Engineering Educators Discuss Social and Technological Change

Convention Stimulates Speech-Making

The American Society of Engineering Educators held their 77th annual meeting at the University last week. Following are some excerpts from speeches given during the convention by a number of the educators:

Eric A. Walker, University president, said last week that American colleges and universities must free themselves from outmoded tradition if they are to keep pace with the real needs of their students.

Addressing the awards dinner of the American Society of Engineering Educators meeting at the University, Walker said, "It seems to be that a part of the problem on our campuses has been created because we have paid all too much attention to the question of what we teach and not enough to the question of how to teach it.

"In spite of innovations in traditional teaching methods, and in spite of the constant addition of new material and new techniques, the traditional pattern prevails.

"We have modified and adapted our programs and methods but we have failed to question the fundamental validity of many of our basic concepts."

Walker, who also is president of the National Academy of Engineering, told the dinner that American higher education had done a remarkable job in accommodating growing scores of students without any loss in the quality of instruction.

Yet, he continued, despite repeated adaptation, review and revision of the college curriculum, a major complaint of students today is the impersonality of their college lives.

"A student can spend four years at a large university and never really get to know a single one of his instructors well," Walker said.

"He registers for the prescribed courses, attends his classes at specified times, takes the scheduled examinations and adds a a few more credit hours to the total he needs for graduation.

"The charge he makes that he has become a number on an IBM card has some justication.

"In spite of our growing recognition of individual differences among human beings...we have nevertheless continued to try to force our students into a pattern designed in many respects for a mythical average student.

"Many of our practices are based upon time-honored conventions..We allow them to hem us in for no good reason. It is merely that we have always done things this way in the past.

"I think we would do well to ask ourselves whether the changes we have made in adapting our educational system to the demands made upon it in recent years have been adequate—whether we have indeed kept pace in our colleges with the real needs of our students."

Among the basic concepts of higher education questioned by Walker were:

The four-year curriculum—"In general we take four nine-month years to accomplish our purpose. Is there anything sacrosanct in this? Isn't it time we ask ourselves very seriously whether we are right in trying to tie everybody to a standard four-year curriculum?"

The credit system—"Somehow or other every course has to be measured n numbers of credit hours or courses...The trouble is that the digits we are trying to use for measurement of credits are not the same size. It seems to me that all too often such a system restrains us from doing what we really ought to do."

Lectures— "Too often, it seems to me, lectures are pretty wasteful devices by which symbols are transferred from the notebook of the lecturer to the notebook of the student without leaving much impression in the heads of either one. Since all kinds of copying machines are now generally available, I see no reason why students can't be given copies of the professor's notes and thus avoid the distracting and useless work of writing by longhand a set of symbols which...are often meaningless anyway.

Regimentation — "What can regiment students more than forcing them to attend class with 100 or 25 or even 10 other students listening to lectures in exactly the same detail, taking exams in unison, and marching on to the final day when each will be given a grade. There is no freedom for the learning process here..."

Productivity — "In the total private economy, man-hour production has almost doubled since 1947. But where has been the increase in productivity in American education? The answer is that there has been very little. In higher education we are still teaching at the ratio of about 15 students for each faculty member and using methods that have long since been outmoded."

Walker said there is enough talent, intelligence and creativity in American higher education to devise a system tailored to meet the individual needs of students if educators would just take on the task.

"Isn't it about time someone applied the innovation, courage, money and freedom from tradition to try to do things differently?" he concluded.

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It's up to engineers to solve the ills of today's society because social and behavioral scientists have failed to do the job, said Melvin H. Snyder.

"The students in engineering schools today will shortly be reshaping the world and they must become aware that their task is to apply science for the good of mankind;" maintained Snyder, professor of aeronautical engineering at Wichita State University.

Snyder called on all engineers to apply themselves to social problems, especially those created by technology. "The economists, the politicians, the humanists and the religionists have failed in this undertaking," he said. "Technology can attack most social ills—food, shelter, communication, transportation—and is capable of solving many of them."

To achieve this redirection in the field of engineering, Snyder urged major changes in the humanistic-social stem of the engineering curriculum in colleges and universities.

In particular, he said, the objectives of these courses must be re-defined and courses be relevant to engineering students.

"Engineering educators must join with their colleagues in the social sciences to offer more interdisciplinary courses relevant to today's problems," he said. "Education in the humanities and in the social and behavioral sciences must be improved both in the stem of the engineers' education and in liberal arts education.

"This may seem presumptuous on my part, but there is a vital need for courses in technology for nontechnical persons," Snyder concluded. "Students in liberal arts colleges and other colleges study science, but they don't study technology. They learn, for instance, that Darwin was a scientist and he discovered a certain principle, but they never heard of Bessemer, although the Bessemer process, which made available structural steel at low cost, has affected their lives much more than Darwin's discovery of the process that he ascribed to evolution."

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Fired by increasing differences among college students both in mental ability and scholastic backgrounds and their stiffening resistance to required courses, a revolution in instruction has begun.

"The last three decades of the 20th century will witness a drastic change in the business of providing instruction in schools and colleges," Harold E. Mitzel said.

The recipient of the Division's Eminent Lectureship Award, Mitzel, who is assistant dean for research in the University's College of Education, believes that adaptive education is the wave of the future.

Progress toward adaptive education—the tailoring of subject matter presentations to fit the special requirements and capabilities of each learner — will be the big difference between our best schools and our mediocre ones by the year 2,000, Mitzel said.

"With society's new awareness of the inequality in higher education, university entrance standards will have to be lowered for sizeable groups of blacks who have been poorly educated in the nation's secondary schools. This lowering of entrance requirements will inevitably increase the heterogeneity of scholastic skills which make the traditional teaching job so difficult," Mitzel said.

HAROLD E. MITZEL, assistant dean for research in the College of Education, tells members of the ASEE that entrance standards will have to be lowered to admit sizeable groups of blacks to Universities.

Among the changes that the instruction revolution will bring, Dr. Mitzel predicts new grading practices. "If our job is to help each of our students to achieve mastery over some operationally defined portion of subject matter...how much more relevant it would be if we could say, on the basis of accumulated evidence, that John Jones has achieved 95 per cent of the objectives in Engineering 101, rather than say that John Jones got a "B" in Engineering 101."

He also suggested that a good way to begin adapting instruction to the student's capabilities is to allow him to pace the rate of his own instruction.

"In the current wave of student unrest," Mitzel concluded, "... lies one big issue which the students themselves haven't spelled out very clearly. This is the issue of the relevance of contemporary collegiate instruction for students' lives. It seems to me students are saying, albeit not very clearly, that they want some adult to care about them, to pay attention to them and to guide them."

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"War in the future, on any appreciable scale, will be virtually imposible because it will be too costly, too devastating and there will be no victory," said Arthur B. Bronwell, dean of engineering at the University of Connecticut in a panel during the convention of the American Society for Engineering Education.

"The scientists and engineers who have created the diabolical instruments of war also are forging the essential conditions of world stability and peace," Bronwell said. "Science and engineering have lifted western civilization to a creative life that the world has never known before."

However, Bronwell cautioned that the nation was woefully short of the number of scientists and engineers needed to combat the problems of the world.

"To rebuild our nation's cities, lift the people in the ghettos to respectable housing and education, rebuild our decrepit urban and interurban transportation systems, develop the limitless economic promises of the oceans, carry on research in interplanetary and interstellar space, decontaminate our lakes, rivers and ocean fronts, as well as the air we breathe, and at the same time provide vigorous leadership on all fronts in scientific, technological and industrial research will require far more scientists and engineers than w eare educating today," Bronwell said.

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All too often today's special education programs are geared toward Negroes and Indians with white middle class backgrounds instead of those whose experience is all "black and red," said Bert Avery, assistant director of the University of Oklahoma's School of Chemical Engineering.

"We are educating the wrong people if we want to effect social change in today's society", Avery said. "Blacks and Indians with white middleclass and up backgrounds can't communicate with the Blacks and Indians who have an all black or red background.

"Yet these are the Blacks and Indians we should be educating, the ones whose experience is black and red, not just those who can interface with the white community."

Speaking as part of a special panel discussion on "Engineering Programs Designed for Minority Groups," Avery said that it is not enough "just to increase numbers, fill federal decrees, or satisfy consciences."

"We must effect social change through all forms of education through special admissions and special support," he said.

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Industry needs to place black engineers and scientists in the South to make job opportunities more visible to black youngsters, said L. C. Dowdy, president of North Carolina Agricultural and Technical State University.

"The visibility in many Southern small towns is just the same as 20 years ago," Dowdy said.

"High school children in the South still see the black preacher, the black doctor, maybe an occasional black lawyer. They never see black engineers or physicists or chemists," Dowdy said. "So when they go to college, they train for the same old jobs."

Calling for a partnership between business, industry and government, Dowdy suggested they begin by helping provide work experiences or internships for students.

"How," he asked, "can a black youngster who spent his accounting internship in a corner grocery store making change from a cigarbox compete with a white student working at a large Eastern bank?"

Wider experience, in the form of summer job programs, is also essential for black faculty members, Dowdy believes. Some professors are not convinced that expanded job opportunities exist.

"If you aren't convinced yourself, you can't start a fire burning in young people," Dowdy said.

"We think too much of perfection. If we are willing to take a chance on heart transplants, to spend millions on a space program before seeing concrete results, we can afford to take a chance on admitting a few high risk students to our schools or offering minority groups jobs.