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BOARD #162: Lessons Learned: Designing Powerful Questions to Foster Empathetic Mentorship for Engineering Faculty through a Faculty Professional Development Workshop

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Lessons Learned: Designing Powerful Questions to Foster Empathetic Mentorship for Engineering Faculty through a Faculty Professional Development Workshop

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Abstract

This lessons learned paper explores how engineering instructional faculty from different higher education institutions in the southeast U.S. respond to a specific professional development training on mentoring undergraduate students. This work builds upon a one-of-a-kind mentoring hub titled as "RITA Mentoring Hub" funded by the National Science Foundation (NSF). The goal of this mentoring hub is to provide professional development to new instructional engineering faculty from experienced faculty members and professional trainers, equipping them with skills to guide future mentees in the academic community. This study is a collaboration between three distinct types of higher education institutions. These institutions include the University of Florida, Virginia Tech University, and Morehouse College. Using participatory action research (PAR) approach, twelve (12) engineering instructional faculty members were recruited purposively and strategically from these institutions. In January 2024, the International Mentoring Association (IMA) at University of Florida organized an online IMA Mentor training titled "RITA Mentor Training - Building Futures" for these participants upon request of the principal investigators of this NSF project. The workshop was divided into four modules: theory, skills and strengths, responsive mentoring, and assessment. This paper focused on the second module which focused on the skills and strengths that drive effective mentoring. A special focus was put on an important mentor skill module titled 'designing powerful questions' in which the participants were introduced to eight different types of questions. The data was collated from the research team notes, participants' responses to the survey, and participants' expressed thoughts during and at the end of training. This study revealed that many participants had not incorporated effective questioning techniques while mentoring their students or mentees to provide empathetic and effective support. It also highlights the need for structured mentoring programs for engineering faculty in educational institutions. This study has implications not only for the instructional faculty that participated in online training but for new and experienced faculty members and graduate students that serve as mentors in different capacities. This paper will be presented as a lightning talk.

Keywords—Faculty Professional Development, Mentor, Mentee, Faculty, Engineering

Introduction

There is a growing discourse on faculty professional development within the field of engineering to improve pedagogical practices within engineering and to enhance students' learning [1], [2], [3], [4]. With a major shift in technological advancements within education due to large language models (ChatGPT, Claude, etc.), the focus of teaching should not only be on lecture content but also on effective didactic approaches [5], [6]. It has been found that the classroom environment has a profound impact on student success and learning [7]. Additionally, there is limited literature on transparent communication of engineering faculty with students. This facet of communication within teaching is significant as it can avoid any conflicts, provide clarity, reflect empathy and foster a positive learning and workplace environment.

RITA Mentoring Hub, funded by the National Science Foundation (NSF) (NSF 2217477), is an initiative to holistically and professionally develop instructional faculty members (mentors) from three distinct types of higher education institutions. These institutions include the University of Florida, Virginia Tech University, and Morehouse College. Researchers in this mentoring hub organize multiple group and one-to-one sessions by offering mentoring support, which is traditionally unavailable for instructional faculty, as previous research showed in our study that this group of faculty was overrepresented in engineering education but the least served [8].

Methodology

The hub was designed and based on participatory action research (PAR) [9]. For this purpose, instructional engineering faculty were recruited via purposive sampling from three different U.S. institutions as part of this mentoring hub. As part of this mentoring hub, they were invited to attend a workshop with four modules on how to be effective mentors. At the end of each module and towards the end of the training, participants were asked to share their thoughts. The research team members wrote their reflections during the training and breakout sessions, and after the training. The trainers circulated a post-training survey in which participants responded to Likert scale and open-ended questions. This paper will focus on the lessons learned from one module of the inaugural workshop training.

Workshop

A one-day workshop was organized on January 23, 2024, in collaboration with the International Mentoring Association (IMA) housed at the University of Florida via Zoom. The workshop was titled as "RITA Mentor Training - Building Futures" as shown in Figure 1.

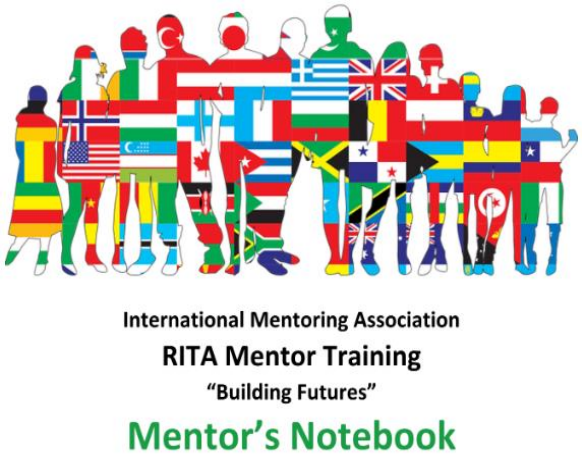

Figure 1: Snapshot of the first page of Mentor's Handbook by IMA, with permission [10]

This workshop was led by two trainers provided by IMA. The workshop had four modules:

- *Module 1: Theory*
  - Essential Question: How do building blocks underpin mentoring?
- *Module 2: Skills & Strengths*
  - Essential Question: Which skills & strengths drive excellent mentoring?
- *Module 3: Supports*
  - Essential Question: How do purposeful supports impact mentoring?
- *Module 4: Assessment*
  - Essential Question: What does success look like in mentoring?

In Module 1, the trainers discussed the developmental stages of mentoring process, developing trust, maintaining confidentiality, exercising listening skills, and uncovering structural roadblocks reinforced with three breakout sessions. Module 2 discussed designing and posing effective questions, aligning mentoring to mentee's evaluation, modeling responsive mentor behavior, and considering potential mentor pitfalls, supported by two breakout sessions. Module 3 was focused on self-reflection, cultural responsiveness and the impact of mentoring with one breakout session while Module 4 entailed selecting appropriate assessment tools, understanding

benefits for mentors and mentees, and best practices for mentors ending with a breakout session activity.

This lesson learned paper focuses on Module 2 which covered designing effective questions and posing eight types of questions. The eight types of questions include open questions, summarizing questions, probing questions, linking questions, closed questions, leading questions, multiple choice questions, and hypothetical questions.

Participants

The attendees in the workshop included 12 participants who are working as an instructional faculty in an engineering department at three different higher education institutions. An institutional review board (IRB 202200008) was conducted, and participants gave their consent to be a part of this study. There was a total of six researchers (also at three different institutions), of which three members were co-principal investigators, two were graduate students and one was an undergraduate student. Eight out of twelve participants (67% response rate) completed the post-training survey.

Survey

In the survey, there were three main questions. The first question asked the participants to rate different items on a 5-point Likert-scale question (5=Excellent to 1=Poor) about *"Mentor-Coach Skills"*. The relevant item to this study was ***"Designing Powerful Questions to fit the situation"***. The second and third items were open-ended questions including ***"What were the most relevant parts of the training to becoming a high-quality mentor-coach?"*** and ***"How can we improve the session(s) to be more responsive to your needs?"*** respectively.

Preliminary Findings

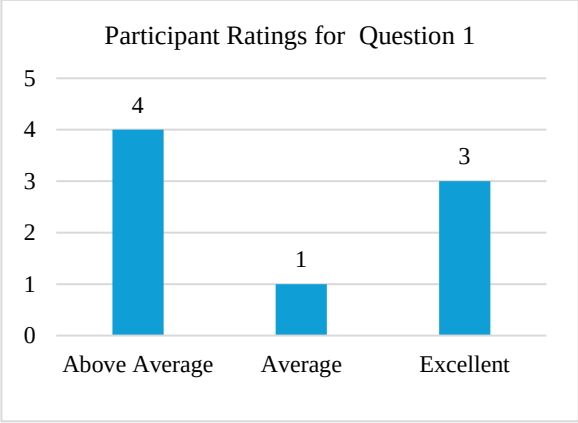

Figure 2: Participant ratings for Question 1

For the first question in which participants rated about ***"Designing Powerful Questions to fit the situation"***, three participants (37.5%) rated *"Excellent"*, four participants (50%) rated *"Above Average",* and one participant (12.5%) rated *"Average"* to the item. This item was the second highest of all items that received highest ratings. In the first open-ended question, four of the eight participants (50%) mentioned that '*designing powerful questions*' was the one of the most relevant parts of the training to become a high-quality mentor-coach.

Lessons Learned

At the end of the training, there were multiple lessons learned which are discussed below.

A) Importance of effective and thoughtful questioning

Majority of the participants shared that they had heard about the types of questions but were not familiar with all of them. During the workshop, the participants shared that in their interactions with students, they often responded quickly, jumped to conclusions and offered immediate solutions undermining the essence of mentorship. The workshop inculcated in faculty members a practice to pause, listen, paraphrase, reflect and then respond in situations to better understand the mentees cultivating a culture of empathetic and supportive mentorship. Another lesson

learned was that some participants (and researchers) had initially believed that asking open questions can primarily lead to understanding the mentees' situations better, however it was discovered that even asking closed questions while carefully probing for reasoning to understand a particular stance can equally lead to enhanced understanding. Another highlight was that mentors should minimize the use of jargon to keep the communication clear and continuously ask appropriate questions to ensure open and meaningful conversations with mentees. The session reflected that well-thought questions when tailored to mentees' context could drive better conversations and help uncover better solutions.

B) Introducing creative learning techniques in workshops

The workshop utilized creative techniques like role plays that simulate real-life environments. In the workshop, each participant was paired in groups (two to four) multiple times to practice different types of questions. One participant acted as a mentee while the other responded as a mentor by asking relevant questions. In some groups, there was an observer who gave feedback to both mentor and mentee at the end of roleplay activity. In this way, the participants were able to give each other feedback based on how they asked different types of questions. This strategy helped participants get a glimpse of how in reality they would interact with their mentees effectively. Other strategies that could be incorporated during workshops include using case studies, scenario-based simulations, fishbowl activities, reflective journaling, games, etc. Such real-life or interactive techniques can provide opportunities to practice being effective teachers and mentors. Creative strategies can lead to better communication and interpersonal skills, and problem-solving techniques by asking relevant or specific types of questions in different scenarios. It can additionally boost the confidence of faculty members to handle and navigate difficult situations.

C) Learning from diverse institutional contexts

During the workshop, it was noted that different faculty members had unique experiences and challenges in their respective institutions. In some breakout sessions, while pairing the participants, they were strategically grouped together with peers from different institutions to get exposure to varied perspectives for meaningful cross-institutional learning and collaboration. Such groupings led to sharing peer feedback, ideating diverse solutions for common challenges, encouraging creativity, and building networking throughout the breakout sessions. It was observed that participants from all institutions were supportive of each other, especially in breakout sessions as they responded with positive feedback for the corresponding participant in multiple activities.

D) Conducting structured mentoring workshops

The institutions generally lack structured mentoring training for engineering faculty. Similarly, the engineering faculty in this study had limited experience in formally understanding the developmental stages of the mentoring process and roles of the stakeholders involved. While some of the participants had been exposed to informal mentor training, they lacked opportunities to practice those skills and often relied on applying ad hoc strategies whenever needed. Through this workshop, a recommendation for institutions is to formulate structured mentoring workshops as a roadmap that would give faculty members not only the content but also the space to practice their mentoring skills to improve the quality of mentor-mentee relationships.

Conclusion

This lessons learned paper offers insightful findings on Module 2 about designing powerful questions in a mentoring workshop for instructional faculty from three institutions. There is great value for institutions in designing structured mentoring workshops for mentors, utilizing creative

techniques, promoting cross-institutional learning and focusing on asking effective questions to build trust and confidence between mentors and mentees. Lastly, there should also be follow-up with participants or mentors to evaluate how they have incorporated the different types of questions in their everyday interaction with mentees or students. Initiatives like RITA mentoring hub have the potential to be scaled and adopted in other institutions to create better mentor-mentee relationships.

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Author Contributions
Gadhaun Aslam: Conceptualization, Data Curation, Formal Analysis, Writing – Original Draft Preparation, **Idalis Villanueva Alarcón**: Conceptualization, Writing – Review & Editing, Training coordination and design.

References
[1] C. Amaro-Jimenez, M. Martinez-Cosio, O. K. Patterson, K. Clark, and J. Luken-Sutton, "'Feel Like More than a Number in the Classroom:' Faculty Perceptions of Professional Development for Student Success," *J. Hisp. High. Educ.*, vol. 21, no. 3, pp. 247–260, Jul. 2022, doi: 10.1177/1538192720950863.
[2] J. Layne, J. Froyd, N. Simpson, R. Caso, and P. Merton, "Understanding and improving faculty professional development in teaching," in *34th Annual Frontiers in Education, 2004. FIE 2004.*, Oct. 2004, p. S1C/15-S1C/20 Vol. 3. doi: 10.1109/FIE.2004.1408683.
[3] R. Sancar, D. Atal, and D. Deryakulu, "A new framework for teachers' professional development," *Teach. Teach. Educ.*, vol. 101, p. 103305, May 2021, doi: 10.1016/j.tate.2021.103305.
[4] T. Zaharopoulos, "Professional Development in International Higher Education," in *Igniting Excellence in Faculty Development at International Schools: Beyond Borders*, P. Pelonis and T. Zaharopoulos, Eds., Cham: Springer Nature Switzerland, 2024, pp. 291–318. doi: 10.1007/978-3-031-67055-8_16.
[5] R. S. Adams and R. M. Felder, "Reframing Professional Development: A Systems Approach to Preparing Engineering Educators to Educate Tomorrow's Engineers," *J. Eng. Educ.*, vol. 97, no. 3, pp. 239–240, Jul. 2008, doi: 10.1002/j.2168-9830.2008.tb00975.x.
[6] M. Basdogan, T. Birdwell, and T. Harris, "Technological Frames in Classroom: A Case Study for a Faculty Professional Development," *Res. Learn. Technol.*, vol. 30, 2022, Accessed: Jan. 13, 2025. [Online]. Available: https://eric.ed.gov/?id=EJ1369238
[7] E. Marquez and S. Garcia, "Learning in Transition: Developing and Employing Pedagogical Supports to Enhance Student Learning in Engineering Education," in *2023 ASEE Annual Conference & Exposition Proceedings*, Baltimore , Maryland: ASEE Conferences, Jun. 2023, p. 43397. doi: 10.18260/1-2--43397.
[8] G. Aslam and I. V. Alarcón, "A Cross-Institutional Study of Engineering Education Faculty Profiles," presented at the 2024 ASEE Annual Conference & Exposition, Jun. 2024.

Accessed: Aug. 14, 2024. [Online]. Available: https://peer.asee.org/a-cross-institutional-study-of-engineering-education-faculty-profiles

[9] S. Kindon, R. Pain, and M. Kesby, "Participatory Action Research Approaches and Methods," *Connect. People Particip. Place Abingdon Routledge*, 2007.

[10] International Mentoring Association Board, "International Mentoring Association Mentor Training Building Futures Mentor's Notebook." International Mentoring Association, 2020.