BOARD # 226: ASEE Faculty Teaching Excellent Task Force: IUSE ICT Capacity Building grant results and Level 1 Registered Engineering Educator Pilot Rollout

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Introduction

It is an odd thing, especially in engineering in the United States, that tenure-track faculty members who are hired into positions are very often not trained in advance (or at all) for a portion of their job responsibilities: teaching. It is not as if this incongruity is hidden or a recent realization. Indeed, it has been known for a long time and at the highest levels. For example, a former president of the Society for the Promotion of Engineering Education (which was the precursor of ASEE), stated in 1901 that "*the time is ripe for [teachers] to prepare themselves expressly to teach in engineering colleges*." [1] And there have been many calls for such training to be provided (or required) for faculty in the intervening years since that time.

This call has been answered in a small, unsustainable way over these 120+ years (e.g., summer institutes [2], teaching workshops at prominent institutions [3], teaching workshops/programs in professional societies [4], etc.) that has had limited impact on engineering faculty and their preparedness to teach at the outset and during their career. While many can speculate why such an issue that has been identified so long ago in the US has been largely ignored (e.g., rewards within the tenure/promotion system, negative bias towards those who receive teaching awards, limited recognized metrics to acknowledge effective teaching, etc.), it is high time to address this training incongruity formally and methodically for engineering faculty in the US.

ASEE Faculty Teaching Excellence Task Force

The American Society for Engineering Education (ASEE) has promoted efforts over the years to explore the concept of engineering education, from as far back as Charles Mann's 1918 Carnegie Foundation Bulletin on "A Study of Engineering Education" [5] to the more recent work 90 years later of Jamieson and Lohmann on "Creating a Culture for Scholarly and Systematic Innovation in Engineering Education." [6] While both efforts (and those in between) had some impact, we argue that such impacts have been muted and/or localized, at best. Indeed, *more than 100 years ago* Charles Mann concluded that the approach of splitting the sciences (math, chemistry, physics) from the engineering courses (e.g., science/math the first two years, then engineering, without integrating these courses) is not a "*sound criteria for judging as to the ability of the student to do successful engineering work, and that many students are sent away from the technical school without having had any fair test as to their capacity for engineering practice or study*." [5] However, in 2025, most engineering programs across the US still teach in a way very similar to the approach that Charles Mann concluded, after his study, was problematic and that anticipated the student retention issues in engineering.

The example above is not to impugn engineering colleges across the US, but to underscore that even when an apparent superior course of action is identified, to deliver that change is often incredibly difficult. Accordingly, within the past five years, ASEE has convened the Faculty

Teaching Excellence Task Force (hereafter, "Task Force") whose goal is to develop a framework that can provide national recognition to engineering and engineering technology faculty associated with the effort and success expended towards the teaching activity. The Task Force has approached this goal by couching such an effort within the auspices of "change theory" and, using the insightful work of Henderson and colleagues, [7] selecting the appropriate change strategies to maximize the probability of success. The rest of this paper briefly describes the results of such efforts and the next steps to answer the call from 100+ years ago to ensure that faculty in engineering and engineering technology are trained in appropriate teaching pedagogies.

IUSE-ICT Capacity Building Grant

In 2021, the Task Force secured an NSF IUSE-ICT Capacity Building grant (#2044199) with the title "Developing a National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence." [8] Based on a variety of approaches (e.g., literature review, focus groups, surveys, town hall meetings, etc.) focused on engagement with internal ASEE constituencies, the Task Force developed and modified a three-level framework for recognition of engineering and engineering technology faculty effort and achievement associated with teaching. The three-level framework separates entry-level/passive ("Registered Engineering Educator") from implementation ("Certified Engineering Education"), with an additional level ("Leading Engineering Educator") that recognizes those who have led and/or contributed to the development and growth of training for engineering and engineering technology faculty. The three-level framework, which is a main product of the capacity building grant, is provided in Figure 1. [9] We also note that another product of the capacity building grant are insights related to the competencies sufficient to earn the Registered Engineering Educator (REE) Level distinction.

It is noted that the theory of action associated with this research was the utilization of a modified version of the Kotter 8-stage strategy, via Froyd and colleagues. [10] Such a strategy looked at the value of such a recognition system, barriers to implementation, and the various (sometimes dissimilar) perspectives of three main constituencies: faculty, those who train faculty in pedagogy (i.e., "content providers"), and administrators. Such insights ultimately led to the final draft version of the framework provided in Figure 1.

IUSE-ICT Level 1 Grant

Buoyed by the success of the Capacity Building grant, the Task Force submitted and received funding for an NSF IUSE-ICT Level-1 grant (# 2417098), with the title "A National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence: Piloting a Registered Engineering Educator Designation." The work on this current grant will look at exploring just the first level of the framework: the Registered Engineering Educator level. A main goal of this work also includes a final list of competencies (and hours) associated with the REE level (which were drafted during the capacity building grant).

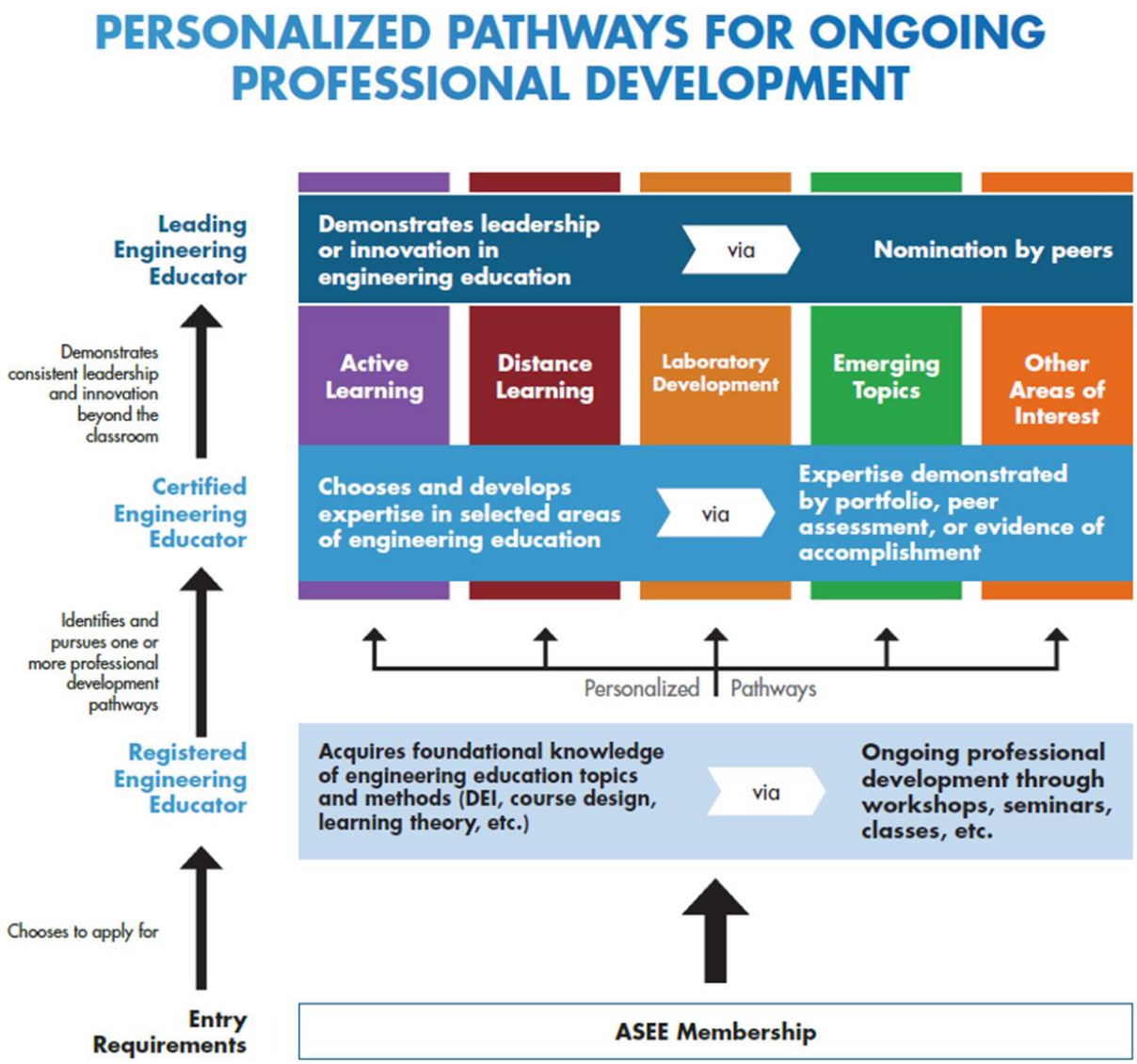

Figure 1: ASEE Three-Level Faculty Recognition Framework

The pilot includes eight diverse institutions (Carnegie classification, geographical location, enrollment size, whether or not primary undergraduate, whether or not serving a particular demographic group) from across the US: Lafayette College, The University of the Pacific, University of Georgia, Bridgeport University, The College of New Jersey, Worcester Polytechnic Institute, Northern Arizona University and University of Nebraska-Lincoln. Each school agreed to have between 5 - 10 faculty members in their engineering and/or engineering technology programs go through the process to receive the "Registered Engineering Educator" designation.

While piloting the REE level, the project team will also engage in research activities to generate insights to guide next steps in this framework implementation as well as to inform similar efforts. The four research questions associated with this grant are as follows:

- RQ1. What are the criteria and strategies used by administrators and faculty when recruiting people to participate in faculty development programs? How does this vary by institutional characteristics and context?
- RQ2. How do the perceptions of value, access, and barriers to professional development programs differ from actual experiences for faculty, administrators, and faculty developers?
- RQ3. How do faculty identify and select opportunities for professional development? What aspects of resources and programs do they find most and least beneficial? How do these perceptions vary across institutions?
- RQ4. How do teaching practices/plans/conversations change as a result of participation? How does this vary by unit of analysis from individuals to departments to engineering colleges and institutions?

These research questions will be evaluated in a variety of ways, including administrator interviews, faculty focus groups, and meeting notes/journal analysis. Additionally, deans and/or representatives from 20+ schools across the US have agreed to serve on an Evaluation Board to help evaluate project goals.

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References

[1] J. Johnson, "Some present tendencies in higher technical education", *Proceedings of the Ninth Annual Meeting of the Society for the Promotion of Engineering Education*, Buffalo, NY, 1901.

[2] O. Lancaster, "Achieve Learning Objectives: Summer Institute on Effective Teaching for Young Engineering Teachers", Pennsylvania State University, 1960. https://files.eric.ed.gov/fulltext/ED011861.pdf

[3] National Science Foundation Awards Database, "Integrating Teaching and Research: The Engineering Education Scholars Program", Alexandria, VA: National Science Foundation. Accessed January 14, 2024. https://www.nsf.gov/awardsearch/showAward?AWD_ID=9633800&HistoricalAwards=false

[4] ASCE, “ExCEEd Teaching Workshop.”, https://www.asce.org/career-growth/educators/exceed-teaching-workshop. Accessed January 11, 2024.

[5] C. R. Mann, “Report to the Joint Committee on Engineering Education: A Study of Engineering Education”, Boston, MA. The Merrymount Press, 1918. https://www.nationalsoftskills.org/downloads/Mann-1918-Study_of_Engineering_Educ.pdf

[6] L. H. Jamieson, L. H. and J. R. Lohmann, “Creating a Culture for Scholarly and Systematic Innovation in Engineering Education”, ASEE, 2009. https://aseecmsprod.azureedge.net/aseecmsprod/asee/media/content/member%20resources/pdfs/ccssiee_phase1report_june2009.pdf

[7] M. Borrego, M., and C. Henderson, “Increasing the Use of Evidence-Based Teaching in STEM Higher Education: A Comparison of Eight Change Strategies”, *Journal of Engineering Education*, 103, 220–252, 2014. https://doi.org/10.1002/jee.20040

[8] National Science Foundation Awards Database, “Developing a National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence”, Alexandria, VA: National Science Foundation. Accessed January 11, 2025. https://www.nsf.gov/awardsearch/showAward?AWD_ID=2044199&HistoricalAwards=false

[9] D. Visco, J. Carpenter, A. Cheville, D. Bohl, and J. El-Sayed, (2023, June), *Board 248: Developing a National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence* Paper presented at 2023 ASEE Annual Conference & Exposition, Baltimore , Maryland. 10.18260/1-2--42691

[10] J. Froyd, D. Penberthy, D., and K. Watson, “Good educational experiments are not necessarily good change processes”, ASEE/IEEE Frontiers in Education Conference, Kansas City, MO. 2000. https://dl.acm.org/doi/abs/10.5555/1253528.1254283