2006-392: FACULTY REWARD SYSTEM REFORM: BEGINNING PHASE II - REVISITING THE NEED FOR UNIVERSITY CHANGE TO ADVANCE PROFESSIONAL GRADUATE EDUCATION FOR ENGINEERING PRACTICE AND TECHNOLOGY LEADERSHIP

Dennis Depew, Purdue University

Dennis R. Depew is dean of the college of technology, Purdue University

Niaz Latif, Purdue University

Niaz Latif is professor and department head, department of industrial technology, college of technology at Purdue University

Gary Bertoline, Purdue University

Gary Bertoline is professor and associate vice president of information technology, Purdue University

Donald Keating, University of South Carolina

Donald A. Keating is assocaite professor of mechanical engineering, University of South Carolina, and chair Graduate Studies Division, e-officio member of the Corporate Members Council, and a director of the College Industry Partnership Division of the American Society for Engineering Education.

Thomas Stanford, University of South Carolina

Thomas G. Stanford is assistant professor of chemical engineering, Univesity of South Carolina

Duane Dunlap, Western Carolina University

Duane D. Dunlap is professor, director, Kimmel School of Construction Management, Engineering and Technology, and associate dean for the college of applied sciences at Western Carolina University, and program chair of the Graduate Studies Division of the American Society for Engineering Education.

Stephen Tricamo, New Jersey Institute of Technology

Stephen J. Tricamo is professor of industrial and manufacturing engineering, and former dean of engineering and technology, New Jersey Institute of Technology

Albert McHenry, Arizona State University

Albert L. McHenry is dean of the college of technology and applied sciences at Arizona State University Polytechnic, and vice president of public affairs of the American Society for Engineering Education.

Eugene DeLoatch, Morgan State University

Eugene DeLoatch is dean, school of engineering, Morgan State University, and a past president of the American Society of Engineering Education

Harvey Palmer, Rochester Institute of Technology

Harvey Palmer is dean of the Kate Gleason college of engineering, Rochester Institute of Technology

Ronald Bennett, University of St. Thomas

Ronald Bennett is dean of the school of engineering, University of St. Thomas, and immediate past chair and director of the Graduate Studies Division of the American Society for Engineering Education

Mohamad Noori, California State Polytechnic University

Mohamad Noori is dean of hte college of engineering, California State Polytechnic University

Jay Snellenberger, Rolls-Royce

Jay Snellenberger is senior manager, aftermarket support, control systems, Rolls-Royce Corporation, and past vice chair, Corporate Members Council and past chair College Industry Partnership Division of the American Society for Engineering Education

Samuel Truesdale, Rolls-Royce

Samuel L. Truesdale is manager of employee development, engineering business improvement organization, Rolls-Royce Corporation

Faculty Reward System Reform: Beginning Phase II – Revisiting the Need for University Change to Advance Professional Graduate Education for Engineering Practice and Technology Leadership

1. Introduction

This is the first of two papers prepared for a special invited panel session of the National Collaborative Task Force on Engineering Graduate Education Reform that is focusing one of its primary tasks on faculty reward system reform. Founded in 2000, the National Collaborative Task Force is an initiative of the ASEE-Graduate Studies Division, Corporate Members Council, and College Industry Partnership Division. The National Collaborative is comprised of leaders from industry, academia, and government all coming together to advance professional engineering graduate education for the advancement of engineering practice in the national interest to enhance U.S. competitiveness.

This paper provides an overview of the panel's continued focus.[1,2,3] It revisits the broad urgency for reform of faculty reward systems for professionally oriented, core faculty at the nation's colleges of engineering and technology in order to advance professional engineering education for the practice of engineering and technology leadership in the national interest.

2. The Urgency of Professional Engineering Education Reform

As William Wulf, president of the National Academy of Engineering, pointed out in his main plenary address to the American Society for Engineering Education annual conference in 2002, there is urgency for engineering education reform to promote the nation's technological welfare.[4]

As Wulf noted; this should be a watershed change to include curricula reform, process reform, and faculty reward reform. Whereas existing faculty reward systems are excellent for research-oriented faculty, they are insufficient for professionally oriented, core faculty at the nation's schools of engineering and technology. As Wulf pointes out:

> "In engineering education I think we have an additional problem, and that's the one I want to emphasize. Recall, my definition of engineering is "design under constraint". I believe that it's a synthetic, highly creative activity.
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> Can you think of any other creative field on campus where the faculty are not expected to practice/perform? Art, music, drama? Even if you won't buy that engineering is creative in the same way as art or music – performance oriented professions such as medicine and law expect their faculty to practice that profession. Can you imagine a medical school where the faculty was prohibited from practicing medicine?
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> Yet, not so in engineering.

Faculty are, for the most part, judged by criteria similar to the science faculty – and the practice of engineering is not one of those criteria. The faculty reward system recognizes teaching, research and service to the profession – but not delivering a marketable product or process, or designing an enduring piece of the nation's infrastructure.

Of course, what you measure is what you get. For the most part our faculty are superb "engineering scientists" – but not necessarily folks that know a lot about the practice of the profession of engineering. At most schools, for example, it's hard to bring someone onto the faculty who has spent the career in industry, even though such people would be extremely valuable to the students; their resumes simply don't fit those the reward system values. Sometimes it's even hard to get recognition for a sabbatical in industry.

Please understand that I am not criticizing the current faculty; I am one of them, and I respect my colleagues greatly. Rather I am criticizing a system that prevents enriching the faculty with a complementary set of experiences and talents. But, to close the loop – of course the current faculty are the folks with the largest say in the engineering curriculum. It should not be a big surprise that industry leaders have been increasingly vocal about their discontent with the engineering graduates."

3. Advancement of Professional Engineering Graduate Education ─ Relevant to the Profession of Engineering for Technology Development and Innovation

Today, there is growing national awareness that the need to reform professionally oriented engineering graduate education to enhance the innovative capacity of the U.S. engineering workforce for competitiveness is imminent. And in order to make this transformation there is growing national awareness that real change must be made at the universities.

Whereas the nation has developed an excellent system of graduate education for basic research during the 1960's, 70's, 80's, and 90's, it has not placed an equal emphasis on professionally oriented graduate education to continue the professional development of our nation's engineering graduates who enter engineering practice in industry. As a consequence, America's primary engineering resource for creative technological development and innovation in industry has not been fully developed to its potential during the last three decades.

If we are to develop professionally oriented curriculum that is more aligned to the needs of the U.S. engineering workforce in industry, in order to ensure the nation's competitiveness for world-class technology development & innovation, then the professionally oriented faculty who develop and teach in these programs must be rewarded accordingly. As the National Academy of Engineering Phase II report, *Educating the Engineer of 2020*, cited: "colleges should develop new standards for faculty qualifications, appointments, and expectations to support the professional growth of engineering faculty."[5]

The National Collaborative Task Force on Engineering Graduate Education Reform recognizes that it is highly unlikely that any movement for the advancement of professional education to support the creative practice of engineering for technology leadership and to ensure the nation's innovative capacity for competitiveness can sustain without the full contributions, dedication,

commitment, and reward of core professionally oriented faculty who will develop these programs.

4. Diversity of Scholarship

But the scholarship of professionally oriented, core faculty in the professional schools at universities is quite different from the scholarship of academic basic researchers … largely because the creative pursuits of engineering and science are quite different. As such, the National Collaborative Task Force Core believes that a new type of scholarship can be defined for professionally oriented, core faculty.

As Diamond and Adam asserted in their book, *The Disciplines Speak: Rewarding the Scholarly, Professional, and Creative Work of Faculty,* [6] there are six characteristics that "most disciplines considered as scholarship, professional, or creative" in terms of *products* rather than *process.*

- The activity requires a high level of discipline-related expertise
- The activity breaks new ground or is innovative
- The activity can be replicated or elaborated
- The work and its results can be documented
- The work and its results can be peer reviewed
- The activity has significance or impact

The National Collaborative Task Force believes that, for the most part, all of these criteria apply to the creative work of creative engineering practice for innovative engineering design, for engineering invention, and for creative technology development and innovation at project level, program level, and policy level of engineering leadership responsibility in the practicing profession.

As a consequence, the National Collaborative Task Force will accelerate its leadership efforts as a major action item to begin to define professional scholarship, to build on work already pioneered at universities,[7,8] to share best practice, and promote new professionally oriented unit criteria for engineering and technology faculty across the United States in order to advance professional engineering education in the national interest.

5. Conclusions ─ A Work in Progress for Planned Reform

Whereas the current faculty reward system at universities largely reflects the value system and mission of universities for scientific research (discovery), there is growing awareness that a major reform is needed at universities to better serve the full range of scholarship diversity in the 21st century. Reform of higher education, however, can not occur without real change. If the value systems of universities change to include the professional realm of engineering for innovation then the reward system must change. This is not an either or strategy but rather a broadening of university perspective to include the various missions of creative scholarship that modern universities must serve in the 21st century. The National Collaborative Task Force

believes that this change can be positive, and that it can be brought about through planned reform in a logical, straightforward manner as a complement to the existing faculty reward system for research and discovery. The Task Force believes that this reform will strengthen the capability of the 21st century university in its endeavors to place more emphasis on engagement within the professions and on its need to improve teaching at both the undergraduate and advanced professional levels of engineering.

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