



Making Contributions to Entrepreneurial Mindset-based Engineering Faculty Mentorship





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written by Lori Ferguson

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Mentorship 360 integrates an Entrepreneurial Mindset-based mentorship approach through three themes:

INSTIGATING
to advance
faculty
mentorship

CONNECTING
to build and share
professional development
opportunities

CONTRIBUTING
to grow the knowledge
base of effective
faculty mentorship

A mentoring program that employs the Entrepreneurial Mindset (EM) to develop future faculty in a holistic way; an omnidirectional approach to mentoring that encourages collegiality and promotes joy among members of the academic community; a research project that probes institutional beliefs and their impact on instructional practices; and a peer mentoring model that reveals the potential of Makerspaces for cultivating the 3C's (Curiosity, Connection and Creating Value) among both faculty and students—these are just some of the nine provocative projects that will be pursued by the latest group of investigators supported by The Kern Family Foundation's Mentorship 360 initiative.

Integrating and institutionalizing EM into engineering curricula in educational institutions around the country is a key goal of The Kern Entrepreneurial Engineering Network (KEEN) and a mission supported in real time by the gifted educators who comprise this Mentorship 360 cohort. We invite you to read on to learn more about these fascinating projects.

The Mentorship 360 Team



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entrepreneurship.engineering.asu.edu/mentorship-360



PRINCIPAL INVESTIGATOR

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Mentoring Engineering Educators with a SOTL-Focused Professional Development Experience

When I first started teaching—I'm currently in my fourth year as an assistant professor—I participated in a writing group on campus. The accountability and feedback I received proved invaluable and led me to believe that other educators—particularly engineering educators who don't have an educational research background—might also find such a development experience of value. My co-principal investigators, Dr. Nathalie Duval-Couetil and Dr. Karoline Jarr, were in agreement.

The purpose of this project, which focuses on scholarship and teaching of learning (SOTL), is to help engineering educators share best practices with one another as well as enhance the representation of best teaching practices in their promotion and tenure portfolio.

Up to this point, engineering educators who have received grants to further the Entrepreneurial Mindset (EM) have been sharing ideas primarily through Engineering Unleashed, the website created by the foundation to support The Kern Entrepreneurial Engineering Network (KEEN).

With this virtual offering, our aim is to disseminate best practices more broadly, not only through contributing to conference proceedings and new cards on KEEN's Engineering Unleashed portal but also by teaching participants how to launch their own virtual writing groups. In short, we would like to get more eyes on what's happening, so that when engineering educators think, 'I did this awesome thing in the classroom and I want to share it,' they'll have the means to do so.

At the end of the project, we plan to have engaged 36 participants, submitted 36 conference proceedings, uploaded at least 36 new cards to the Engineering Unleashed portal, and published our findings—as they relate to EM-embedded faculty professional development experiences—in a journal. And long-term, I hope that my work fosters more collaboration and co-creation around the entrepreneurial mindset.

Using Bioengineering & Bio-Inspired Design to Integrate the Entrepreneurial Mindset into the Engineering Classroom

My co-principal investigator, Dr. Katey Shirey, and I have been using bioengineering and bio-inspired design to bring EM into the classroom for the past two years, inspired in part by the Black Lives Matter movement and in part by the National Science Foundation, which had leveraged its Broadening Participation goals to make greater representation of minoritized groups an agency priority. As an educator with over 15 years of teaching experience, I also know the importance of making engineering more accessible and equitable to minoritized groups.

Bioengineering and bio-inspired design, e.g., chemical engineering and biofuels or mechanical engineering and prosthetics, are appealing not only because they encourage transdisciplinary problem solving, but also because their humanistic aspect is compelling for problem-solvers in the arts and sciences as well as engineering. Through this project, we aim to show engineering faculty how to use bioengineering and bio-inspired design to increase the entrepreneurial mindset through integrated STEAM (science, technology, engineering, art, and math).

We have also designed this project with minoritized groups in mind. Research shows that this demographic relates better to concepts that incorporate a humanistic element, thus offering us an opportunity to attract participants who are traditionally underrepresented in STEM, including women and minoritized groups.

Beginning in the spring 2022 semester, we plan to run four, semester-long cohorts aimed at developing and delivering a new classroom intervention. We also plan to evaluate students' comprehension and use of the entrepreneurial mindset.

This initiative was designed with an eye to assisting junior engineering faculty who are just learning to utilize the entrepreneurial mindset (EM) in the classroom. To amplify the impact of our project, we will create cards on our findings and share them with the KEEN through the Engineering Unleashed website. Ultimately, we hope to encourage more faculty collaboration around EM.



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Coaches and Peer Mentoring: Structuring Entrepreneurial Mindset Mentoring for Faculty Success

We've been working to integrate Makerspaces into the curriculum for several years now—aided in part by several projects implemented through KEEN—to engage faculty and show them how Makerspaces can enhance their course offerings to develop the Entrepreneurial Mindset (EM) in their students.

Typically, mentoring would be a valuable means of disseminating such information, with experienced faculty assisting newer faculty. However, given the relative newness of Makerspaces, there are fewer faculty with in-depth experience in utilizing these spaces and we've identified several hurdles to training.

Thus, for this project, we decided to implement a buddy system that pairs faculty members and encourages them to hold each other accountable for completing training and working on their curriculum projects. They can consult the coaches and one another on how to leverage the power of Makerspaces for themselves and their students. Based on previous work by my colleague and Co-PI, Stephanie Gillespie, on using Makerspaces

to leverage curiosity, we believe if we can encourage faculty buy-in and build their confidence in using Makerspaces, they will engage students to try and tinker, thereby facilitating the development of the 3C's of EM—Curiosity, Connections, and Creating Value—for all parties.

An important factor driving this research is that there isn't much literature regarding the effectiveness of using a buddy system (aka accountability partners) in a mentoring effort for training faculty, nor is there much data on how to best train faculty in the use and implementation of Makerspaces.

We hope that what we learn from working with this initial study group of 12 faculty will yield valuable information that can eventually be more broadly applied in different departments and university settings. And looking down the road, if this peer mentoring model is effective, we would like to see it used in more extensive studies that go beyond our initial cohort size of 12.

Leveraging a 'Communities of Practice' Model of Educational Innovation to Support Faculty Mentoring of Entrepreneurial Mindset

As newcomers to The Kern Entrepreneurial Engineering Network (KEEN), The Grainger College of Engineering and the University of Illinois are excited about the opportunity to build capacity and support endeavors in the KEEN system. We view this research project not only as an opportunity to support the development and dissemination of the Entrepreneurial Mindset (EM) in our college through purposeful faculty collaborations but also a chance to further invest in this valuable partnership.

Our project draws upon Grainger's established communities of practice and the successes we have realized with our Strategic Instructional Innovations Program (SIIP). Our goal is to get faculty thinking about EM, familiarize them with the resources that exist within KEEN, and demonstrate how EM-infused work can strengthen the teaching and learning experience in our college.

We already have elements of EM teaching and learning happening in small pockets around the

college and see threads of the 3C's in many places, but we need a means of bringing these ideas together. We plan to do this through the establishment of a new Entrepreneurial Mindset (EM)-track for competitive SIIP project development which will launch with at least two teams. We envision these teams building interest in EM and creating capacity to catalyze ideas and interests among faculty to get them on the fast track to implementing changes and solving problems.

In this initial phase, we will educate faculty on the Entrepreneurial Mindset—how it fits in their classroom and benefits them as well as their students. Looking toward the future, we envision a time when a distinct EM track will no longer be necessary in the SIIP community, as the Entrepreneurial Mindset will be infused in many SIIP projects and will have become an integral part of how we go about educating the next generation of engineers.



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PRINCIPAL INVESTIGATOR

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Making Connections: Using the Entrepreneurial Mindset to Create Future Faculty Mentoring and Professional Development

Experience has shown that faculty advisors frequently view their relationship to their graduate students as transactional, their role as developers of future researchers rather than as mentors or counselors to the next generation of scholars. It is our contention that graduate students could be better served if their education as future faculty were approached in a more holistic manner that incorporated all facets of faculty life—research, teaching, leadership, and administration—and recognized them as individuals with unique goals and challenges.

We are also eager to integrate knowledge gained from our previous Mentorship 360 project, which looked at the parallels between the Entrepreneurial Mindset (EM) and teaching, and extend those to research and leadership. We believe that EM informs all the different areas in which faculty engage and dovetails with mentoring and professional development.

As professionals charged with faculty education and development, we're constantly asking ourselves, 'What educational opportunities can we offer

graduate students that will allow them to be more successful as they enter academia?' Based on this research, we plan to develop modules that we can include in the classes we teach as well as share with others who are leading professional development initiatives for graduate students in universities everywhere. As active members of the American Society for Engineering Education Faculty Development Division, we will also be disseminating information with that group and hope to publish our findings in a graduate education journal.

We believe this research project will not only allow us to enhance our own teaching but also help graduate students gain a vocabulary they can use to talk about the challenges they face in teaching, mentoring, and leadership. We also hope to teach graduate students to use EM in ways that impact all areas of their work as future faculty members and aid them in understanding the connection between EM and their careers through successful mentoring experiences.



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Omnidirectional Mentorship for Faculty Success Through Entrepreneurially Minded Learning Community Circles

Being an academic can be hard; the experience is often isolating and anxiety-producing. We recognize that mentoring can be a powerful tool for addressing this issue, offering faculty a way to connect and create authentic, nurturing relationships.

Unfortunately, it's been our experience that most mentoring relationships are underwhelming; it can be tough to identify commonalities among people from different backgrounds and power differentials between tenured and junior faculty can present challenges. Mentoring relationships also tend towards one-way communication, with the wiser, older individual dispensing knowledge while the younger person listens. With this project, we hope to break down such barriers, build empathetic relationships, and encourage a dynamic state in which everyone can sometimes be a mentor and other times a mentee.

To facilitate this omnidirectional approach to mentoring, we will encourage entrepreneurially minded learning (EML) through the creation of two community circles, each comprised of five faculty from different ranks, disciplines, and personal experiences. Each month, we will facilitate a series

of professional development connection points through gatherings on various topics, bringing Kern Entrepreneurial Engineering Network (KEEN) workshop training to our participating faculty. The entrepreneurial mindset, rooted in the 3C's (curiosity, connections, and creating value), provides an excellent framework for this endeavor. We imagine leveraging curiosity to vitalize engagement, building connections among faculty to strengthen our efforts and creating value by generously helping one another in professional development.

This project is all about restoring a sense of joy within our academic community, an emotion that is partly contingent on collegiality and trust. When joy is present, it elevates the work and life landscape for all, particularly during this pandemic.

We are initiating our work from within the engineering department, but participation will be open to faculty from across campus. Our hope is to demonstrate the success needed to replicate this omnidirectional mentoring approach anywhere. We also believe this support model could be of value to engineering students as they seek degree completion and a life of impact in the profession.

Faculty Connection and Mentorship Through an Integrated Entrepreneurial Mindset Curriculum

This project springs from knowledge gained in our own classrooms. Most of our team uses project-based instruction methods in our courses, and we discovered that a semester-long project alone is not enough to expose students to multidisciplinary, applied projects. So, in 2016, we established a customer-based faculty collaboration to extend projects to other follow-up courses. We found the experiment to be very productive; it not only led students to collaborate outside of their course groups and co-author conference and journal papers, but also brought faculty together to design projects and write papers and proposals.

This experience led us to believe that projects integrating the Entrepreneurial Mindset (EM) with systemic faculty collaboration would create a good platform for a sustainable, impactful learning environment that connects courses, students and faculty through a symbiotic relationship. Our team has also participated in several inspirational Kern Entrepreneurial Engineering

Network (KEEN) and American Society for Engineering Education workshops that have given us the tools to create an environment in which we can learn and share experiences while implementing EM-based projects.

Through this project, we hope to connect faculty and establish a mentorship mechanism as part of a sustainable, EM-based curriculum on our campus. Additionally, we plan to share project outcomes through presentations, publications and KEEN cards which will be shared with network members and other conference venues.

Long term, we hope to expand the network of faculty who use EM-based approaches to empower future engineers to solve community problems through EM. We will also seek to cultivate a culture of learning across the campus that will lead to an increase in faculty productivity and success in implementing EM approaches in both their teaching and research activities.



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Motivating Successful Advising: Creating Productive Doctoral Advising Relationships in Engineering

This project springs from our lived experience—as students, advisors, and now faculty—as well as our individual research efforts. What we have found, unfortunately, is a troubling lack of formal training for future faculty; thus, when students become faculty, they typically end up doing what their advisors did—or didn't—do. Our aim is to alter this dynamic, first by gaining an understanding of what makes a good advisor and then by helping faculty and students strengthen their advising relationships accordingly.

The 3C's of EM—Curiosity, Connections and Creating Value—characterize a relationship that benefits both student and advisor. Our goal is to develop an 'entrepreneur mentorship' training framework in which faculty and students engage one another with curiosity and build a connection so that work gets done. We are especially interested in

aiding graduate students from minoritized groups, as research indicates that a primary reason these students don't finish their degrees is because they are not suitably mentored.

While this project is currently focused on chemical engineering faculty, we envision gradually expanding the program so that it is applicable across different engineering fields. We plan to share the knowledge gained through this research via an advisor workshop series.

Ultimately, we hope to address the next level of change at the administrative level. We can't just 'fix' students or faculty, we need to address the effectiveness of doctoral advising practices at a systemic level, across the institution.



PRINCIPAL INVESTIGATOR

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Beliefs Matter: The Relationship Between Engineering Faculty Beliefs about Abilities and Instructional Practices

In conducting research on the entrepreneurial mindset (EM), I've found that people often talk about entrepreneurship as innate to an individual, i.e., 'that person was born to be an entrepreneur.' This is important because the beliefs that faculty hold about the nature of different abilities can have a profound impact on their behavior in the classroom and their approach to teaching. After all, if you enter the classroom with the belief that entrepreneurship is innate, then how do you teach it? The same question extends to other characterizations that people fall back upon, e.g., that individual is a 'born teacher' or a 'natural engineer.'

In this study, we plan to delve into faculty beliefs about the nature of teaching, entrepreneurial-related abilities, engineering, and general intelligence and shed light on the ways in which those beliefs influence instructional practices.

We believe that probing these connections will offer valuable insights into how to train faculty to teach in the best way possible.

At the end of this project, we plan to utilize our findings here at The Leonhard Center both to improve existing workshops and create new ones. We also plan to share our findings with other faculty developers through dissemination at national conferences.

But the work doesn't end there. I see this study as a stepping stone—there's much more to explore. I have not seen any studies on faculty beliefs and how they relate to instructional practices, so I feel this research has much to offer. Ultimately, I hope to build on this research and in the next phase explore how faculty beliefs and approach to education affect student outcomes, for example their success in learning, their persistence, etc.



To find out more about Mentorship 360, visit:

entrepreneurship.engineering.asu.edu/mentorship-360



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