Int. J. Engng Ed. Vol. 13, No. 6, p. 389–390, 1997
Printed in Great Britain.

0949-149X/91 $3.00+0.00

Editorial

GOALS FOR HIGHER EDUCATION REDEFINED

The continuing financial crisis of higher education institutions has prompted a closer look at the inherent efficiency of our universities. Assessment, accreditation and quality are being re-examined and applicable criteria and goals are being redefined.

The **Boyer Commission** report published by the State University of New York (available in hard copy from Mary Leming at mleming@notes.cc.sunysb.edu) has come up with useful maxims for undergraduate higher education renewal. The points listed below are relevant to engineering education and would, upon implementation, produce the kind of graduate needed by industry and prepared ready for employment.

- Make research-based learning the standard
- Construct an inquiry-based freshman year
- Build on the freshman foundation
- Remove barriers to interdisciplinary education
- Link communication skills and course work
- Use information technology creatively
- Culminate with a capstone experience
- Educate graduate students as apprentice teachers
- Change faculty reward systems
- Cultivate a sense of community

The list applies to research universities. The non-researcher is too often limited to transmitting knowledge generated by others, but the scholar-teacher moves from a base of original inquiry. In a research university, students should be taught by those who discover, create, and apply, as well as transmit, insights about subjects in which the teacher is expert.

Only two of the points would need to be redefined for non-research universities: research-based learning may not be relevant and graduate studies may not be part of the system. In such cases, the research is replaced with a project and senior students are taking up tutoring tasks. In the model the Commission proposes scholar/teachers would treat the sites of their research as seminar rooms in which not only graduate students but undergraduates observe and participate in the process of both discovery and communication of knowledge. Those with knowledge and skills, regardless of their academic level, would practice those skills in the research enterprise and help to develop the proficiency of others.

Even though few researchers ever escape the human temptation to compete for rewards, this model is collaborative, not competitive. It assumes that everybody—undergraduate, graduate student, and faculty member alike—is both a teacher and a researcher, that the educational/research process is one of discovery, not transmission, and that communication is an integral part of the shared enterprise. In principle all the points with the minor variations cited above apply to both research and non-research universities. A good case can be made for crossover models where the distinction between the two types of university can be made a continuum.

Essentially a theoretically schooled engineer should also be practically inclined; therefore internships are vital for both research and non-research based students. Problem-based learning is typical of the renewal trends. This is similar to project-linked learning and is coming more into practice. Problem-based learning was adopted in all basic science classes at the **University of Delaware** to promote active learning and connect concepts to applications. Students are not given all the information they need to solve the open-ended 'real-world' problems, but are responsible for finding and using appropriate sources. They work in teams with access to an instructor; trained graduate or undergraduate students help lead some groups.

It is essential that equal opportunities for development will exist for both research-based and non-research-based undergraduate institutions. The learning methods and technologies are compatible, and only by avoiding a class distinction between the two, the community goal of equal opportunity in higher education can be realized.

Michael S. Wald

THE ROLE OF COMPUTERS IN TEACHING MECHANICS

This special issue documents how modern computing has been applied to undergraduate mechanics education. Since engineering mechanics is fundamental to many engineering disciplines, including aerospace, civil, and mechanical engineering, this issue will benefit a broad range of engineering educators. Most of the articles came from papers presented at the Workshop on Computing in Undergraduate Mechanics Education. A few papers, however, came from submissions in response to the call for papers as well as from regular submissions.

This special issue would not have been possible without the initiative and effort of Professor Nicholas J. Salamon. In my opinion, the peer review process is the most important element of a journal. We appreciate the contributions of the following individuals who served as reviewers for this special issue: Charles E. Bakis, Bernard B. Beard, Ray W. Brown, Renata Engel, Thomas L. Geers, Gary L. Gray, Robert M. Hackett, Michael W. Hyer, John Laffitte, Clifford Lissenden, Victor Mucino, L. Michael Santi, Dhushy Sathianathan, Yeu-Sheng Shiue, Alok Sinha, Mehrdad Soltani, Donald Streit, and Kau-Fui Wong. Last but not least, Dr. Michael S. Wald, Editor-in-Chief, is acknowledged for his suggestions and co-ordinating efforts.

Siripong Malasri

This issue is a special issue on Computers in Undergraduate Mechanics Education. The integration of computers and the reform of curricula due to the new emphasis on synthesis over analysis has facilitated major rethinking of engineering curricula concepts. The rethinking has been going on for a number of years in electrical engineering, but the new tools have more recently infiltrated mechanical engineering subjects. Moveover, design and business components and very much more motivating science and mathematics basics provide additional challenges and involvement for the engineering student. The set of papers submitted for the special issue has been augmented by the contribution by **Liu** and **Boyle** whose approach to teaching mechanisms complements and contrasts that presented in the contribution by **Yin**.

We are deeply indebted to Nicholas Salamon and Siripong Malasri for launching this special issue. I know that it is hard work to get a topic together, and hope it will benefit all those interested in the teaching of mechanics to all engineering disciplines. We are also pleased to announce that Professor Salamon will be joining our editorial advisory board.

Michael S. Wald