

# Should the Engineering Curriculum

Glahn, a chemical engineering senior, says no. He bases his argument on such practical considerations as time and money and what competing institutions are offering.

By GERALD GLAHN, '54



GERALD GLAHN  
... From Industry, a Basic Decision

The problem of how much and how many of the social-humanistic studies an engineering curriculum should contain is not new. It is a problem of a new proportioning of the technical and non-technical studies in an engineer's education. In recent years advocates of increasing the engineering curriculum by the addition of more non-technical studies have been more determined and vocal. They believe that this increase is the answer for the need of an engineer's having a "broader" education than has usually been offered. They have been heard and their arguments well considered. The number of liberal arts subjects included in the engineering courses of many colleges and universities has been increased. At the present time 20 to 25% of the usual engineering undergraduate study is in non-technical courses.

Many educators and engineers favor and support this trend for valid reasons. However, there are significant arguments against further addition of liberal arts studies to engineering requirements. One is that the engineering curriculum is already tightly packed. New developments and techniques in engineering practice have resulted in new and necessary subjects that must be covered in the undergraduate curriculum. Increasing demands for technical engineering courses and increasing pressure for a more liberal engineering education are incompatible within the limited four-year college term. While still retaining a four-year curriculum, most engineering institutions have tried to effect a compromise satisfactory to those opposed to the addition of more social-humanistic studies in the engineering course and to those advocating further addition.

Some schools such as Rice Institute and Ohio State University have adopted a five-year curricula for engineering. Most colleges and universities are reluctant to do so for very justifiable reasons. A college education is a very expensive undertaking. The typical engineer must spend many years in industry to make up the cost of his college education and the wages lost to him while attending college. A great number of college students would find the in-

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## Glahn Says No . . .

creased cost of a fifth year to be a heavy and in many cases a prohibitive financial burden. Although the prospective college student realizes that he would have the opportunity to obtain a more "rounded" education with a five-year course, he may find it necessary to attend a four-year college because of expediency and financial problems.

At the University of Oklahoma, a state-supported school, it would be inexpedient for its College of Engineering to adopt the five-year curriculum since its sister institutions in the Southwest retain the four-year course. Great engineering schools as Massachusetts Institute of Technology, California Institute of Technology, Carnegie Institute of Technology, and Georgia School of Technology have felt it wise to retain the four-year engineering curriculum. Other schools such as Purdue University, Michigan State College, and University of Texas have added a summer session to their four-year course rather than adopt the controversial fifth year. For some schools the adoption of a fifth year has not been significantly harmful for enrollment. Such schools have generally been long established and have never been wanting for students. Adoption of a five-year curriculum would be unwise for the University of Oklahoma and other state-supported and smaller schools of the Southwest until the advantage of the five-year plan has been generally proven and accepted throughout the country. This universal acceptance will not occur for some time to come.

The problem would be greatly simplified if industry could determine whether it needs engineers with a broader educational background or with an intensified technical training. Industry has tried to do this. Although constantly concerned with the

problem, industry has not found a satisfactory solution because of lack of consistent and significant data on this problem.

Many engineering educators feel that the undergraduate engineer's studies should give to him the most comprehensive technical instruction possible. They recognize the value of social-humanistic and other liberal arts subjects, but they feel that the young engineer has an opportunity to acquaint himself with these fields after he has graduated. These educators believe that the student should be given as many technical tools as possible in his college training. They feel that the engineer should have upon graduation the technical know-how necessary to handle even the most difficult and intricate industrial problems. Many feel that it is better to do one thing well rather than to do many things poorly.

Other educators believe that increased appreciation of social-humanistic studies can be given without increasing the curriculum. This can be done by teaching technical subjects in such a way as to bring out their inherent general, or liberal, values. Such teaching is difficult to realize because most engineering instructors have specialized in research in their graduate course and do not themselves have a very liberal education.

A solution proposed to meet this problem of liberalizing technical education is to encourage the faculty to accept summer jobs foreign to their specialty, to travel extensively, and to read widely to achieve a broader and more liberal viewpoint which they can reflect in their teaching. In this way the need for specific liberal arts courses for the student can be lessened.

Some educators and engineers feel that the undergraduate curriculum should contain some basic social-humanistic subjects but that the training should be predominately technical with direct application to industrial problems. They feel that the more liberal aspects of education should be introduced in graduate work.

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Much broader educational requirements for advanced degrees would help insure liberal viewpoints for engineering teaching and engineering management.

In summary, it is admitted that social-humanistic subjects are valuable to engineers. However, further additions of such subjects to the present undergraduate engineering curriculum should not be made for several reasons:

1. It would require another year of formal college education. Some students cannot afford a fifth year. Many universities could not adopt this plan at the present time.

2. Industry needs many men with specialized technical training. Industry has not specified its need to the contrary. Best utilization of time and effort is achieved in technical training.

3. Technical training can be liberalized without increasing the amount of liberal arts requirements.

4. A liberal education would be more advisable in the graduate rather than the undergraduate engineering curriculum.

Despite some exceptions occasioned by the particular problems of a few schools, these reasons are valid considerations for not increasing the social-humanistic subjects in undergraduate engineering curricula throughout the country.

## Winslow Says Yes . . .

believe he is prepared to meet the greater social need.

There is a demand in industry today for engineers capable of handling positions in management—men who have engineering know-how and yet possess the broad background in the liberal arts that would make them equal to the responsibilities of management. The surprising thing to me is that few engineering students are inclined to accept the challenge. Instead of broadening their intellectual horizons, they narrowly pursue a single phase of education, and as a result rob themselves of a vast personal satisfaction as well as the benefits offered to the career of one who is not willing to let himself remain narrow in his knowledge.

It is not that students talented along engineering lines are unable to comprehend material contained in liberal arts courses, but that engineering students are, in many cases, indifferent to any non-technical subject.

The reason for this indifference does not rest wholly with engineering students. The prevailing attitude in the engineering profession holds that any course which does not require the use of a slide-rule is to be regarded as practically useless to an engineer.

This viewpoint is reflected in the curricula of engineering schools. Instead of providing a broad base upon which industry and the individual can build, the curricula seem to be striving to make specialists of engineering students even before they leave college.

As an example of the specialization of an engineering student, consider the curriculum which is to gain me an engineering degree. Before I will be graduated I will have completed the following:

In the field of liberal arts, English, 6 hours; government, 3 hours; history, 3 hours, and speech, 2 hours—a total of 14 hours.

In engineering or related fields, mathematics, 25 hours; physics, 12 hours; chemistry, 8 hours; electrical engineering, 41 hours; mechanical engineering, 4 hours; mechanics, 9 hours; engineering drawing, 5 hours; industrial education, 2 hours, and civil engineering, 3 hours—a total of 109 hours.

In addition, I have taken 20 hours of naval science under the NROTC program—giving me a total of 143 hours by the time I graduate.

A good picture of specialization can be drawn from the percentage of non-technical and technical hours as presented here.

I will have completed 9.8 per cent non-technical college work, 75.2 per cent technical studies, and 14 per cent naval science.

A great many engineers are employed in work totally different from the particular phase of engineering that they studied in college. These engineers have found that their specialization has profited them little. For them, as for other engineers, their education would have been much more valuable if they had coupled the fundamentals of engineering with an acquaintanceship with the liberal arts!

The engineering approach to technical problems is systematic and effective. Businessmen have been quick to see the value of such an approach to the problems of management. The paradox of the situation is that most engineers, when asked to leave the world of slide-rules, are not able to adapt themselves to a new environment well enough to be able to apply the engineering approach to non-technical problems. They are such total strangers to the 'other world' that they are unable to orient themselves well enough to be able to use the facilities at their command.

There is a great deal of truth in the idea that the basic benefit derived from a college education is not the preparation for a profession but rather a fostering of an effective process of thinking and the ability to use that process. Unfortunately for many engineers, all of life's problems are not engineering problems. They can only be dealt with effectively by those whose thinking is flexible. Engineers educated solely from today's engineering curricula can not be blamed for their lack of effective thinking in areas outside the engineering realm. If they approach life with the viewpoint of a specialist, remember that was the way they were taught.

The benefits to be gained by an engineering student who will extend his knowledge only slightly into the liberal arts are most gratifying. Enough, I say, to warrant extending or modifying the engineering curriculum to include more courses in the liberal arts. Such a curriculum would produce engineers better trained for industry. Such a curriculum would also produce more useful citizens and members of the society in which they live. Such a curriculum would tend to help the individual meet his problems of living.

I can think of no greater return for time and talent invested.

*About the Authors: Gerald Glahn has a 3.92 grade average in the School of Chemical Engineering. President of the Engineers Club, a Rhodes Scholar applicant, 1953 Dad's Day winner, he graduates in June. Winslow, a year behind Glahn in standing and awards, is a junior in the School of Electrical Engineering with a 3.71 grade average. No comment is necessary concerning their intelligence. These articles and their grade averages speak for themselves. Neither student presented his full views on the debate topic but limited himself to a 1-sided argument at the editor's request.*

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