

## **The Process of Conceptualizing and Creating the Engineering Faculty Impact Collaborative to Support Faculty Development and Mentorship**

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# **WIP: The process of conceptualizing and creating a strategic plan for the Engineering Faculty Impact Collaborative (EFIC) to support faculty development and mentorship**

## **Abstract**

This is a work in progress paper that describes an effort to support faculty development and mentorship. The current faculty development literature indicates that faculty members who receive adequate mentoring are more productive leading to greater overall objective career success. Minimal research in engineering education has investigated the impact of faculty development and mentoring programs despite these findings. Evaluating faculty development and mentoring programs can elicit information that can help inform the development of an evidenced-based approach to designing such programs. The Engineering Faculty Impact Collaborative (EFIC) seeks to address this need by building a collaborative among institutions and faculty that will: (1) *instigate* broad interest in and awareness of entrepreneurial mindset (EM)-based engineering faculty mentorship and development, (2) *contribute* to the knowledge base around engineering faculty development or mentorship, and (3) *connect* engineering faculty members who wish to engage in EM-based faculty development. This paper shares the process of developing a strategic plan for EFIC and details from the resulting strategic plan that emerged.

## **Introduction**

It is well known that new faculty must quickly master ‘early career survival skills’ and become productive researchers, effective teachers, and conscientious colleagues who provide meaningful service to their institution. Mastering these different responsibilities is a challenging process that can lead to considerable stress. Boice [1] found that 95% of new faculty take four to five years to become fully productive in research and effective in teaching. Untenured faculty have reported higher levels of stress during this time period for reasons including they feel like they do not have enough time, receive inadequate feedback and recognition, are given unrealistic expectations of what they can accomplish, lack an environment with collegiality, or struggle with work-life balance [2]. Tenured faculty are not immune to this process as new challenges emerge in continuing to produce impactful research and improve teaching, while also taking on more service responsibilities. Support programs and resources often provided during the pre-tenure years are typically unavailable once tenured [3]. For example, recently promoted faculty may find it challenging to change research directions in order to remain competitive with a potentially shifting funding landscape.

There is broad agreement that mentorship plays an important role in supporting faculty, especially those early in their careers. Little evidence on how institutions can most effectively support mentorship to achieve the optimal level of impact on faculty productivity and success is available in the literature. There is a particular lack of empirical support for evaluating the efficacy of mentorship programs. This suggests a need for a concerted effort to investigate the effectiveness of mentorship approaches on faculty development at different stages in their careers.

The Engineering Faculty Impact Collaborative (EFIC) was created to inspire a unified effort among researchers and administrators to address this need. This paper describes the formation of the EFIC led by a planning team at Arizona State University and supported by the Kern Family Foundation. The following paper provides background on faculty development and mentorship, describes the process of developing a strategic plan for EFIC, and provides examples of research studies and activities that would contribute to EFIC.

## **Background**

Faculty development programs may be able to enhance faculty members' productivity and performance in research, teaching, and service, while reducing stress. Such programs include institutional and/or departmental onboarding orientations, professional development workshops, and resources to attend external professional development opportunities. Mentorship is viewed as a key facilitator for faculty development. Mentoring in the context of faculty development has been defined as "a process where an experienced faculty member serves as a guide to an individual with lesser experience for the purposes of socializing them into disciplinary norms, fostering their acquisition of institutional and scholarly knowledge, providing professional opportunities, and person and/or professional support" [4]. Mentorship has been divided into three core areas – career development, psychosocial support, and role modeling – and can be provided through both formal and informal interactions [5, 6].

Formal mentoring programs typically involve a more experienced faculty member, the mentor, being assigned to a new faculty member, the mentee [7]. These programs require time, money, and programmatic support. Informal mentoring relationships are developed organically when two individuals are drawn together for what could be a variety of reasons. Assigned formal relationships may infringe on the autonomy of younger engineering faculty or create dissatisfaction due to regular, required meetings [4, 16]. Not offering formal mentoring opportunities may leave underrepresented minorities (URMs) and women at a disadvantage in identifying a mentor, especially within engineering. There is some evidence indicating that same gender mentoring relationships generally provide more psychosocial support than cross-race and cross-gender relationships [17]. Women currently constitute 16.9% of tenure-track faculty in colleges of engineering in the United States [18] making it difficult for them to identify a mentor similar to themselves. Women from underrepresented groups may find this an even greater challenge. Long et al. [16] found women may even need to go outside of their institution to find mentors.

Regardless of whether these connections are made formally or informally, research suggests that having a network of multiple mentors, sometimes referred to as "mentoring constellations," leads to greater objective career success [8, 9]. Studies indicate that faculty members who receive adequate mentoring become more productive scholars, more effective teachers, experience greater job satisfaction, and have more collegial relationships [1, 10, 11, 12]. Faculty who do not receive adequate mentoring are more likely to become isolated, stressed, and experience burnout that can decrease morale and increase turnover [13]. Most faculty development orientations and workshops can provide faculty with general best practices within teaching, research, work-life balance, and more. Mentorship offers the additional value of specific advice tailored to an individual's current situation and psychosocial support.

There is a clear consensus that faculty development and mentorship are important, but trends have largely not impacted faculty mentorship offerings. The majority of higher education institutions in the United States do not have formal programs [14]. In a recent exploratory qualitative study completed by Huerta, London, and McKenna [15], interviews were conducted with engineering deans across different types of institutions to investigate the state of faculty development across different colleges of engineering. It was revealed that, although mentorship is recognized as important, there was a lack of evidence on how to best structure mentoring programs. The majority of deans reported that their institutions relied on informal mentoring programs. Deans also noted that supporting recently tenured faculty was an area in which few resources and attention have been allocated.

## **Conceptualizing EFIC**

The planning team for EFIC was formed with the purpose of conceptualizing an approach to enhance engineering faculty development and mentorship in a manner that supports meaningful and impactful research, teaching, service, and mentorship. Engineering faculty are the focus of this effort because they have direct and immediate influence on the next generation of students, contribute long term and lasting impact to the field of engineering, and serve as key leaders in advancing technological solutions that create value to society. The planning phase was carried out over nine months starting in April 2018. The final goal was to develop a strategic plan for EFIC to help mitigate issues with faculty development, specifically mentorship models.

Entrepreneurial mindset (EM), a construct propagated by the Kern Entrepreneurial Engineering Network (KEEN), was integrated as a core framework for EFIC. Bekki and colleagues [19] define EM as “the set of cognitive behaviors that orient an engineer toward opportunity recognition and value creation in any context, not just that of an entrepreneurial venture.” KEEN’s framework for EM, referred to as the “3Cs”, supports developing student behavioral and mindset outcomes, including using *curiosity* to explore the world, and making *connections* between different sources and information in order to *create value* for others [20]. This framework has resonated and been applied by a number of faculty to drive content, assessment, and pedagogical changes in their courses. This has become known as entrepreneurially-minded learning (EML) [21]. The majority of courses in which EM has been integrated focus on engineering design or project-based courses [21].

Having an EM framework aligns well with the goals of faculty development. It promotes a paradigm of having faculty leverage curiosity and connections to identify opportunities and create value [20]. The 3Cs framework also fits well with the objectives of quality mentoring relationships as curiosity is required by both the mentor and mentee to make a meaningful connection, which fosters more insightful feedback and/or even collaborations that lead to the creation of value and impact.

The overarching goals for EFIC were conceptualized into three domains: 1) ***Instigate*** broad interest in and awareness of EM-based engineering faculty mentorship and development, 2) ***Contribute*** to the knowledge base around EM-based engineering faculty development or mentorship, and 3) ***Connect*** engineering faculty members who wish to engage in EM-based faculty development. These core goals for EFIC are synergistic in the sense that supporting one goal indirectly supports the other goals. For example, contributing to the knowledge-base of faculty development would instigate broad awareness of faculty development.

### **Think Tanks**

Two instrumental convenings, referred to as “Think Tanks,” were held to support the development of the EFIC strategic plan. These events brought together key stakeholders within engineering education, including administrators serving key roles (e.g. dean or associate dean), faculty involved in faculty development and/or mentorship research, and program directors from organizations like the National Academy of Engineering (NAE) and the American Society for Engineering Education (ASEE). Attendees of the Think Tanks were invited to become key partners in EFIC by providing input and feedback to ensure a sound direction for the strategic plan. Many of the attendees were invited based on their extensive experience with faculty development and/or mentorship initiatives, which positioned them well to contribute to EFIC. These attendees also brought unique perspectives from their institutions as faculty development and mentorship related problems or needs can vary depending on the characteristics of the institution (e.g. number of engineering faculty and students, program mission, Carnegie classification, etc.). The rationale for this approach is well aligned with the EM framework in

that the goal was to attract and connect stakeholders who are curious about faculty development and mentorship efforts with the goal of creating value in this space.

### ***Think Tank 1***

The first Think Tank group included a diverse range of administrators and faculty representing ASEE, Arizona State University, Clemson University, Dartmouth University, Kern Family Foundation, National Academy of Engineering (NAE), North Carolina State University, The Ohio State University, and Oregon State University. The first Think Tank took place in Summer 2018. The primary goals were to: 1) share and learn about existing research, models, and initiatives pertaining to faculty development and mentorship within engineering education, and 2) share and discuss an early vision for EFIC, including ideas for how to collaborate/partner. The activities included panels and presentations to share research on faculty development and mentorship. The Think Tank concluded with a structured brainstorming session in which participants shared their perspectives on key features, activities, and resources that EFIC should provide and potential ways they could partner.

The first Think Tank connected researchers and administrators interested in faculty development and mentorship, while raising awareness and generating interest in EFIC. Feedback from the convening was positive, indicating an interest in partnering to advance the topic of faculty mentorship. The role of entrepreneurial mindset (EM) was determined to be a meaningful vehicle to engage faculty in thinking about their impact in new ways. The brainstorming sessions sparked a number of different research ideas and potential activities for EFIC. These ideas included developing workshops connecting EM to faculty development, building a mentorship network in engineering education, and creating an online portal for EFIC that shares research data and disseminates resources related to faculty development and mentorship. The main research ideas fell into two categories: 1) benchmarking existing faculty development and mentorship models/initiatives, and 2) developing a conceptual framework to measure the impact of faculty mentorship. There was considerable discussion on defining metrics of success for how to characterize and document the impact of mentorship. These metrics of success were categorized as faculty productivity metrics (e.g. research, teaching, service, mentoring, work-life balance, and retention) and personal/affective metrics (e.g. sense of belonging, well-being, job satisfaction, entrepreneurial mindset, etc.). The comprehensive list of metrics of success that were identified can be seen in Appendix A.

The EFIC planning team evaluated the ideas shared in the first Think Tank and were able to clearly define next steps for EFIC. The first EFIC Think Tank revealed a consistent theme—*a need to better understand approaches to mentorship that are effective at different career stages, different types of institutions, and different individuals*. The participants recognized that to gain a better understanding they needed to gather systematic data, identify specific and differentiated practices, collaborate on studies, and share data across institutions. The EFIC planning team chose to provide this opportunity through a request for proposals (RFP) developed prior to and shared during the second Think Tank. An RFP approach allowed participants from the EFIC Think Tank events to submit research project ideas that align with one of EFIC's three elements. The rationale for the RFP process was to begin to formulate affinity groups within the EFIC community that converge on specific projects.

### ***Think Tank 2***

The second Think Tank took place in Fall 2018 and also included a diverse range of administrators and faculty representing the ASEE, Arizona State University, California State University, Northridge, Clemson University, the Kern Family Foundation, Lehigh University,

the NAE, North Carolina State University, Old Dominion University, the Ohio State University, Oregon State University, Purdue University, Tufts University, University of Southern California, and Virginia Tech University. The primary goals were: 1) review the results from the first Think Tank and discuss the status of EFIC, 2) allow participants to continue to provide input and direction on EFIC, and 3) establish partnerships and plans to implement research studies and/or activities related to faculty development/mentorship. A prominent activity of the Think Tank continued to be structured brainstorming. Affinity groups among the participants were formed around core themes that emerged from the structured brainstorming sessions. Time was allocated for these affinity groups to plan research studies for potential submission to the RFP. The response from participants after the second Think Tank was again very positive. All participants who completed the post-survey agreed that the Think Tank was worth their time, were excited about EFIC, and planned to submit a project idea to the RFP.

### **Strategic Plan for EFIC – Current State and Next Steps**

The Think Tanks largely contributed to shaping the key activities and features EFIC will use to instigate, contribute, and connect within EM-based faculty development and mentorship. The presented strategic plan describes the current two-year plan for EFIC. For the *Instigating* and *Connecting* goals, EFIC seeks to grow a scholarly and active community in three ways: 1) building visibility around the collaborative, 2) increasing the size of the collaborative, and 3) encouraging collaboration and partnerships. This vision will be supported through a two-day symposium for deans, administrators, researchers and faculty members focused on EM-based faculty development and mentorship. The target date for the inaugural event is Fall/Winter 2019. The event will likely include panels, research talks, workshops, and networking opportunities organized around various EM-based faculty development and mentorship tracks.

For the *Contributing* goal, EFIC aims to provide coordination among the community in making substantive contributions to the EM-based engineering faculty development and mentorship knowledge base. A total of eight proposals were submitted to the initial RFP and are currently under review. Each proposal focuses on a unique area of scholarship relating to EM-based faculty development and/or mentorship. Several proposals include PI teams from multiple institutions, including both KEEN and non-KEEN schools, suggesting collaboration as a needed attribute in order to contribute. Details regarding funded projects will be broadly shared once these projects have launched.

Results from the planning stage RFP process indicate a desire to collaborate across institutions and to share data within the EFIC community. These initial seed proposals will serve as a basis for how the EFIC planning team might focus future RFPs. The resulting data that will emerge from funded studies conducted under the RFP are intended to be broadly disseminated and shared within and beyond EFIC. To evaluate EFIC, key metrics of success will be monitored closely, including the level of engagement by the community, quality of the ideas being generated, and impact created through the implementation of these ideas.

### **Conclusion**

EFIC was developed to address the need to further investigate the effectiveness of mentorship approaches on faculty development at different stages of their careers. The initial steps have been taken to instigate interest in EM-based faculty mentorship, contribute to the knowledge-base of EM-based mentorship, and connect engineering faculty members who wish to engage in EM-based faculty development. EFIC aims to support the development of evidenced-based approaches that foster more meaningful mentoring relationships and ultimately increase faculty productivity, success, and well-being.

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## Appendix A – Metrics for Success

METRICS OF SUCCESS OF FACULTY MENTORSHIP from Think Tank 1 Convening INSTITUTIONAL (administrator focused, based on institutional or departmental data)

- workforce/personnel metrics (faculty and grad students)
  - number of faculty retained
  - number of faculty who accept positions
  - number of faculty who go up for promotion and tenure
  - number of faculty who succeed at promotion and tenure
- research metrics
  - number of research proposals submitted
  - number of research awards won
  - amount of research expenditures
  - number of publications
  - number of collaborations with others (papers, proposals)
- teaching metrics
  - faculty teaching evaluations
  - number of teaching innovations
  - number of PhD students recruited
  - number of PhD students graduated
- service and institutional engagement metrics
  - number of faculty engaging in leadership
- mentoring metrics
  - number of faculty mentoring or being mentored
  - number of faculty mentees becoming mentors
  - number of faculty adopting best mentoring practices
  - increased feedback to mentors/mentees
  - greater advocacy about mentorship
- work-life metrics
  - number of faculty with dual career/partners
  - number of faculty having children
  - number of faculty buying houses
- institutional rankings

PERSONAL (researcher focused, based on faculty self-report)

- sense of work life balance
- sense of belonging/inclusivity at work
- faculty satisfaction (with job, with quality of mentorship)
- faculty well-being and health
- faculty self-efficacy in different faculty roles
- faculty self-perceptions of success
- faculty EM, innovation, adaptability, risk-taking