International Journal of Gender, Science and Technology
http://genderandset.open.ac.uk

Selected papers presented at the 7th Network Gender & STEM Conference, 18-20 July 2024 in Heidelberg, Germany

In association with
NETWORK GENDER & STEM educational and occupational pathways and participation

Near-peer coaching for early-career under-represented faculty members in engineering

Shayna Earle & Kim S. Jones*

Department of Chemical Engineering, Faculty of Engineering, McMaster University, Canada

Corresponding Author* Contact: kjones@mcmaster.ca
ORCID: Earle & Jones

ABSTRACT
Many academics from under-represented groups in engineering, such as women, face struggles to succeed in traditionally patriarchal spaces like engineering faculties. Coaching is a common and effective career support that focuses on employee goals and is typically done by coaching professionals. Here, we implemented a novel coaching approach that paired early-career faculty members from an under-represented group in engineering with senior faculty members who had been trained in coaching techniques. To discover the effectiveness of this intervention, we conducted interviews with the coaches and coachees and used reflexive thematic analysis with the lens of self-determination theory (SDT). Results indicated that ensuring that the coaching pairs were from different departments and that the expectations for meetings were clearly outlined fostered autonomy. Choosing coaches who were also faculty members was associated with increased competence because the coaches could provide informed perspectives.

Finally, findings indicated that the coaching decreased isolation and increased relatedness within the faculty. This structured near-peer coaching facilitated non-hierarchical relationships to address barriers to career growth and social belonging for faculty members from under-represented groups.

KEYWORDS: Near-Peer Coaching, Mentoring, Career Development, Inclusivity, Engineering, Professors, Academia, Barriers, Networks

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INTRODUCTION

Professors from under-represented groups in engineering, such as women and Black faculty members, struggle with barriers to academic success (Cardel et al., 2020; Clark et al., 2024; Corneille et al., 2019; Turner et al., 2008; Wright et al., 2017). People from these identity groups remain persistently underrepresented in engineering, due in part to a chilly academic climate. The lack of diversity within engineering faculties is a problem because it limits the role models to inspire a more diverse next generation of engineers, which in turn narrows the types of problems that get addressed, the creativity of problem solving and opportunities. Because of the barriers these individuals face, we implemented a near-peer coaching program in an engineering faculty to determine if this fostered adaptive outcomes for these faculty members. We sought an approach that would motivate faculty members from under-represented groups by addressing their need for self-determination.

Self-Determination Theory: A Framework for Understanding Motivation in Academia

Self-determination theory (SDT) suggests that intrinsic motivation (i.e., inherent interest and enjoyment one experiences in relation to a task) stems from fulfilling three psychological needs: autonomy, competence and relatedness (Deci & Ryan, 1985). SDT has been applied in a variety of contexts to understand individual motivation and adaptive outcomes (Ng et al., 2012; Reeve, 2012; Ryan & Deci, 2017; Ryan & Deci, 2000; Van den Broeck et al., 2016). We used this framing to determine the effectiveness of our coaching programs for faculty members from under-represented groups in engineering.

Fulfilment of psychological needs improves well-being and intrinsic motivation (Deci & Ryan, 2008). Autonomy is defined as regulation of the self by the self (Ryan & Deci, 2006). Here, we interpret it as the ability to set your own professional goals and to interact (e.g., share values and seek help) without fear of being judged by extrinsic standards. Competence is defined as "a propensity to have an effect on the environment as well as to attain valued outcomes within it," reinforced by positive feedback (Deci & Ryan, 2000). We focus on professional competency, which in this study includes understanding how to fulfil expectations in teaching, service and research. Relatedness refers to "the desire to feel connected to others—to love and care, and to be loved and cared for." (Deci & Ryan, 2000). Again, we focus on relatedness within a professional context as this could build a sense of belonging within an academic faculty.

Autonomy, Competence and Relatedness in Mentorship for Faculty Members

Higher education often relies on informal mentorship as a training tool for new faculty members. A more experienced faculty member, typically from the same department, will provide advice to the mentee on specifics of teaching, research

and academic life. However, this traditional approach to mentorship in higher education can serve to perpetuate patriarchal structures (Beck et al., 2022; Goerisch et al., 2019; Wallace et al., 2022). This is particularly important to consider within an engineering faculty because these structures are often what prevent under-represented faculty members from thriving. As a result, we wanted to disrupt expected power dynamics to ensure autonomy for faculty members from under-represented groups.

It can often be challenging for early career professors to ask for help if they fear that senior faculty might judge them and potentially others from their identity group (Lee, 2017; Murray, 2018). Similarly, advice can be perceived as prescriptive, particularly if the mentor and mentee do not share values and priorities (Wallace et al., 2022), decreasing the mentee's sense of autonomy and thus motivation. We argue that a coach external to the institution could potentially remove that fear but would likely be unable to directly improve competence or relatedness within the work sphere.

New and early career faculty members face challenges to their sense of competence. It is rare that their previous experience has fully equipped them to write research grants, recruit and train graduate students, manage finances and teach, let alone navigate the administrative complexities of a new institution (Farakish et al., 2022; Mays et al., 2022; Strawser & Smith, 2020). Onboarding for faculty members tends to be brief; the more typical experience is that many academics learn by making mistakes, which is an inefficient and demoralizing approach. Having a designated senior faculty member to ask could help mitigate this issue.

Being a new faculty member, particularly one whose identity is under-represented within engineering, can be lonely (Middleton, 2016). We also hoped to facilitate trusting relationships between mentors and mentees in order to foster and build a sense of relatedness and belonging within the faculty.

Coaching vs Mentoring

Although mentorship and coaching are sometimes used interchangeably, there are key differences (Joo et al., 2012). In older literature, coaching sometimes refers to simply working collaboratively toward a particular goal, like improving teaching (Flynn et al., 1994; O'Keefe et al., 2009). Current literature on executive coaching focuses on the client's goals and values by listening, asking reflexive questions and working as an independent resource in partnership with the client. In contrast, mentors provide their own perspectives, guidance, advice and network connections in a hierarchical relationship with their mentee (Horvath et al., 2024).

Mentorship as a Tool to Support Faculty Members from Under-Represented Groups

Research has consistently demonstrated that faculty members from under-represented groups in engineering (as well as in other domains) benefit from formal mentorship programs (Crawford, 2015; Jones et al., 2015; Ntshongwana, 2024; Ortiz-Walters & Gilson, 2012; Thompson, 2008). Networks leading to informal mentorship can be limiting for those in token (<15%) groups (Schoen et al., 2018). Formal mentorship programs typically match a junior person with someone more senior to provide advice and psychosocial support and sometimes try to match

identities. However, among other things, the unstructured nature of mentorship leads to frequent failure (Davis et al., 2022; Eby et al., 2000; Hairon et al., 2020; Straus et al., 2013) and the implicit hierarchy can serve to perpetuate inequitable systems and structures (Beck et al., 2022; Goerisch et al., 2019). Coaching from external professionals has more recently been used in the academy to foster women leaders (Horvath et al., 2024). Near-peer group coaching, in which a trained coach facilitates sessions with post-docs and graduate students, has been used to elevate graduate students from under-represented groups in science fields (Womack et al., 2020); similarly, peer coaching has been used to support mid-career faculty members (Huston & Weaver, 2008). However, there is no apparent research about near-peer coaching (i.e. from slightly more senior faculty members) being used to support faculty members from groups under-represented in engineering; thus, our study offers a novel contribution to the field. In the present study, we address the following research question: Was near-peer coaching for faculty members from under-represented groups in engineering successful in fostering work-related autonomy, competence and relatedness?

METHODS

The coaching program that we implemented took place within a faculty of engineering at a single university in Canada. The faculty includes seven departments. There are over 200 academic staff members within the faculty. The coaching program was run over four years; the data for this study focus on a two-year period.

The coaches in our program were senior, mostly male professors in engineering who had been selected to participate in a six-day leadership program, offered annually; the coaches in this project had all participated in the program. In the program, a professional leadership coach taught the basics of coaching over a half-day session. All faculty participants in the program were asked if they would be willing to volunteer as coaches. Coaches did not receive any special recognition or compensation but were encouraged to include the coaching when reporting their service contributions for the year. Recruiting senior men as coaches for engineering faculty members from under-represented groups has a double benefit. First, the male coaches can use their networks and power to become champions for their coachees. Second, these men can contribute time and resources that would otherwise be a "minority tax" on the overburdened senior women who often end up doing informal mentorship for faculty members from under-represented groups. By using near-peer coaches, we hoped to achieve the combined benefits of coaching and mentoring. Here, we use the term "near-peer" because all participants are academics and there were no reporting relationships or explicit hierarchies, but the coaches were senior to the coachees.

The coachees were women and Black faculty members in engineering, who were offered the opportunity to be coached over a period of one year. Over the duration of the period included in this study, women compromised approximately 17% of faculty members and Black faculty members were approximately 5%, both of which are under-representations compared to the population of Canada. In the first year, the program was offered to all women faculty members in engineering; most who participated were within six years of being hired (still early career). In the subsequent years, limited availability of coaches restricted the program to new

hires. During that time, the engineering faculty had a Black Excellence cohort hire, so the coaching program was expanded from only women to members from that program as well.

Coachees ranked their preferred coaches prior to matching. In all cases, coachees were matched with someone in their top three choices. We matched between (rather than within) departments, to mitigate perceived power imbalances, while giving space for senior faculty members to share their expertise and networks.

The participants were instructed to meet monthly over one year and to reflexively focus on the values and goals of the coached faculty member, providing a coaching structure that would give autonomy and provide a basis on which to build a productive relationship. We believed a productive and autonomy-supportive coaching relationship would foster the adaptive motivations highlighted in self-determination theory: autonomy, competence and relatedness.

The effectiveness of our coaching approach was assessed using interviews with the first two cohorts of faculty members who were coached during the first two years of the program. All coachees were invited to participate in the study; seven (P1-P7) of the possible 15 chose to give interviews, which took place one to two years after completing their coaching experience. The interviews were recorded and transcribed using Microsoft Teams. We interviewed five ethnically diverse women and two Black men, with each interview taking approximately an hour. Five were new hires; two were early-career women. The principal investigator (KSJ) initiated and ran the program, was the only woman coach (out of ten) and performed the interviews. It is likely that some bias was thus introduced, but, consistent with feminist research methodology, our identities are embedded in collection and interpretation of the data. KSJ's experience as an Associate Professor of Chemical Engineering and a White woman informed and influenced the program and the analysis.

After transcription, the terms "like" and "you know" were removed for clarity. The qualitative data were assessed using a combination of reflexive thematic analysis and a codebook method (Braun & Clarke, 2006; Smith & Firth, 2011). We initially constructed the questions and codes with a different framework, but analysis of the results guided us to use self-determination theory, and we re-categorized our sub-codes into themes of autonomy, competence and relatedness. Coding was primarily done by SE (co-investigator) and discussed with KSJ, who later validated a subset of the coding, in which raw percentage agreement came out to 57.5%, and the chance-corrected agreement using Cohen's Kappa was 0.53, which falls in the moderate agreement range for multi-category qualitative coding (O'Connor & Joffe, 2020). Some of the disagreements between coders were due to choosing different sub-codes that were under the same theme (e.g. personal connection and community would both be under the theme of relatedness). Through discussions between the co-authors, many of the conflicts were resolved. The study was reviewed and approved by the McMaster Research Ethics Board.

RESULTS AND DISCUSSION

Every person we interviewed expressed gratitude for the program and spoke positively about their experiences. The coaching model did have some of the

benefits of mentorship, while providing a structure that fostered autonomy, competence and relatedness.

Autonomy

Traditional mentoring relationships can interfere with a sense of autonomy, particularly if the onus is on the mentee to request help (Poleacovschi et al., 2020). This puts a burden of obligation on the mentee. Under-represented people often struggle to find mentors (Davis et al., 2022) and feel particularly vulnerable asking for help (Martinez, 2024; Wolfe et al., 2015). Here, because the coach role was appointed and recognized, the coachees indicated that they retained their sense of autonomy:

> *I'm very bad at approaching people and annoying people. It's definitely on my list of, 'I don't wanna annoy someone,' so I'm very hesitant to approach them for questions. And I think for the teaching at least, I'm very comfortable going to [my coach] and looking, 'What do I do for this?'* (P1)

Feeling judged could also interfere with a sense of autonomy, but our structure of making pairings across departments appeared to minimize that:

> *You're not gonna be on my tenure and promotion committee. It's not like you're gonna go and run around and tell everyone in my department, 'Ohh, she was worried about that. She did this.' It's so I think I could actually be way more open because of that. (P1)*

Faculty members typically place a high value on independence (Osakwe et al., 2015) but the cost can be that other career development goals get less priority because the only accountability is to yourself. Here, we maintained a sense of autonomy, because coachees articulated and set their own goals, but introduced a low-risk sense of accountability:

> *We met about once a month and every time usually how we started. Talk about what are the problems that I'm facing or even, then what? What goals do I want to achieve and then you will continue by suggestions and then after that you should be ended by OK, the next time we will, I will try to talk about or what will I like to achieve and so on, and I find that really helpful because it's like a To Do list and it gives me some sort of, I'm not saying as a pressure, but a bit of push to helping and do better or fix that problem. (P1)*

Coaching focuses on having the coachees set their own goals. We argue that this approach provides more autonomy than when a traditional "mentor" provides advice centred on their own goals and priorities.

Competence

The feedback system of coaching not only added accountability but a sense of accomplishment and, thus, competence:

> *We always try to go back at the end of what are my goals for next time and what will happen. And then usually just naturally, when [my coach was] asking me how things went and I would actually go over*

> *what I had accomplished which actually was in line with my goals of the last meeting. (P2)*

The reflexive structure of the coaching appears to effectively highlight the coachee's progress towards achieving goals, which satisfies the definition of competence: attaining valued outcomes reinforced by positive feedback.

Because the faculty members were not professional coaches, there were aspects of mentoring that emerged that boosted coachees' competence as professors. They learned some of the unwritten rules of the institution and got reassurance that their challenges were normal. For example, one coachee shared:

> *[My coach was] sharing their experiences and how internal processes [for how] work and decisions are made, and some of those factors. I think that was the most valuable. (P3)*

> *You have mentors telling us that all that's a common problem that gives us a lot of assurance and actually allows me to work through my problems with less stress, I'll say, speaking that oh other people are facing the same problems. (P3)*

These outcomes are positive, but more reflective of traditional mentorship. Because under-represented people (or, tokens, where they represent 15% or less of the population as per Schoen et al., 2018, which is close to the situation for women and Black colleagues in our Faculty) often have a more limited network (Collins & Steffen-Fluhr, 2019; Nguyen et al., 2025; Schoen et al., 2018), it can be more difficult to access knowledge and understand shared challenges: this program helped to overcome that.

The coaching structure provided positive feedback around goal attainment, while the mentorship aspects built professional competencies and provided valuable perspectives, all of which helped coachees feel a sense of competence.

Relatedness

The coaching structure given to participants suggested that the coachee share their values in the first meeting. The introductory email suggested that they choose a specific career goal in every meeting to work towards for the subsequent meeting. The coaching structure then suggested that they should reflect on their progress, barriers to success and modified goals for the next meeting. This structure meant the first few meetings had a specific purpose and were designed to reduce social awkwardness. This is particularly important when the coach and coachee do not share obvious identity cues, like age, gender or race. The following quote illustrates how this structure (though not rigidly followed in later meetings), helped build a trusting relationship:

> *We knew of each other, but we didn't know each other well. So I think the first two or three sessions, we kind of followed the model of, 'OK, what's your personality? What are some of the values? What was your background like?' So it was more just getting to know each other too. Kind of, see, you know where, where each [was] coming from. And I think once we had that background of what we valued then they asked me, 'You know what? What are some of the objectives that you*

> *wanted from the mentoring?' So I told them what I was looking for and then they gave me suggestions on what to try. And then at the follow-on meeting, we were able to say 'OK, how was that?' And then we adjusted based on that. But I think as the sessions went on, as we got to know each other, and we started to talk more casually, then it became more free form. (P1)*

Early-career faculty valued the opportunity to meet regularly with a senior faculty member, reducing the sense of isolation they felt. It became clear that the relationships were valued and the positive experience of being coached had ongoing benefits to the sense of relatedness.

> *It made me feel integrated much faster in the faculty. (P4)*
>
> *It gave me the impression that the faculty cared about the development of junior faculty. (P5)*
>
> *I expanded my network and I had someone outside that I felt I bonded with. (P5)*
>
> *[My coach] does know everyone on campus; he's just walking around and like, 50 people will say 'Hi' to him. So he would introduce me in that way. (P1)*
>
> *The lesson is to seek out help and ask people more. So, developing that network of mentors and people that you can ask, even for small decisions. So, I've reached out to them even after that. (P1)*

The coaching structure provided a basis on which to build a relationship, which often developed into more traditional mentorship, with both contributing to the psychological need for relatedness.

Limitations

Ideally, this program would be available to all interested faculty members at any career stage to address larger career goals, on top of separate within-department mentorship. However, the pool of trained senior faculty members was limited. In our initial offering, we offered the coaching opportunity to early/mid-career women as well, who found it was helpful in prioritizing longer-term career goals, but we later had to restrict the offering to new faculty members because of the limited number of coaches.

In two cases, the pairing was not successful: one because the coach had an unexpected commitment and the other because of a personality conflict. We tried to avoid the latter situation by allowing the coachees to rank preferred coaches, but conflict is not always avoidable. While most pairings met nearly every month, in some cases, meetings were less frequent. This usually happened when the coach left it to the coachee to initiate the meeting requests. The best outcomes were either if all the meetings were scheduled up front or if the coach set up the subsequent meeting prior to the end of each meeting. We also acknowledge that the between-department structure meant that occasionally coaches were less able to provide advice specific to the coachee's own department, teaching or research, but they could provide an informed perspective and suggest the coachee seek out others, which is itself a useful experience.

We had also hoped that the coaches would gain additional empathy for the struggles faculty members in under-represented groups in engineering experienced. While some acknowledged that they gained insight into experiences of junior faculty members or of differing departmental cultures, none felt they had learned more about inequities faced by faculty members. We suspect that the professional goal-oriented structure of coaching together with the mismatch in identities discouraged the coachees from specifically raising these topics.

Finally, we recognize that this was a relatively small sample in a single engineering faculty in one institution and might not extend successfully to all contexts. While there were some differences, most departments in engineering shared similar processes and expectations; this might be less true in a more diverse science faculty for example.

CONCLUSIONS AND RECOMMENDATIONS FOR IMPLEMENTATION

Near-peer coaching of faculty members from under-represented groups in engineering was effective in building autonomous motivation for pursuing career goals, achieving professional competence and improving relatedness within the faculty. It served a group that is often confronted with patriarchal structures, unspoken expectations and isolation. This is a relatively low economic commitment for an institution, with excellent rewards. Indeed, we struggled to meet demand.

Implementation of a similar coaching program should offer near-peer coaches to all early and mid-career faculty members, and particularly those from under-represented groups in that field. We found it decreased vulnerability when matches were made between (not within) departments. We also found it was helpful to set clear expectations for both coaches and coachees early. The first meeting should be to discuss overall values and career goals and end by setting one specific and achievable goal (with an action plan); each meeting should reflexively discuss progress and barriers and set a new small goal. Meetings should occur monthly (initiated by the coach), and the coaching should last for one year, with options to re-engage later. We were limited by the number of trained coaches, so we highlight the importance of building coaching capacity by offering annual coaching training to a new cohort of senior faculty members. By asking men to act as coaches, it relieved the burden on women faculty members, often the only source of mentorship for under-represented groups. We encouraged coaches to treat coaching as an assigned and recognized service contribution and it helped to provide ongoing administrative support for the program.

There is no question that mentorship benefits under-represented faculty members. Our contribution was ensuring inter-departmental matches and putting the responsibility to set and reflect on goals on the coachee, which helped with autonomy, competence and relatedness. Aspects of more traditional mentorship fostered competence and relatedness.

ENDNOTES

Funding Statement: This work was funded by the McMaster Faculty of Engineering

Conflict of Interest: None

Acknowledgements: The authors are grateful to all the research participants and to the reviewers.

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