ENGINEERING SOCIETIES AND FACILITATING MEASURES OF FACULTY IMPACT: RECENT TRENDS IN ENGINEERING EDUCATION

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• How is engineering education evolving?
• How are faculty roles changing?
• How is faculty impact evaluated?
• Are there (should there be) changing expectations for faculty in RPT?
• How have engineering professional societies affected engineering education and faculty activities?
ENGINEERING EDUCATION PARADIGMS

• Pre-1950: Foundations in Engineering Practice
  • Largely based on practical experience, development of codes and standards, training graduates for industry; design
  • Emphasis on engineering disciplines

• 1950 – 1990: Foundations in Engineering Sciences
  • Infusion of more mathematics and natural sciences into curricula
  • Emphasis on analysis, theoretical underpinnings for practical applications; design

• Post-1990: Rise of Interdisciplinary Programs
  • Emergence of new fields that cross traditional engineering disciplines
  • Engagement with learning sciences; problem based learning, student-centered learning; design and creativity

• The Engineer of 2020: NAE Reports and the “T-Shaped” Engineering Education
EVOLVING FACULTY ROLES IN ENGINEERING EDUCATION

• Requirement for practical experience; primarily a teaching role; PhD degree not a requirement

• Increasing emphasis on research; bring new findings into curricula; more time spent with graduate students; emphasis on advancing disciplines; growth in sponsored research funding; PhD degree becomes required

• Further emphasis on research and securing external funding; postdoctoral experience needed as fields become more complex; emergence of biology as a pillar for engineering; subgroups of faculty formed (professors of the practice, design professors, non-tenure track faculty for teaching, entrepreneurs-in-residence); growth in graduate programs
HOW HAVE FACULTY BEEN EVALUATED?

• Three pillars: teaching, research, service
• Variations in “weighting” among these, depending on institutional mission, faculty rank and track
• Examples of RPT processes: Georgia Tech, Johns Hopkins
• Challenges in assessing “impact”
  • Input (students taught, sponsored research dollars)
  • Output (students graduated, student employment, teaching evaluations, publications and citations (the infamous H-index))
  • Contributions to education (books, new courses, advances in pedagogy)
  • Contributions to the profession (committees, society leadership, ethics, etc.)
  • Contributions to society at large (interactions with industry, start-ups and patents, effects of scholarship on healthcare, the economy, etc.)
CHANGING EXPECTATIONS FOR FACULTY CAREER ADVANCEMENT

• The “triple threat” vs selective excellence
• RPT process will drive faculty behavior: “carrots work better than sticks”
• What’s best for the institution?
• What’s best for the engineering profession?
• What’s best for the public?
• What’s best for the student?
• What can engineering learn from other professions?
HOW HAVE/CAN ENGINEERING SOCIETIES AFFECTED ENGINEERING EDUCATION?

• ABET
• Professional conferences, publications
• Student chapters, competitions
• Forecasting educational improvements
  • ASME Vision 2030 (design-make-innovate-create)
  • AIChE Report on Academia-Industry Alignment: Expectations About New Graduates
  • NAE Reports on the Engineer of 2020
  • NAE Grand Challenges
• Role of professional societies in illuminating “impact” – TBD!