

## **Lessons Learned: Motivational Factors for Engineering Faculty Seeking Professional Development for Inclusive Teaching**

**Marie E. Evans, University of Colorado Denver**

Marie Evans is a professional that works within diversity and inclusion initiatives and assists in conducting qualitative research focused on working towards a more equitable society.

**Prof. Tom Altman**

Dr. Altman received his Ph.D. in Computer Science from the University of Pittsburgh. He specializes in optimization algorithms, formal language theory, and complex systems. He has published a book and over 90 journal/refereed papers. He received numerous research and teaching awards. An ABET CAC Program Evaluator, Dr. Altman has expanded his research interests into STEM and, in particular, Engineering Education.

**Dr. Maryam Darbeheshti, University of Colorado Denver**

Maryam Darbeheshti is an Associate Professor in the Department of Mechanical Engineering at the University of Colorado Denver. She earned her Ph.D. from the University of Denver in 2009. She has been teaching at CU Denver since 2010. Darbeheshti's research interests are in the area of Fluid Mechanics and Engineering Education. She is the PI of a recent NSF award that focuses on STEM identity at Urban Universities.

**Prof. Katherine Goodman, University of Colorado Denver**

Katherine Goodman is an associate teaching professor at the University of Colorado Denver in the College of Engineering, Design, and Computing. She also serves as the University's Director of the Center for Excellence in Teaching and Learning. Her research focuses on transformative experiences in engineering education. She has served as program chair and division chair of the Technological and Engineering Literacy - Philosophy of Engineering (TELPHE) Division.

**Dr. Heather Lynn Johnson**

Heather Lynn Johnson is a mathematics educator who investigates students' math reasoning. She designs tasks to help students to expand their math reasoning, and she studies how instructors and departments transform practices to grow students' math reasoning.

**Prof. David C. Mays, University of Colorado Denver**

David Mays is an Associate Professor in the Department of Civil Engineering at the University of Colorado Denver. He earned his B.S. from the University of Pennsylvania in 1995, then taught high school through Teach for America and worked as a contractor at Los Alamos National Laboratory before earning his M.S. and Ph.D. from the University of California Berkeley in 1999 and 2005, respectively. He has been at CU Denver since 2005, where he teaches fluid mechanics and hydrology, studies flow in porous media using ideas from complex systems science, leads the graduate track in Hydrologic, Environmental, and Sustainability Engineering (HESE), and advocates for broadening participation in engineering. He is a registered professional engineer (PE) in California and Colorado.

# **Lessons Learned: Motivational Factors for Engineering Faculty Seeking Professional Development for Inclusive Teaching**

## **Abstract**

This lessons-learned paper presents qualitative data on the factors motivating engineering faculty to seek professional development for inclusive teaching, that is, teaching that works for all students. We conducted semi-structured interviews with nine engineering faculty who had self-selected into a three-year faculty learning community (FLC) designed to address the recognized gap between the known best practices for inclusive teaching and actual practices. Our study was designed to determine what factors of engineering college culture accelerate or inhibit faculty participation in the FLC and implementation of known best practices for inclusive teaching by those same faculty. Interview recordings were transcribed and coded. Using phenomenographic analysis, we identified three themes, descriptions of which have been submitted to a refereed engineering education research journal. In this presentation, we focus on lessons learned, not reported elsewhere, that emerged from two specific codes: (1) reasons for joining the FLC and (2) benefits of FLC, which address, respectively, why faculty joined the FLC and why they stayed for at least two years, when the interviews were conducted. Faculty joined the FLC because they were invited, because they wanted to learn inclusive teaching, because they desired conversations around teaching. Faculty stayed because the FLC helped them to focus on their students and because they appreciated the focus on teaching. A common theme across both codes, and perhaps the biggest surprise, was that faculty joined the FLC and stayed for at least two years because it provided a stronger and deeper sense of community at work. We intend these lessons learned might help to guide others working to improve the research-to-practice cycle through faculty development, and we welcome feedback from the community following our lightning talk.

## **Introduction**

Broadening participation is one strategy to answer the national need for workforce expansion in science, technology, engineering, and mathematics (STEM) (National Science Board, 2024). Here we present lessons learned from a broader study aimed at nudging engineering faculty to adopt more of the known best practices for inclusive teaching. We adopt Hockings's (2010, p. 1) definition of *inclusive teaching* as "the ways in which pedagogy, curricula and assessment are designed and delivered to engage students in learning that is meaningful, relevant and accessible to all. It embraces a view of the individual and individual difference as the source of diversity that can enrich the lives and learning of others." Engineering faculty are often unaware of inclusive teaching, so consequently, inclusive teaching methods are not often utilized by engineering faculty (Brooks et al., 2024). To address this gap, we organized a faculty learning community (FLC) at the University of Colorado Denver (CU Denver). The FLC was called Engineering is Not Neutral: Transforming Instruction through Collaboration and Engagement (ENNTICE), and it hosted monthly workshops over the three academic years 2021/22 through 2023/24 (Collopy et al., 2022; Darbeheshti et al., 2024; Goodman et al., 2023, 2024). A qualitative study on this FLC identified three themes, descriptions of which have been submitted to a refereed engineering education research journal. Here, we focus on lessons learned, not reported elsewhere, that highlight why faculty joined the FLC and why they stayed for at least

**Table 1:** Participants in the faculty learning community (FLC).

Pseudonym	Sex	Title	Department
Ahsan	Male	Assistant Professor	Electrical Engineering
Anaya	Female	Associate Professor	Civil Engineering
Dacia	Female	Assistant Professor	Bioengineering
Farshid	Male	Associate Professor	Computer Science
Jung	Male	Professor	Electrical Engineering
Long	Male	Assistant Professor	Computer Science
Nathan	Male	Associate Professor	Mechanical Engineering
Sara	Female	Instructor	Dean's Office
William	Male	Professor	Civil Engineering

**Table 2:** Codes, descriptions, and examples.

#	Code	Description	Example
1	Reasons for Joining the FLC	Why faculty joined the group.	Anaya liked teaching and joined the FLC because she wanted to be effective.
2	Benefits of FLC	Positive or helpful aspects of participating in the FLC for faculty.	As Dacia used things she learned in the FLC, she saw differences in student engagement.

two years (i.e., until the interviews were conducted at the end of the 2022/23 academic year).

To provide a brief overview of the qualitative study, after human subjects review by the Colorado Multiple Institutional Review Board (COMIRB 21-3235), Zoom interviews were scheduled with nine participants in the FLC in April-May 2023 (Table 1). These nine faculty included six men and three women, each assigned a pseudonym. All the men were tenured (Farshid, Jung, Nathan, and William) or tenure-track (Ahsan and Long). One woman was tenure-track (Anaya), one was an instructor (Sara), and one was a research assistant professor (Dacia). The semi-structured interviews ranged from 19-53 minutes with an average of 31 minutes. Interview transcripts were reformatted into coding workbooks, one for each of the nine participants. Coding followed the method of descriptive coding (Saldaña, 2013, pp. 87-91), where each code is a noun or short phrase that captures an essence of meaning, where the codes were sometimes *a priori* and sometimes *emergent*. The final list of 10 codes includes two selected for reporting here (Table 2). To extract meaning from the coded transcripts, we applied phenomenography (Marton & Booth, 1997), which has been identified as a promising methodology for advancing engineering education research (Case & Light, 2011). In phenomenography, researchers draw out variation in how people experience and express their experience of some phenomenon.

## Lessons Learned

Lessons learned are organized under two headings corresponding to the two codes in Table 2 and one cross-cutting heading addressing the fundamental importance of community.

### *1. Why did faculty join the FLC?*

**Faculty valued invitations.** At the most basic level, faculty joined the FLC because they were invited. When asked why they joined, five of the nine participants mentioned the invitation. For example, when a senior colleague in her department invited Anaya, that fact sealed the deal for her: “And he was like, yes, you should totally do this training, you should learn something new.” Nathan received the invitation and was glad to be part of an engineering-focused community: “And so when I heard about ENNTICE, you know, when we got the invitation, I was like, that sounds good. Now it’s like all engineers. We’re all going to be on the same page.”

**Faculty wanted to learn.** Faculty wanted to learn to improve their teaching: Dacia wanted to learn from others; Farshid wanted to learn more about diversity, equity, and inclusion (DEI); Jung wanted to learn strategies for diversity and inclusion; and Nathan wanted to learn how to teach better in a diverse classroom. As Dacia shared, “I’m new in teaching, so I wanted to get more insight ... and more advice.”

**Faculty desired conversations around teaching.** Across departments, faculty mentioned the rarity of conversations around teaching. As Long said, “We don’t have all these kinds of conversations yet.” The FLC provided a space for that. Sara said, “And then once the faculty actually realize [that there are other faculty interested in inclusive teaching practices], oh, wow, they just had a really great conversation about that.”

### *2. Why did faculty stay in the FLC for at least two years?*

**Faculty wanted to focus on students.** Faculty mentioned that the FLC helped them to have a greater awareness of their students. Dacia learned to put herself in her students’ shoes: “You know, until you try to see the perspective from the point of view of the student, you really don’t understand what is happening in their lives.” Nathan became more aware of how he treats his students: “In a nutshell, I’d just say, it just means being aware that all our students have lives outside of your classroom and that they all have different things going on. And they are not all like I was in college.”

**Faculty appreciated the focus on teaching.** Faculty from different departments and ranks mentioned that they valued the focus on teaching. Anaya said, “So, yes, ENNTICE was helpful in terms of strategies and teaching tools.” William said that he wants CU Denver to be a space where we can focus on both research and teaching: “I think we’re too small of a university to have people that are just doing research and just shirking their teaching duties.”

### *3. The fundamental importance of community.*

**Faculty wanted to connect with community.** A desire for community spanned departments. When asked why they joined the FLC, eight of the nine faculty participants mentioned community: (1) Ahsan was interested to see how the group would approach the idea that engineering is not neutral, noting that most engineers think of themselves as unbiased; (2) Dacia wanted “to get to know more people in the college of engineering...” (3) Farshid accepted because he wanted to benefit from other faculty’s recommendations; (4) Jung wanted to

collaborate with colleagues; (5) Long joined because the group would provide a way of sharing between faculty to learn best practices; (6) Nathan thought it would be great to have a community of engineers, adding that community was his favorite part of the FLC; (7) Sara joined the FLC for community to connect, interact, and meet with colleagues; and (8) William felt that the FLC is the kind of community that he wants with his colleagues.

Community was especially valuable for faculty who did not have a home department (e.g., Sara) or whose home department was on a satellite campus (e.g., Dacia), which reinforces the known benefits of working in a *community of practice* (Wenger, 1998). Sara added that the principal benefit of the FLC is community-building, not only for herself, but also for faculty from other departments. Echoing this sentiment, Anaya stated that community was as important as strategies or tools: “Often, in research universities, teaching is in the back end, really, it’s like you are mostly evaluated on research. And so it is good to be part to be a community who thinks about teaching and who wants to make teaching better and helps students.”

## Conclusion

This study identified several motivational factors for engineering faculty seeking professional development for inclusive teaching. Faculty joined the FLC because they valued invitations, because they wanted to learn, and because they desired conversations around teaching. Faculty stayed in the FLC because they wanted to focus on students and because they appreciated the focus on teaching. A desire to connect with community was a cross-cutting theme that emerged both in the context of why faculty joined and why they stayed.

The fundamental importance of community underscores the humanity in teaching engineering. We engineering faculty may think of ourselves as efficient, quantitative, and objective. But, according to our peers interviewed in this study, we value invitations, conversations, and community, each of which is affective rather than cognitive. Perhaps the most important step in promoting inclusive teaching is to provide a warm and genuine invitation for our colleagues to join us.

## Acknowledgments

This work was supported by the U.S. National Science Foundation through award #2040095. Opinions, findings, conclusions, and recommendations expressed are those of the authors and do not necessarily reflect the views of the National Science Foundation.

## References

- Brooks, A. L., Shekhar, P., Knowles, J., Clement, E., & Brown, S. A. (2024). Contextual influences on the adoption of evidence-based instructional practices by electrical and computer engineering faculty. *IEEE Transactions on Education*, 67(3), 351–363. <https://doi.org/10.1109/TE.2023.3338479>
- Case, J. M., & Light, G. (2011). Emerging research methodologies in engineering education research. *Journal of Engineering Education*, 100(1), 186–210. <https://doi.org/10.1002/j.2168-9830.2011.tb00008.x>
- Collopy, A., Johnson, H. L., Goodman, K. A., Altman, T., Darbeheshti, M., Wood, K. L., & Mays, D. C. (2022, August 23). *Exploring nudging approaches for growing a culture of*

- diversity and inclusion with engineering faculty*. [Conference presentation]. American Society for Engineering Education 2022 Annual Conference & Exposition, Minneapolis, Minnesota. <https://peer.asee.org/42018>
- Darbeheshti, M., Altman, T., Goodman, K. A., Johnson, H. L., Evans, M., & Mays, D. C. (2024). *Building community for inclusive teaching: Can we bridge the valley of neglect?* [Conference presentation]. 2024 ASEE Annual Conference & Exposition, Portland, Oregon. <https://peer.asee.org/46784>
- Hockings, C. (2010). Inclusive learning and teaching in higher education: A synthesis of research. *EvidenceNet*. <https://www.advance-he.ac.uk/knowledge-hub/inclusive-learning-and-teaching-higher-education-synthesis-research>
- Goodman, K. A., Johnson, H. L., Darbeheshti, M., Altman, T., & Mays, D. C. (2024). Setting a better default: Designing a welcome academy for new faculty centered on inclusive teaching in engineering. *International Journal of Designs for Learning*, 15(2), 14–25. <https://doi.org/10.14434/ijdl.v15i2.36438>
- Goodman, K. A., Johnson, H. L., Darbeheshti, M., Mays, D. C., & Altman, T. (2023, June 25). *From cohort to classroom: Transitioning to year 2 in a faculty learning community*. [Conference presentation]. American Society for Engineering Education 2023 Annual Conference & Exposition, Baltimore, Maryland. <https://peer.asee.org/42810>
- Marton, F., & Booth, S. (1997). *Learning and awareness*. L. Erlbaum Associates.
- National Science Board. (2024). *The STEM labor force: Scientists, engineers, and skilled technical workers* (NSB-2024-5). National Science Foundation. <https://nces.nsf.gov/pubs/nsb20245>
- Saldaña, J. (2013). *The coding manual for qualitative researchers* (2nd ed.). SAGE.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.