Board 248: Developing a National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence

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Doug Bohl obtained a Ph.D. in Mechanical Engineering from the Michigan State University in 2002. After completing his degree, Doug worked for the US Naval Academy as a Research Faculty and at the Naval Surface Warfare Center Indian Head Division in Maryland as a Research Scientist. He is a professor the Department of Mechanical and Aerospace Engineering Department at Clarkson University. Doug specializes in the development and application of optical diagnostic techniques for the measurement of fluid flows. He has applied these techniques to study problems ranging from the unsteady aerodynamics of airfoils modeled after the flipper of the humpback whale, to the motion of particle laden flows in pipes, to the aerodynamics of luge sled. Doug has also worked with graduate students and faculty to learn about and improve teaching throughout his career. Doug is currently directing a professional development group at Clarkson University for junior faculty and is a member of the ASEE Taskforce on Faculty Teaching Excellence.

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Dr. Jacqueline El-Sayed is the Chief Academic Officer & Managing Director for the American Society for Engineering Education. She has leadership experience with the entire pipeline of engineering education and most recently served as the Chief Academic Officer & Vice President for Academic Affairs at Marygrove College. She is a professor emerita of mechanical engineering and served on the faculty at Kettering University for 18 years, eventually earning the position of Associate Provost. In addition to her work in academia she has served in industry and government. She is a four-time gubernatorial appointee to the Michigan Truck Safety Commission and, as commissioner, served as chair for two terms. She also chaired the Driver's Education Advisory Committee and the Motorcycle Safety Advisory Committee for the Michigan Department of State—work that resulted in new legislation for Michigan. She began her career as an engineer for General Motors Truck Group and has been nationally recognized in higher education as both an American Council on Education Fellow and a New Leadership Academy Fellow. Currently Dr. El-Sayed serves on the Bloomfield Hills Board of Education, serves as a director on the BHS Foundation Board and serves on the Advancement Committee for the Society for College and University Planning (SCUP). She is married and has three adult children.

Developing a National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence

Background

More than 100 years ago, a former president of the precursor to ASEE (SPEE) made the following call "*The time is ripe for [teachers] to prepare themselves expressly to teach in engineering colleges*." [1] While progress has been made over the last century, such progress is best characterized as localized and minimal, especially in the US.

Outside of the US, frameworks exist to recognize faculty professional development in teaching. For example, such systems exist in the UK [2], Scandinavia [3], and Australia [4], with engineering focused approaches available in Japan [5], Eastern Europe [6] and the UK [7]. The latter program is sponsored by the Royal Academy of Engineering, with more than 50 programs across the globe participating at some level with the goal to recognize and certify faculty training.

Inside the US, the approach has been different. For decades there have been localized approaches, such as the 1960 'Summer Institute on Effective Teaching for Young Engineering Educators' at Pennsylvania State University with topical areas similar to those found today. [8] The National Science Foundation offered opportunities for faculty members to improve teaching in STEM via their Undergraduate Faculty Enhancement program in the 1990s. Likewise, NSF has supported an assortment of teaching workshops in the 1990s, notably at R1 institutions, and such approaches continue to the current time.

Within engineering disciplines some professional societies offer annual workshops (for example, IISE, and AIChE) to try and instill basics for new or prospective faculty. Likewise, popular national teaching workshops exist, such as those offered by NETI, KEEN, and ExCEEd. At a local level, some well-resourced universities operate centers for teaching and learning that cater to their faculty needs, or share resources through a consortium, like CIRTL.

A main reason for the difference in approaches to answer this call within the US and outside the US is that US institutions are much more independent and less subject to oversight from governmental bodies. Indeed, many R1 institutions are viewed as "aspirational models" for most of the rest of the universities within the US. These models review faculty (especially tenure-track) in three areas: research, teaching, and service, often in that order of importance. As faculty often receive large start-up packages in support of their research pursuits, they feel pressured to recover that investment and justify that confidence, so much effort goes towards bringing in external funds. Within this model, teaching often takes a back seat to research and, thus, most engineering and engineering technology (EET) faculty know only a little about formal pedagogy (in other words "how to teach and how people learn").

It is more difficult to quantify effectiveness in teaching than it is in research where metrics like h-indices, research expenditures, and Ph. D. students graduated, provide a quantitative measure of impact. Teaching, lacking such metrics, does not have the same broad recognition of scholarship (and effort towards training) that research does. When teaching is recognized, it is often a local award—such as a departmental or college honor—than something that is transferrable between institutions. In fact, many stories exist (and have existed) for decades about teaching awards being viewed in a negative light by the tenure and review processes as

they indicate time that might have been spent on technical pursuits (that next paper, that next experiment, or that next grant proposal) which are valued more highly.

As a response to all that has been written above ASEE is making an effort to change the dynamic around recognition of effort put in to becoming a better teacher. The mission of the Society focuses on "*innovation, excellence, and access at all levels of education for the engineering profession*" and, as such, it makes sense that a national organization focused on engineering education lead this effort in the US. In particular, the goal of ASEE through this effort is to develop a framework for formal recognition of faculty (both engineering and engineering technology) professional development in teaching.

Some work began more than a decade ago and was buoyed by recent grassroots efforts of ASEE members in 2015. In response to these efforts, a task force was created to professional development in teaching. Following a positive report to the ASEE Board of Directors, a formally charged "Task Force on Faculty Teaching Excellence" was created (hereafter called "Task Force") in 2020. This group, currently comprised of about 15 members from the faculty, administration and faculty development community, submitted a grant to the NSF IUSE Capacity Building program called *Developing a National Framework for Recognition of Engineering and Engineering Technology Faculty Instructional Excellence.* This grant was funded and the rest of this manuscript describes the efforts of the Task Force associated with executing the plans associated with this effort towards three main constituencies: faculty, administrators, and faculty developers.

Research Questions

The three research questions identified in this work were as follows:

1. In what ways can national certification by the proposed this effort support a fundamental shift to teaching as a profession by creating value for the identified constituents? Value is defined by addressing an identified need using an approach in which the benefits outweigh the costs and is competitive with alternatives. [i]
2. What barriers are identified by the constituent groups that would limit the adoption of the proposed ASEE Institute for Engineering Teaching Excellence program, and how can these barriers be overcome, or better leveraged, to increase the value of the proposed program?
3. What are emerging needs in recognizing teaching excellence, faculty development efforts, and faculty development? Analysis of the data collected through interviews will inform the overall direction of the Institute and will be shared with others looking at such needs.

The first research question focuses on why the framework to be developed is valuable to the constituent groups and looks at personal, institutional, and educational value. We focus on uncovering a proper balance between a framework that is not too burdensome to be implemented, yet also has enough content to make meaningful change (in other words, to address the "100+ year call"). The second research questions looks at implementation barriers, such as practical considerations (e.g., time) and importance in the promotion process (from the possibly varied perspectives of the relevant stakeholders). The third research question is focused on how

to keep the framework relevant through the identification of emerging needs, acknowledging that crucial competencies change over time and for different reasons.

Theory of Action

A national framework for EET faculty recognition of instructional proficiency is a *structural* change that has the (desired) potential to impact most colleges and universities in the US that have EET disciplines. The Henderson Foursquare [9,10] is a good model to use to consider large changes such as the one proposed. The Henderson Foursquare (as seen in Figure 1 below) separates change efforts on two dimensions: (1) are you attempting to change individuals or structures and (2) is the desired change already known (prescribed) and is being disseminated or will it evolve through feedback.

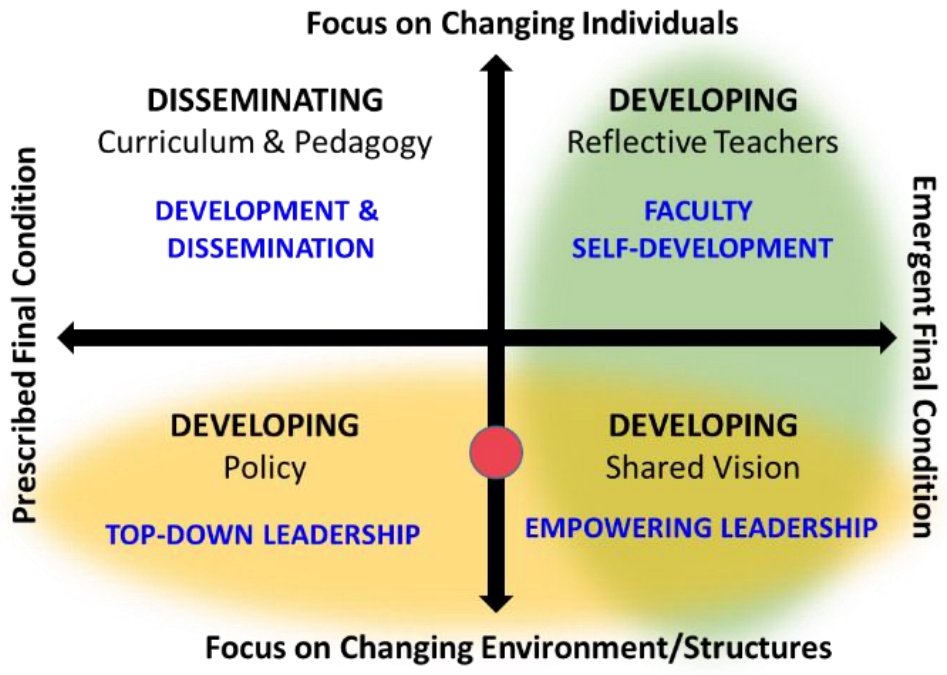

Figure 1: Henderson Foursquare, after [10]

While a national framework for professionalism of EET education will impact multiple categories within the foursquare, for the purposes of the IUSE ICT-Capacity Building effort the bottom yellow shaded region of the Henderson Foursquare is most appropriate (changing environment/structures). The placement between the "prescribed" and "emergent" final condition acknowledged that the approach utilized a sample framework for constituencies to consider; the framework may be refined somewhat in the future based on feedback.

The main value of the Henderson Foursquare, beyond framing the type of change, is the fact that these researchers have identified certain change strategies that work best depending on the type of change desired (i.e., where within the Henderson Foursquare you are located). Accordingly, we have selected a modified version (by Froyd and colleagues [11]) of the Kotter 8-stage process. [12] We list the first four of the stages below as these are the stages associated with this Capacity Building effort.

- Stage 1: Create a task force to guide activities.
- Stage 2: Establish how a national model for professional development in EET education creates value.
- Stage 3: Draft level criteria informed by the literature and obtain feedback from ASEE constituencies.
- Stage 4: Refine level criteria and prepare for engaging non-ASEE constituencies.

Tasks and Results

Over the course of about one year (2021), the Task Force conducted focus groups (virtual) with the following ASEE entities:

- Undergraduate Engineering Deans Committee
- Indiana/Illinois Sectional Meeting
- Engineering Deans Council

- Faculty (2 groups -- @ ASEE Annual Meeting)
- Dept. Chairs (2 groups -- @ ASEE Annual Meeting)
- Faculty Development Division
- Chemical Engineering Division
- Women in Engineering Division
- Minorities in Engineering Division
- Two-Year College Division

The focus groups were small (no group had more than 7 persons) and met for about 70 minutes. One person from the Task Force served as the focus group facilitator, while a second Task Force member served as the recorder. All focus groups were recorded and transcribed.

The strategy within the first three focus group cohorts (listed above) were to ask three types of question: (1) Introductory, (2) Main, and (3) Closing. The Introductory questions asked attendees about their roles and responsibilities within their organization and how their college evaluates teaching in retention, tenure, and promotion decisions, including evidence used and not used.

For the Main questions, we shared a one-page (two-sided) document that pitched the problem we were solving with a national recognition program, potential barriers for implementation and value on the front, with a picture on the reserve side (Figure 2). We provided the attendees five minutes to read and review the document. Following this time, we asked questions related to their impressions of the document, thoughts on framework purpose, confusing aspects of what has been presented, what needs to be added and how the framework could help them in their current position.

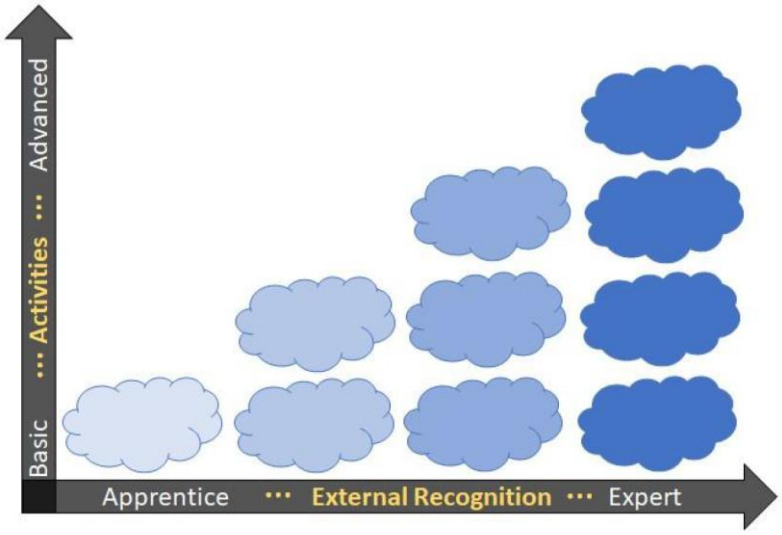

Figure 2: Reverse side of document used during focus groups

Finally, in the Closing section, we provided an open opportunity for the attendees to mention anything they would like to associated with the effort and questions for clarification. Following this, the Task Force recorder provided an overview of key points they have heard to help verify accuracy.

Based on the feedback from these first three meetings, we learned the following two things:

- The framework needs to have some flexibility built if it will be meaningful for the 400+ engineering colleges in the US.
- There needs to be an "action" aspect of the framework where faculty implement what they have learned and presentation of evidence of this (e.g., via a portfolio).

Seven additional groups (9 focus groups in total) were convened in the same way as the first three. Owing from both the number and diversity of the groups, more extensive feedback themes emerged. The most relevant and impactful were the following:

- How are diversity, equity, and inclusion embedded within the framework?
- Continued theme about recognizing participation versus recognizing outcome attainment.
- How will you manage the different resource levels across the wide range of engineering colleges in the US?
- What can be learned and utilized about the FE/PE structure that currently exists?
- Where would graduate students participate within the framework?
- How can faculty developers engage to support the framework?

At this point, the Task Force regrouped and created a framework that was responsive to the feedback received. The most recent draft of this framework is provided in Figure 3.

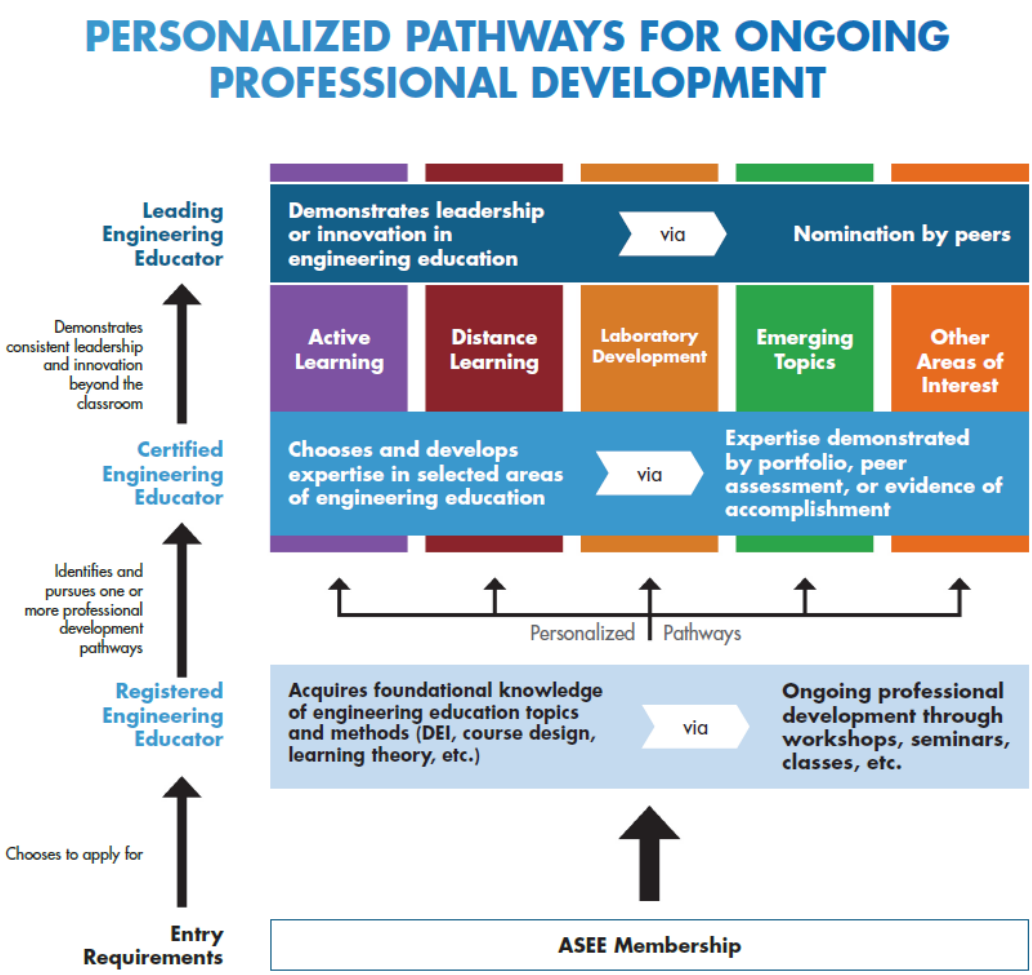

Figure 3: Current draft framework for recognition of engineering and engineering technology faculty instructional excellence.

Notably, the framework has three levels: (1) Registered Engineering Educator (REE), (2) Certified Engineering Educator (CEE), and (3) Leading Engineering Educator (LEE). The initial entry point is ASEE membership. We note that the REE level is foundational, while the CEE level provides both flexibility in pathway and requires application of skills learned at the REE level. The LEE level recognizes impact of an individual beyond their own classroom.

During the 2022 ASEE Annual Conference, the Task Force utilized part of the ASEE Town Hall structure to both introduce the draft framework in a broader way and receive additional feedback on the framework. However, no new themes emerged based on this session, so the framework was not modified.

Additionally, during a month that started with the 2022 ASEE Annual Conference, the Task Force initiated a survey to obtain feedback from ASEE membership on a variety of aspects associated with the framework. In particular, the survey asked about required competencies for the REE level, where individuals saw themselves currently within the framework (i.e., at what level), and their interest in getting involved with the Task Force in the future.

Associated with the competencies within the survey, the Task Force listed several competencies based on what currently exists in the literature and other programs. Figure 4 below provides the percentages of responders who identified that a particular competency should be included within the training for the REE level. Responders were classified as junior (pre-tenure including postdoctoral fellows and graduate students) and senior (post-tenure). We note that of the ten competencies listed, senior faculty selected nine of them for inclusion at the REE level more often than the junior faculty, suggestive of a retrospective identification of need for newer educators. The only competency suggested more often by junior faculty was “student life issues” and this was also the only competency that was selected by less than half of all faculty.

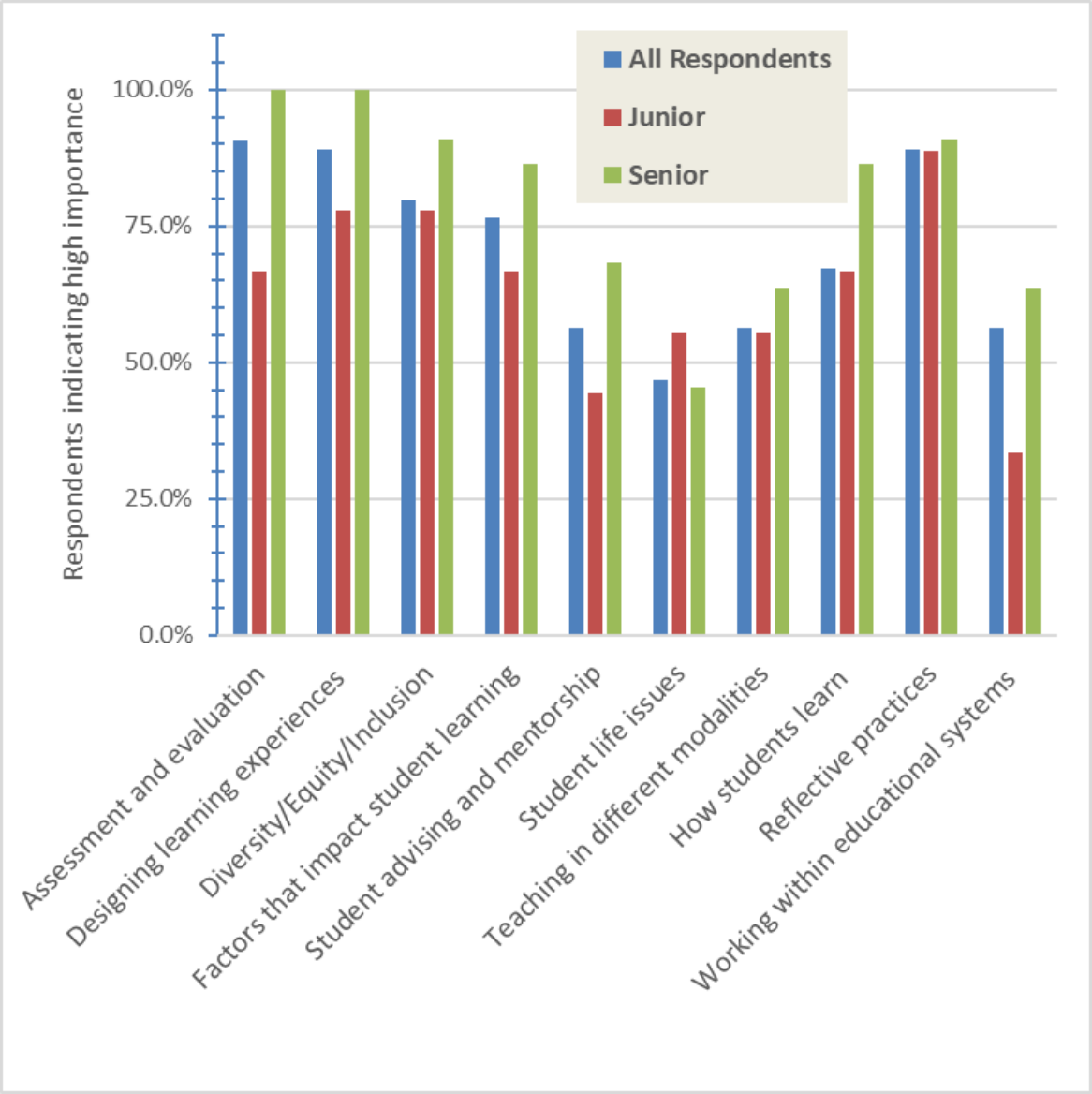

Figure 4: Results of survey for competency inclusion within the REE level

Next Steps

The next steps for this effort revolve around both finalizing the competencies within the REE level and piloting the framework. A pilot rollout will help answer important questions associated with the framework on logistics, mechanisms, and availability of training opportunities for the

REE level, among other areas. Work is currently ongoing associated with developing such a rollout plan.

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