Engineering Education—A Graduate Program Only?

In "Goals for Americans"* the following statement occurs in the chapter National Goals in Education by John W. Gardner.

"Engineering. The long-term goal is to have students who are preparing for a professional career devote their undergraduate years to a liberal arts program with heavy emphasis on mathematics and the sciences. . . . We don't just need more engineers, we need more good engineers."

No one can quarrel with the second sentence in this quotation, but one can certainly challenge the implication that it follows from the first. The first statement comes as a bolt from the blue; it is not supported by reasons or evidence. The emphasis on science and mathematics is not objectionable, for that is the current trend in engineering. The objectionable feature is that the remainder of the undergraduate program should be devoted to the liberal arts, deferring all engineering to the graduate years.

The suggestion that engineering be studied only after the completion of a baccalaureate degree in liberal arts has often been made, although never before in such a distinguished reference. A little examination of it may be in order. The arguments in favor of it usually are these:

1. The medical and legal professions have adopted this procedure.
2. Science is growing so rapidly that engineers, who build their work on scientific education, must have more basic preparation in this field.
3. The broad cultural background afforded by a liberal arts degree will make the engineer better able to play his increasingly important part in the world of affairs.
4. Better engineers will result.

These arguments can be refuted easily:

1. What is good for doctors and lawyers is not necessarily good for engineers. The reduction in numbers which will most certainly result is not beneficial to any of the professions.
2. Science is growing so fast that preparing anyone in all of its aspects is impossible. No one can expect that engineering students can study in undergraduate arts programs all the new de-velopments which may lead to engineering applications. Specialization is required now more than ever. Engineers, like scientists, must continually learn throughout their lives.
3. The broad cultural background afforded by liberal arts degrees has not made doctors, lawyers, or others notably successful in handling their responsibilities in the world of affairs. Indeed, some of the troubles in which we find ourselves may be attributed to traditional thinking in historical perspective instead of forward thinking in terms of scientific and engineering possibilities. This argument really should be turned around. World affairs should be dealt with by those with some training and experience in technology, as Sir Charles Snow has said so well:
4. There is simply no evidence that better engineers will result from their having a liberal arts degree first.

There are some powerful arguments against a first degree in the arts, as follow:

1. Requiring a liberal arts degree does not take into account differences in the minds of students. Some just don't like the humanities, and they will not do well in them. To them it is a waste of time which they cannot afford.
2. Many liberal arts courses are often unchallenging in the extreme. Students may sit through them and learn something by osmosis, but the demands on the students' talents and efforts are often less than modest.
3. Many potential engineers will be lost to science. They can hardly be blamed for wanting to pursue a subject which they know and like rather than one of which they have little knowledge.
4. The engineering profession is very democratic; it is the only profession which can be entered after four years of college. It is the only profession to which a considerable number of students with inadequate means can aspire. This is a source of great strength and pride to the profession which would be lost.

It is to be hoped that this recommendation in "Goals for Americans" may be modified or forgotten.

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