potluck process.

This brings me back to my initial comments—those of us involved in the accreditation system represent AICHE and the chemical engineering profession, a profession involving educators and practitioners in industry and government. I conclude by confessing that participating in the camaraderie of the Exxon suite sure beats grinding through a mountain of accreditation reports and sitting through literally days of meetings. Anyone wish to trade places? □

BRIDGING THE GAP

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institutions. It is suggested that an integrated approach is more realistic and meaningful to study and to bridging the gap between academic curriculum and industry's needs. Specifically, we recommend that curriculum-related data and job-related data be analyzed simultaneously. The authors feel that this approach should give us better insight to the much reported 'gap' between theory and practice.

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