Resetting the Default: Welcoming New Engineering Faculty to Inclusive Teaching

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.

Prof. Tom Altman

Tom Altman received his B.S. degrees in Computer Science and in Mathematics, and M.S. and Ph.D. (1984) in Computer Science, all from the University of Pittsburgh. Dr. Altman specializes in optimization algorithms, formal language theory, and STEM 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.

Dr. Priscilla Hwang, Virginia Commonwealth University

Priscilla Hwang an Assistant Professor in Biomedical Engineering at Virginia Commonwealth University (VCU). She earned her BS, MS, and PhD from Duke University. While at Duke, she also received a Certificate in College Teaching. After her PhD, she worked as a postdoctoral fellow at Washington University in St Louis. In 2019, she joined the faculty at VCU, where she teaches a freshman course, Introduction to Biological Systems in Engineering, and graduate level course in Microfluidics. She is also passionate about being an effective mentor and training the next generation of students in STEM.

Dr. Cassandra McCall, Utah State University

Dr. Cassandra McCall is an Assistant Professor in the Engineering Education Department at Utah State University (USU). Her research focuses on the intersections of disability, identity formation, and culture and uses anti-ableist approaches to enhance universal access for students with disabilities in STEM, particularly in engineering. At USU, she serves as the Co-Director of the Institute for Interdisciplinary Transition Services. In 2024, Dr. McCall received a National Science Foundation CAREER grant to identify systemic opportunities for increasing the participation of people with disabilities in engineering. Her award-winning publications have been recognized by leading engineering education research journals at both national and international levels. Dr. McCall has led several workshops promoting the inclusion of people with disabilities and other minoritized groups in STEM. She holds B.S. and M.S. degrees in civil engineering with a structural engineering emphasis.

Dr. Stephen Secules, Florida International University

Dr. Stephen Secules is an Assistant Professor in the School of Universal Computing, Construction, and Engineering Education at Florida International University. Secules holds a joint appointment in the STEM Transformation Institute and a secondary appointment in the Department of Mechanical and Materials Engineering. He has bachelor degrees in engineering from Dartmouth College, a master's in Architectural Acoustics from Rensselaer Polytechnic Institute, and a PhD in Education (Curriculum and Instruction)

©American Society for Engineering Education, 2025

from the University of Maryland. Prior to his academic career, Stephen was an acoustical consultant for 5 years in both London, UK and Silicon Valley, CA. His research has focused on culture and equity in engineering education, particularly undergraduate contexts, pedagogy, and student support. Through his work he aims to use critical qualitative, video-based, participatory, and ethnographic methods to look at everyday educational settings in engineering and shift them towards equity and inclusion. He also leads the Equity Research Group where he mentors graduate and undergraduate students in pursuing critical and action-oriented research.

Prof. Maribel Vazquez, Rutgers, The State University of New Jersey

Dr. Vazquez is an inducted Fellow of the American Institute of Medical and Biological Engineers (AIMBE) and Biomedical Engineering Society (BMES) for the contributions of microfluidic systems in the visual system. She received the 2023 AIMBE Professional Impact Award for the inclusion of Health Disparities within under/graduate training and was honored as the 2024 Plenary Speaker to the BMES Council of Chairs for integration of health disparities in Biomedical Engineering curricula. She is an executive committee member for the Rutgers Connection Network that develops inclusive forms of peer mentoring for mid-career faculty as well as new faculty.

Kelsey Watts, University of Virginia

Kelsey Watts is a postdoc at the University of Virginia in Biomedical Engineering. She is committed to developing more inclusive teaching and research practices.

©American Society for Engineering Education, 2025

Resetting the Default:
Welcoming New Engineering Faculty to Inclusive Teaching

Abstract

This work-in-progress paper explores how faculty professional development can support inclusive teaching, recognizing the classroom as a terrain of struggle and site of possibility. There have been numerous calls to increase the number of engineers in the United States. A prominent strategy to answer this call is broadening participation, which can be achieved, in part, by promoting practices of inclusive teaching. But at many engineering schools, faculty are hired primarily for their technical expertise rather than their educational expertise. This is not to say that engineering faculty do not care about broadening participation, quite the contrary, in our experience, most engineering faculty do indeed care about student success. This paper reports findings from a group of engineering faculty, students, and staff who gathered in September 2024 as part of a national society meeting discussing engineering education to brainstorm approaches for professional development following a process that was informed by the theory of nudging. One key strategy from nudging is to reset the default. In business, for example, a nudge to increase retirement plan participation is to make the plans opt-out instead of opt-in. Here, in the context of engineering education, the group brainstormed strategies to nudge new faculty toward inclusive teaching. This work was based on three premises. The first premise is that departments are good places to focus educational reform. The second premise is that resetting the default is easier for new faculty than for experienced faculty. The third premise is that context matters, that is, what may work at one engineering school may not work at another. Accordingly, the recommendations focus on process rather than product, since there is no one product (i.e., nudging approach) likely to work at all engineering schools. Instead, this paper aims to help the faculty at other engineering schools to apply this process, or a similar process, to welcome their own new faculty colleagues to inclusive teaching.

Introduction

This work-in-progress paper explores how faculty professional development can support inclusive teaching, recognizing the classroom as a terrain of struggle and site of possibility. The classroom is a terrain of struggle because, while some students thrive in engineering school, others struggle, for various reasons—for example, they may need full- or part-time employment to meet their financial needs, or they may be learning English, or the curriculum may lack an obvious connection to serving their community. The struggle arises from knowing that success in the classroom is a mandatory milestone for those seeking an engineering career. But the classroom is also a site of possibility because it is a setting where instructors have enormous freedom to create an effective learning environment. In other words, while students may face circumstances beyond the influence of the instructor, the classroom offers a setting where instructors have a profound opportunity to make a difference. The premise of this work is that instructors can and should use that freedom to make their classrooms work for all their students, which we define as *inclusive teaching*. Inclusive teaching promotes liberation at multiple levels: At an individual level, engineering education supports class mobility that builds intergenerational wealth. At a community level, good engineering does more than support individual engineers, it supports all of us, as captured in our central canon to serve *public* health, safety, and welfare.

Over the last decades, there have been numerous calls to increase the number of engineers in the United States (e.g., Bush, 1945; National Science Board, 2024). To answer these calls, there have been notable advances in engineering education research (e.g., Felder and Brent, 2016). We know a great deal about how to teach inclusively so that each of our students can grow into a conscientious, rigorous professional who can support themselves, their family, their community, their profession, and society. But we have yet to learn how to effectively prompt engineering faculty to adopt the many well-known and well-documented best practices for inclusive teaching. Accordingly, many of the theoretically-grounded, data-driven best practices for inclusive pedagogy have yet to be widely deployed (Brooks et al., 2024; Reinholz et al., 2017, 2018, 2019; Wieman, 2019). That is the gap this work seeks to bridge. Thus, we focus on strategies to promote inclusive teaching.

Nudging (Thaler and Sunstein, 2008) is one strategy to promote inclusive teaching. Nudging is defined as creating a choice architecture where people are more likely to make better choices. One key strategy from nudging is to reset the default. In business, for example, a nudge to increase retirement plan participation is to make the plans opt-out instead of opt-in. Resetting the default is an effective nudge simply because many people will accept the default. In the current context, this work was based on three premises. The first premise is that departments are good places to focus educational reform (Lee et al., 2017). The second premise is that resetting the default is easier for new faculty than for experienced faculty (Nahapetian et al., 2019). New engineering faculty need training in inclusive teaching, which overlaps substantially with active learning (Bennett et al., 2023). The third premise is that context matters, that is, what may work at one engineering school may not work at another.

This paper has three goals. The first goal is to highlight three selected initiatives, at engineering colleges across the USA, focused on training faculty to be more effective to all their students. The second goal is to summarize a September 2024 workshop where 13 faculty, staff, and students from 11 institutions brainstormed strategies to nudge engineering faculty toward more inclusive teaching. The third goal is to call for action by other engineering faculty who share our vision that more effective teaching supports the broader goal of liberation.
The coauthors, a subset of the 13 attendees, offer the present work-in-progress paper that is part workshop report and part call-to-the-community.

Example Practices to Make Inclusive Teaching the Default

In this section, we present a review of current practices by highlighting three examples where engineering schools have institutionalized faculty development for inclusive teaching. We do not claim this list to be exhaustive, rather, our goal is to discuss how institutional resources have been applied to support student success.

First, the Welcome Academy for New Faculty at the University of Colorado Denver nudges engineering faculty toward inclusive teaching by resetting the default (Goodman et al., 2024). This training, offered the day after the campus-wide new faculty orientation, is required for all new rostered engineering faculty,[*] including both tenure-track and instructional faculty, and including faculty joining as assistant professors and at higher ranks (but not including lecturers hired on a course-by-course basis). Delivered by a team of senior faculty, this half-day

[*] We use the term *rostered engineering faculty* for professors and instructors who may occupy a faculty line in the organizational chart, have their picture and biosketch on the department website, vote on matters of faculty self-governance, and make a commitment to the department (and vice versa).

training begins with an icebreaker, then presents campus demographics, orients new faculty to campus resources for inclusive teaching, provides a tour highlighting how power dynamics shaped campus history, and concludes with presentations by current engineering students. Importantly, this training welcomes new faculty into a community supporting inclusive teaching.

Second, the Just-in-Time Teaching with Two-Way Formative Feedback for Disciplinary Faculty (JTFD) program at Arizona State University provides a year-long apprenticeship for new engineering faculty (Ross et al., 2024). Like the Welcome Academy for New Faculty at the University of Colorado Denver, JTFD nudges engineering faculty by resetting the default. During the fall semester, JTFD provides biweekly workshops on inclusive teaching; during the spring semester, JTFD provides biweekly sessions where faculty discuss their successes and failures in applying methods of inclusive teaching through a community of practice. Interestingly, classroom observations noted no significant change in teaching practice following the fall workshops, but did report significant changes following the spring community of practice; thus, community promotes inclusive teaching. Arizona State University has continued their JTFD community of practice under the auspices of an ongoing program promoting entrepreneurial mindset (Arizona State University, 2025).

And third, the Collins Scholars Program at the University of Illinois Urbana-Champaign is a year-long, weekly training program for new engineering faculty (University of Illinois Urbana-Champaign, 2025). Here again, the nudging works by resetting the default. Hosted by their Academy for Excellence in Engineering Education (AE3), this program supports the three areas of teaching, research, and service. Importantly, each Collins Scholar observes classroom teaching by excellent teachers, and hosts at least one evaluation visit to their own classroom. Their syllabus includes a short, curated list of recommended books on inclusive teaching and an invitation to join the American Society for Engineering Education (ASEE). Here again, the program promotes community-building by providing a weekly lunch.

What can we learn from these three examples? First, there is a recognized body of knowledge on inclusive teaching—each of these programs provides similar content emphasizing, for example, the benefits of active learning. Second, we learn that these programs work in community, since every one of them gathers in person, often including lunch, and following the established framework of *community of practice* (Wenger, 1998). And third, we learn that engineering schools across the USA have recognized the need to share this body of knowledge with their new engineering faculty. Each is a compelling example of nudging based on resetting the default. The urgent need is that not every engineering school has a program like these. This allows us to pose the question: What can we do to promote similar practices at other engineering colleges? That is, we know other contexts are different and need their own strategies. What can we adapt from these examples of nudging engineering faculty toward inclusive teaching to guide engineering faculty more widely?

Customizing the Training for the Engineering School: Our Process

In this section, we outline our process for customizing the nudge for each of our engineering schools. We have deliberately chosen to call this section Process, rather than Methods, which one would expect in a research study. But this work is not research—the research is well established—this work is about implementation.

In September 2024, 13 participants from 11 institutions gathered for a 60-minute workshop entitled, Nudging New Engineering Faculty for Inclusive Teaching at the U.S.

National Science Foundation Engineering Education and Centers Grantees Conference meeting in Alexandria, Virginia USA. The purpose of this workshop was to build esprit-de-corps among faculty working to nudge their own colleagues toward more inclusive teaching. Participants counted off by three to form three groups of four participants each. Counting off by three was chosen to shuffle participants who were sitting by colleagues from their home institution. The facilitator (the 13th participant) then reviewed the classroom technique of think-pair-share, using a timer for each step, explaining that the initially silent *think* step is deliberately included to encourage participation by quieter participants. Through two cycles of think-pair-share, the groups considered two questions:

- **Question 1:** What do new engineering faculty need to know about inclusive teaching at your institution?

- **Question 2:** How can a welcome academy convey this content actively, compellingly, and effectively?

Participant responses were recorded by the facilitator on flipcharts provided by the meeting organizers, and have been reproduced verbatim in Boxes 1-2, then sorted to list the notes in a logical order for presentation.

During this brief workshop, participants generated a preliminary syllabus (Box 1) and a preliminary lesson plan (Box 2) for their own welcome academy for inclusive teaching. The preliminary syllabus (Box 1) recognized the need to provide motivation for this work, since many new engineering faculty have little or no formal teaching training. The syllabus also

Box 1. Preliminary syllabus based on responses to Question 1.

- Motivation
- Define inclusion
- Define inclusive teaching
- Equity does not equal equality
- Sharing resources
- Cultural awareness
- Backgrounds unique
- Knowing students
  - Their own students
  - Family obligations
  - Military and veterans
  - Generational differences
  - Next steps after graduation
- Not overnight

Box 2. Preliminary lesson plan based on responses to Question 2.

- Different modes
- Acting/videos
- Best practices
- Definitions
- Concepts
- General → example
- Background surveys
- Faculty reflection
- Mentoring/pairing with senior
- Resources/handouts
- Statistics on students
- Student testimonials
- Student panel
- Valuing everyone else
- Valuing teaching (with research)
- Small changes
- Meaningful new training

included definitions, concepts, perspective, and a multidimensional focus on students. Importantly, the participants also recognized that inclusive teaching may not happen overnight, which dovetails with the preliminary lesson plan (Box 2) emphasizing that small changes are a good way to begin the march toward more inclusive teaching. The preliminary lesson plan recognizes that the welcome academy should model active learning techniques through different modes, acting, and videos. After articulating a number of specific ideas for content delivery, the bottom line was to create *meaningful* new training. We emphasize that the syllabus in Box 1 and the lesson plan in Box 2 are *preliminary*. The next step, beyond the scope of this one-hour workshop (or the present work-in-progress paper) would be to take these lists and turn them into syllabi and lesson plans for faculty development training in collaboration with the faculty at each engineering school. The premise of the current conference paper is that this new training must be customized at each engineering school.

Call to Action

ASEE's Equity, Culture, and Social Justice in Education Division (ECSJ) provides a forum to develop educational communities grounded in liberation struggles and to highlight connections to social justice movements. Here we challenge readers to initiate similar conversations on their own campus, supporting the formation of educational communities that will institutionalize the practice of inclusive teaching, that is, teaching that works for all students. Community is a central theme in the three example programs discussed above, and the power of community was also reflected—in a small way—by the current group of coauthors who gathered after the workshop to write this conference paper. Community is essential because it is exhausting for any one individual to promote change alone (e.g., Meredith, 1963). The change we propose, to promote inclusive teaching, would be liberatory for students, because engineering education supports social mobility and engineering practice builds intergenerational wealth.

Accordingly, this work focuses on process rather than product, since there is no one product (i.e., nudging approach) likely to work at all engineering schools. Instead, we challenge faculty at other engineering schools to apply this process, or a similar process, to welcome their own new faculty colleagues to inclusive teaching.

Acknowledgments

This work was funded by the U.S. National Science Foundation through awards 1833983, 2040095, 2114241, 2114242, 2237564, 2243644, and 2349211. Opinions, findings, conclusions, and recommendations expressed are those of the authors and do not necessarily reflect the views of the funding agency.

References

Arizona State University. (2025, January 4). *Community of practice teaching workshops*. https://entrepreneurship.engineering.asu.edu/community-of-practice-teaching-workshops/

Bennett, A.B., Uhing, K., Williams, M., & Kress, N. (2023). A set theory analysis of the relationship between active learning and equitable and inclusive teaching. *International Journal of Mathematical Education in Science and Technology*, *54*(9), 1765-1784. https://doi.org10.1080/0020739X.2023.2255183

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

Bush, V. (1945, July 1). As we may think. *The Atlantic*. https://www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/

Felder, R. M., & Brent, R. (2016). *Teaching and learning STEM: A practical guide*. Jossey-Bass.

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

Lee, V.S., Hyman, M.R., & Luginbuhl, G. (2017). The concept of readiness in the academic department: A case study of undergraduate education reform. *Innovative Higher Education*, *32*, 3–18. https://doi.org/10.1007/s10755-006-9032-6

Meredith. J.H. (1963, April 19). I can't fight alone. *Look*, 70–78.

Nahapetian, A., Huynh, V., Ruvalcaba, O., Alviso, R., Melara, G. (2019). Music as the icebreaker for learning to code. In K.M. Mack, K. Winter, & M. Soto (Eds.), *Culturally responsive strategies for reforming STEM higher education: Turning the TIDES on inequity* (pp. 217-228). Emerald Publishing Limited.

National Science Board. (2024). *Science and engineering indicators 2024: The state of U.S. science and engineering* (NSB-2024-3). National Science Foundation. https://ncses.nsf.gov/pubs/nsb20243

Reinholz, D.L., Corbo, J.C., Dancy, M., & Finkelstein, N. (2017). Departmental action teams: Supporting faculty learning through departmental change. *Learning Communities Journal*, 9, 5-32.

Reinholz, D.L., Pilgrim, M.E., Falkenberg, K., Ngai, C., Quan, G., Wise, S., Geanious, C., Corbo, J.C., & Finkelstein, N. (2018). Departmental action teams: A five-year update on a model for sustainable change. *Reinvention Collaborative*. https://www.sci.sdsu.edu/crmse/msed/papers/reinholz_pilgrim_et_al_conference_paper_2018.pdf

Reinholz, D.L., Pilgrim, M.E., Corbo, J.C., & Finkelstein, N. (2019), Transforming undergraduate education from the middle out with departmental action teams. *Change: The Magazine of Higher Learning*, *51*(5), 64-70. https://doi.org/10.1080/00091383.2019.1652078

Ross, L., Krause, S., Judson, E., Hjelmstad, K., Culbertson, R., Middleton, J., Maylet, L., Hoyt, S., Hjelmstad, K. (2024), A multi-year professional development program to advance active learning pedagogical practices for engineering faculty. *Advances in Engineering Education*, *12*(1) 45-73. https://doi.org/10.18260/3-1-1153-36056

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

University of Illinois Urbana-Champaign. (2025, January 4). *Collins scholars*. https://ae3.grainger.illinois.edu/programs/collins-scholars

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge University Press.

Wieman, C. (2016). Foreword. In G. C. Weaver, W. D. Burgess, A. L. Childress, & L. Slakey (Eds.), *Transforming institutions* (pp. ix–xiv). Purdue University Press. https://doi.org/10.2307/j.ctv2x00vcx.3