



LESSONS LEARNED - PREPARING GRADUATE STUDENTS AND POSTDOCTORAL RESEARCHERS FOR TENURE TRACK CAREERS THROUGH MENTORING CIRCLES

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Dr. Jackie McDermott joined the College of Engineering at Purdue University as the Assistant Director of Graduate Recruitment and Retention in August 2018. Jackie completed her B.S. in Biology from Hofstra University (NY) with minors in Spanish and Biochemistry, and her Ph.D. in Molecular and Cellular Biology from Brandeis University (MA). At Purdue, Jackie is enthusiastic about supporting both prospective and current graduate students in their education and she has a specific focus on increasing the diversity of future engineering faculty and community.

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Now retired, Michael C. Loui held the Dale and Suzi Gallagher Professorship in Engineering Education at Purdue University from 2014 to 2019. He was previously Professor of Electrical and Computer Engineering and University Distinguished Teacher-Scholar at the University of Illinois at Urbana-Champaign. He has conducted research in computational complexity theory, in professional ethics, and in engineering education. He is a Carnegie Scholar, a Fellow of the IEEE, and a Fellow of the American Society for Engineering Education. Professor Loui was the editor of the Journal of Engineering Education from 2012 to 2017 and the executive editor of College Teaching from 2006 to 2012. He was Associate Dean of the Graduate College at Illinois from 1996 to 2000. He directed the theory of computing program at the National Science Foundation from 1990 to 1991. He earned the Ph.D. at the Massachusetts Institute of Technology in 1980 and the B.S. at Yale University in 1975.

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Introduction and Background

Landing a tenure-track position is difficult. Tenure-track faculty positions seek applicants that have a variety of skills. Many job advertisements state they are seeking technical competency, research vision, effective classroom teachers, and diverse community members. But how does a candidate transform from a graduate student or post-doctoral researcher working under a principal investigator to an independent colleague with these characteristics? The Engineering Academic Career Club (EACC) at Purdue University seeks to help bridge this gap between student or post-doctoral researcher and successful tenure-track applicant. To this end, the goal of the Engineering Academic Career Club is to establish a community to bring graduate students and postdocs together who have the drive and passion for continuing on to academic careers. EACC's flagship initiative is the mentoring circles program.

Mentoring is widely accepted as a key promoter of personal and professional growth in science and engineering [1]. This paper discusses one novel program designed to help graduate students and postdocs identify achievable goals, which will help establish a timeline from Ph.D. to professor. Moreover, by the end of the program, each student is expected to identify at least one action item, which will help position them better for an academic career. After three years of conducting the mentoring circle program (in-person in 2019, hybrid in 2020, and virtual in 2021), the EACC has developed a program structure including questions, prompts, and exercises that enable mentees to be successful on the job market and in future careers as faculty.

Mentoring programs of various sizes, structures, and target populations are run across the world. EACC explored many options for mentoring programs including traditional mentor-mentee models, peer mentoring, and mentoring circles. Ultimately, the EACC team chose the mentoring circle model because it offers the greatest perceived benefit to all participants without overburdening faculty or having mismatched mentors and mentees. EACC initially modeled the mentoring circle program after an existing program focused on promoting women in the Massachusetts Association of Women in Science (AWIS) [2]. This program emphasizes starting small, having participant training, and instituting a leadership structure to support the program. Other programs have used a similar mentoring approach to retain and promote women in STEM [3], recommend programmatic changes from Ph.D. students and professors for a multidisciplinary program [4], and help postdocs explore academic and non-academic future careers [5]. These programs all found great benefits for participants including greater practical career skills and specific recommendations for community changes [4] and increased skills and promotions [5]. Ultimately to make these programs successful, Darwin and Palmer recommend addressing four core principles: commitment from all participants to attend, confidentiality outside of circle meetings, rapport between participants, and voluntary participation [6]. EACC followed these principles in developing the mentoring circles program.

Program Implementation

Program Leadership and Planning - The mentoring circles planning committee (MPC) is a sub-committee of EACC's leadership team. This group consists of two club members (generally

graduate students) and the faculty/staff club advisor. These two club members are elected in the summer and start in August. Regular MPC meetings begin in the spring and include creating applications, forming circles, recommending circle discussion topics, planning the kickoff event, creating feedback surveys, and reviewing feedback at the end of the program. Program setup takes about 5 hours per month and program administration takes about 2 hours per month.

Recruitment and Circle Formation - Each mentoring circle consists of two faculty members and four to six mentees. Both mentors and mentees apply to the program through an online survey distributed to engineering faculty members and to members of EACC, respectively. The limiting factor on program size is faculty mentor involvement. Further mentor recruitment occurs via personal email as necessary to complement existing mentors. Mentor and mentee survey questions are included in Table 1. The MPC reviews applications, prioritizing participants with a mature interest in academic careers, a commitment to participate in regular meetings, and active EACC members.

Table 1. Mentor and mentee application questions.

Mentor Applications Questions	Mentee Application Questions
<ul style="list-style-type: none"> • What are you comfortable sharing or reviewing during these mentoring circles? (i.e., application documents, interviewing or negotiating tips, mentoring students) • Why do you want to be a mentor to graduate students and postdocs interested in an academic career? • What do you think your greatest contribution might be to these future academics? 	<ul style="list-style-type: none"> • Why do you want to pursue an academic career? • What are you looking to gain or learn from this mentoring experience? • What specific questions or topics would you like to discuss? • What do you feel you need to obtain a faculty position?

When creating circles, the organizers prioritized both mentees' stage in their academic career and their broad engineering discipline. Each circle has both a junior and senior faculty member, resulting in mentees working with a junior mentor who was recently hired and senior mentor who has been part of hiring committees. With two faculty mentors, a mentoring circle meeting can be productive in the unlikely event when one mentor is absent during a meeting. The MPC specifically tries to ensure that each mentoring circle group has one member who is also part of the club leadership, functioning as a connector to the MPC if there are any group issues. Regardless of the exact composition of circles, the most important thing is circles that are mutually committed and interested in a common career path: a faculty career.

Circle Meetings - Mentoring circles meet during the summer, when mentees and mentors generally have fewer commitments. A typical timeline for the program is shown in Figure 1. After mentoring circles are created, there is a mentoring circles kickoff and training event where the participants learn about program expectations. This hour-long event includes three main components: introductions, mentor/mentee training, and goal setting. The MPC reiterates the program goals and shares ways that participants in the past have found success such as consistently attending meetings, coming with questions, and sharing personal stories and advice. This training is limited, as participants are generally already involved in other mentoring relationships (as graduate advisors/advisees) and receive some training in these roles. Goal setting includes mentees thinking about what they want to complete by the end of this program.

The MPC offers goal suggestions: a) short-term goals, such as working on a research elevator pitch or updating application statements and b) long-term goals, such as networking, applying to Future Faculty Workshops, publishing a certain number of papers, or identifying future postdoc, national lab, or industry opportunities.

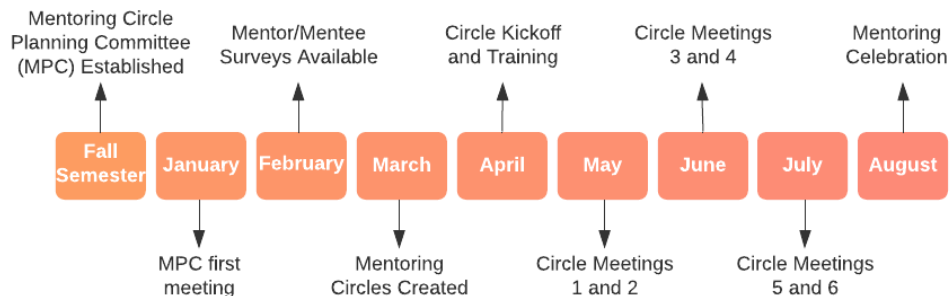


Figure 1. Mentoring circles timeline.

After the initial group kickoff event, circles meet on their own six times. These meetings are prescheduled for one hour around lunchtime. In 2019, the MPC let each circle schedule their meeting times, provided they met bi-weekly, but without a predetermined schedule some circles struggled to meet regularly. This frustrated both mentors and mentees. As a result, in 2020 the MPC publicized a pre-determined meeting time for all circles, which increased attendance. The 2021 iteration of this program was similarly prescheduled. Due to COVID-19, the program was entirely virtual in 2021. As such, all participants connected to the same Zoom meeting and then joined circle-specific breakout rooms. Although circles are provided with the option of rescheduling meetings, having these prescheduled meetings prevents participants from spending significant meeting time discussing when to meet next and allows the MPC to more easily send timely reminders about upcoming meetings. The MPC also provides recommended meeting topics, sample questions, and mentee/mentor meeting preparation and follow-up. Recommended meeting topics are included in Table 2. These topics were selected because they are critical to understanding what a future faculty career could look like in both breadth and depth, and they help mentees prepare documents for tenure-track applications. Circles are encouraged to use this structure or develop their own. Between meetings, circles communicate via email or services like Slack or Microsoft Teams. In general, circles that created a Slack or Teams group found these platforms helpful for sharing files, providing feedback, and sending links to articles of interest.

Table 2. Recommended meeting topics.

Meeting	Recommended Topics
Meeting 1	Life as a faculty member: facing imposter syndrome, failing gracefully, challenges of early faculty career, work-life balance, the tenure process
Meeting 2	CVs: what to include and how to build yours up. Action: update CV
Meeting 3	Faculty Application Overview and Timeline: job postings, search process, negotiating offers, postdocs
Meeting 4	Research: selecting topics, recruiting students, lab management, funding, time management. Action: draft research statement
Meeting 5	Teaching: course design, negotiating teaching load, the balance between teaching and research. Action: draft teaching statement
Meeting 6	Diversity and Service: why diversity is important, how do we increase it, how do faculty impact diversity, collaborating with people at other universities, committee work. Action: draft diversity statement

At the end of the semester, EACC hosts a mentoring celebration and encourages participants to reflect on their experiences and goals. Participants are also asked to provide the MPC with program feedback for future iterations. This feedback is crucial in developing the mentoring circles program and has resulted in changes like running this program only during the summer, developing a recommended list of topics and questions for each session, and creating a pre-established schedule for all meetings.

Program Impact and Future Goals

The program continues to grow. In Summer 2021, 36 mentees and 12 faculty mentors participated in six mentoring circles. On average, mentors or mentees missed one meeting. The program melt rate was about 10% of participants (all mentees) (melt defined as missing at least the final third of meetings). When removing these participants, the average absence rate was 0.5-0.6 meetings for both mentors and mentees. These low absentee and melt rates suggest that both mentors and mentees were committed to the program. Preliminary numbers from summer 2022 circles show similar trends, with 55 mentees and 18 faculty mentors participating in nine circles.

As previously stated, the goal of the mentoring circles program is to help mentees identify achievable goals, which will help establish a timeline from Ph.D. to professor. Since this program is only three years old, longitudinal data is not available, but a handful of program participants are now in tenure-track positions. Therefore, self-reported growth is the primary measure of program success. About 50% of the participants responded to the 2021 feedback survey and unanimously agreed that the mentoring circles better prepared them for a faculty career. Many mentees reported benefits of starting or refining application documents (CVs and research, teaching, and diversity statements), which are critical for a successful job search.

Mentoring circles prepare mentees, but mentors are also positively impacted by the program. Mentors reported generally feeling positive about interactions and hopeful for mentees' futures. Mentors expressed a desire to better equip people for faculty careers, and this program allowed them to do so. The formalized mentoring structure provides a framework for faculty to use in other capacities in mentoring and research advising roles. Since junior and senior faculty members are paired together, the format of these circles also allows for senior-to-junior faculty mentoring. Moreover, as junior faculty come up for tenure review, they can include this program as an example of service to the university community. In these ways the program serves both as future faculty development and current faculty development.

The MPC is very optimistic about the future of this program. Specific improvements incorporated for summer 2022 include 1) setting up a Microsoft Teams channel for each circle and 2) asking for non-university affiliated contact information from mentees (to facilitate following participant future trajectory). The MPC also plans to improve feedback forms to better differentiate the level of importance of discussion topics.

In addition to running a program like this for graduate students and postdocs, the format is also conducive for new faculty mentoring. New faculty members similarly may have knowledge gaps and need to build their professional network at a new institution. Circles could discuss topics like adjusting to university life, using university services, recruiting and mentoring students, writing letters of recommendation and support, and applying for early-career grants. EACC is looking to interface with Purdue University's College of Engineering to suggest this idea.

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