# **2021 ASEE ANNUAL CONFERENCE**

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# Embracing Diversity, Equity, and Inclusion in Our Classroom and Teaching

Paper ID #34488

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Meg Handley is currently the Associate Director for Engineering Leadership Outreach at Penn State University. Previously, Meg served as the Director of the Career & Corporate Connection's office at the Smeal College of Business at Penn State University. Meg completed her PhD in Workforce Education at Penn State, where she focused on interpersonal behaviors and their impact on engineering leadership potential.

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Dr. Alisha Sarang-Sieminski is an associate dean and a professor of engineering at Olin College. They have taken a winding career path, starting with a BS in chemical engineering from MIT, moving to a PhD in bioengineering from University of Pennsylvania followed by postdoctoral work in the Biological Engineering Division at MIT. They have been at Olin College since 2015, where their work has ranged from bioengineering teaching and research, to running a senior capstone program, to academic leadership. Throughout this, a focus of their work has been to work on issues of equity and inclusion at all levels from offering individual trainings to working for institutional change.

#### Dr. John Brooks Slaughter P.E., University of Southern California

A former Director of the National Science Foundation, Chancellor of the University of Maryland, College Park, and President of Occidental College, Dr. Slaughter has served for many years as a leader in the education, engineering and scientific communities. He is well known for his commitment to increasing diversity in higher education with a special focus on the STEM disciplines. A member of the National Academy of Engineering — where he has served on the Committee on Minorities in Engineering, cochaired its Action Forum on Engineering Workforce Diversity and served two terms on the NAE Council - he is also the recipient of the Academy's Arthur M. Bueche Award in 2004. A Fellow of the American Association for the Advancement of Science, the Institute of Electrical and Electronic Engineers (IEEE), and the American Academy of Arts and Sciences, he was elected to the Tau Beta Pi honorary Engineering Society and was named Eminent Member of the Eta Kappa Nu Honorary Electrical Engineering Association. He is a member of Phi Beta Kappa and in1993, Dr. Slaughter was named to the American Society for Engineering Education Hall of Fame and was the recipient of the society's Centennial Medal. He received the UCLA Medal of Excellence in 1989, was elected to the Kansas State University Engineering Hall of Fame in 1990, received the Roger Revelle Award from the University of California, San Diego in 1991 and was named that institution's Alumnus of the Year in 1982. Dr. Slaughter, a licensed professional engineer, began his career as an electronics engineer at General Dynamics and, later, served for 15 years at the U.S. Navy Electronics Laboratory in San Diego, where he became head of the Information Systems Technology Department. He has also been director of the Applied Physics Laboratory and professor of electrical engineering at the University of Washington, Academic Vice President and Provost at Washington State

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University, the Irving R. Melbo Professor of Leadership in Education at the University of Southern California and, until his return to USC in January 2010, president and CEO of the National Action Council for Minorities in Engineering, Inc. (NACME) from August 2000 to September 2009. Among the boards of directors on which he has served are IBM, Northrop Grumman, Monsanto, Baltimore Gas and Electric Co., Sovran Bank, Union Bank, Avery Dennison, Atlantic Richfield (ARCO) and Solutia, Inc. He was appointed by President Jimmy Carter as Assistant Director and, later, as Director of the National Science Foundation and by President George W. Bush to membership on the President's Council of Advisors on Science and Technology (PCAST). Dr. Slaughter earned a Ph.D. in Engineering Science from the University of California, San Diego (UCSD), an M.S. in Engineering from the University of California, Los Angeles (UCLA) and a B.S. in Electrical Engineering from Kansas State University. He holds honorary degrees from 30 colleges and universities. Recipient of the first U.S. Black Engineer of the Year Award in 1987, Dr. Slaughter was awarded the Martin Luther King Jr. National Award in 1997. He and his wife, Dr. Ida Bernice Slaughter, herself an educational leader, have two children: a son, John Brooks Slaughter II, D.V.M., and a daughter, Ms. Jacqueline Michelle Slaughter, a university administrator and doctoral student in educational administration.

#### Dr. Meagan C. Pollock, Engineer Inclusion

Dr. Meagan Pollock envisions a world where personal and social circumstances are not obstacles to achieving potential, and where kindness, inclusivity, and conservation prevail. As an engineer turned educator for diversity, equity, and inclusion, Meagan focuses on engineering equity into education and the workforce. An international speaker, teacher, engineer, and equity leader, her mission is to provide services, tools, and resources that inspire awareness and initiate action. Learn more at EngineerInclusion.com.

#### Dr. Homero Murzi, Virginia Polytechnic Institute and State University

Homero Murzi is an Assistant Professor in the Department of Engineering Education at Virginia Tech with honorary appointments at the University of Queensland (Australia) and University of Los Andes (Venezuela). He holds degrees in Industrial Engineering (BS, MS), Master of Business Administration (MBA) and Engineering Education (PhD). Homero is the leader of the Engineering Competencies, Learning, and Inclusive Practices for Success (ECLIPS) Lab. His research focuses on contemporary and inclusive pedagogical practices, emotions in engineering, competency development, and understanding the experiences of Latinx and Native Americans in engineering from an asset-based perspective. Homero has been recognized as a Diggs Teaching Scholar, a Graduate Academy for Teaching Excellence Fellow, a Global Perspectives Fellow, a Diversity Scholar, a Fulbright Scholar, and was inducted in the Bouchet Honor Society.

#### Dr. Monica Farmer Cox, Ohio State University

Monica F. Cox, Ph.D., is Professor in the Department of Engineering Education at The Ohio State University. Prior to this appointment, she was an Associate Professor in the School of Engineering Education at Purdue University, the Inaugural Director of the College of Engineering's Leadership Minor, and the Director of the International Institute of Engineering Education Assessment (i2e2a). In 2013, she became founder and owner of STEMinent LLC, a company focused on STEM education assessment and professional development for stakeholders in K-12 education, higher education, and Corporate America. Her research is focused upon the use of mixed methodologies to explore significant research questions in undergraduate, graduate, and professional engineering education, to integrate concepts from higher education and learning science into engineering education, and to develop and disseminate reliable and valid assessment tools for use across the engineering education continuum.

# Embracing Diversity, Equity, and Inclusion in Our Classroom and Teaching

#### Abstract

Recent events have brought to light the gravity of the challenges that our society faces today relative to systemic racism and its impact on equity and access in our society. Marginalized groups face daily microaggressions and bias due to the impacts of systemic racism, sexism, homophobia, transphobia, ableism, and other forms of oppression. Recently, the NAE hosted their annual meeting and included a keynote speaker, Dr. John Slaughter, who has committed his life's work to dismantling racism specifically in engineering education. He called the organization and members to recognize the challenges that systemic racism poses for the engineering field and to take action in changing the way our students are educated. Dr. Slaughter pointed out that without an inclusive engineering workforce, we are missing viable and important solutions to engineering problems.

As engineering leadership educators, our obligation to our students extends beyond transmission of technical knowledge. We have a responsibility to infuse our curriculum with knowledge of systemic racism, how bias can impact our solutions, and how engineers can lead and create teams that foster belonging and inclusivity. We must help engineering leadership students develop a growth mindset and discover the sophistication of mind to celebrate diversity, equity, and inclusion in their daily lives, school, and workplace. This requires us to consider inclusive leadership as a foundational approach to engineering leadership development. Inclusive leadership has been shown to positively impact team performance, decision-making, collaboration, innovation, and motivation. Inclusive leaders celebrate differences and recognize and challenge attacks on DEI. As engineering leadership educators, we must lead by example, model inclusive leadership behavior, and have courage to infuse these concepts into our curriculum.

This paper assembles the collective thoughts, perspectives, insights, and experiences of a distinguished panel of educators and scholars on embracing diversity, equity, and inclusion in the classroom and teaching practices. The panel brings together people from multiple universities, different stages of their career, with interests in various areas related to DEI. It includes John Slaughter who has devoted his life to combatting racism, to scholars whose research is dedicated to teaching about DEI and creating a work environment that values DEI, and educators who have found creative ways to incorporate DEI in their instruction of engineering courses. The panel and this paper will have recommendations on why it is important to welcome DEI in our workplace and in our classrooms, how to embrace DEI in designing and delivering our courses and teaching strategies to celebrate and support DEI as we prepare students for the workforce.

# Introduction

Since its inception, engineering education has trained students to leverage the principles of mathematics and science to create the physical world that has made humans more productive, more comfortable, healthier, and more mobile, among many of the advantages and benefits we enjoy. Skyscrapers, bridges, air travel, space exploration, and communication networks, for

example, are all testaments to the technical competence and creativity that have been imbued in students by dedicated engineering professors. Regrettably, in most cases, little attention has been given to preparing engineers to design and build for our whole society, something that necessitates an understanding and appreciation for demands for social justice, both domestically and globally.

In 2008, the National Academy of Engineering produced a list of the 14 greatest engineering challenges of the 21<sup>st</sup> Century, a list developed by 18 engineers, technologists, and futurists with the goal of "making our world more sustainable, secure, healthy and joyful." The Grand Challenges for Engineering included issues such as Make Solar Energy Economical, Develop Carbon Sequestration Methods, and Secure Cyberspace. The common thread that exists through all 14 of the grand challenges is that none of them can be solved by relying on math and science alone. An education solely centered in the STEM disciplines will not be adequate for their solution. They all require a recognition on the part of the engineering profession for social consciousness and an understanding and respect for multiculturalism. Engineers must not only consider the technical and economic constraints in their designs and deliverables, they must also consider the needs, aspirations, fears, and the social conditions and status of those who will use and be affected by the artifacts that are produced. They must come to understand the impacts of the inequities in education and healthcare, the systemic racism and oppression, and the inattention to the needs of the poor and the marginalized. Among other requirements on the engineering profession, it demands a deeper and more concerted effort to take into account matters of diversity, equity, and inclusion (DEI). For the most part, these have not been present in the education of engineers. As a result, the majority of engineering professors are ill-equipped to engage in discussions of these matters with their students.

To address this reality, engineering education must begin to embrace and introduce students to some of the tenets and course content of the arts, humanities, and social sciences. There are universities today that are conducting what is known as a Grand Challenge Scholars Program in which students are prepared to achieve competencies in entrepreneurship, systems thinking, ethics, the understanding of different cultures, and the recognition that their engineering solutions must serve the purpose of contributing to the welfare of people and societies. But there are far too few institutions that are doing so. In addition, over 200 schools of engineering have pledged to become more diverse, equitable and inclusive in their enrollments at all levels and in their hiring of staff, faculty, and administrators, but evidence of meaningful change is hard to find. While there have been creditable increases in the numbers of women, there is still a paucity of African American, Latinx, and indigenous faculty members and graduate students in engineering in our major research universities.

#### Background

The work of engineering education is dedicated to making the world a better place. As educators, we are called to create classroom spaces that support this endeavor. The American Society for Engineering Education (ASEE) sets as its vision, "Excellent and broadly accessible education empowering students and engineering professionals to create a better world" [1]. Yet, often, the better world we are working to create as engineering educators is not modeled in our classrooms. Marginalized groups describe the "chilly" and unwelcoming atmosphere of

engineering spaces [2], [3], [4]. This unwelcoming culture is characterized by ineffective pedagogical approaches, microagressions, and competitiveness [5], [6], [7]. Faculty with privileged/majority identities are generally unaware of the issues minoritized populations face as well as the training available to build awareness [6]. The vision to create a better world must start with how we are educating our engineers. In an editorial in JEE, Dr. Leroy Long recently stated, "Engineering classrooms must move beyond focusing solely on technical proficiency and become places where social justice and antiracism concepts are infused into the design and implementation of the course" [7]. As engineering educators, it is our responsibility to create educational environments that are inclusive and support a welcoming atmosphere for learning and problem-solving that create a better world.

As leaders of our classroom environments and influencers of our institutions, engineering educators have a responsibility to positively impact the cultures and practices that support welcoming and inclusive engineering spaces. Inclusive leadership provides a model towards this goal. Inclusive leadership is defined by behaviors that facilitate group member belongingness and value uniqueness [8]. Inclusive leadership practices have been shown to support creativity and innovation in technical teams [9], [10], [11], [12]. The inclusive leadership model (Figure 1) focuses on leaders' meta-cognitive abilities to recognize systemic racialized problems and shift behaviors that facilitate belongingness and value unique contributions of group members. Randel, *et al.* [8] posit that these behaviors will lead to psychological safety, identification with the team and positive team and individual outcomes.



# Figure 1. Theoretical Model of Inclusive Leadership

Source: [8] Randel, et. al., 2018

This paper contributes to the call to action outlined by Dr. Long to recognize that the inequitable practices of our engineering educational institutions contribute to and are connected to our society's problematic racialized norms [7]. Through this paper we aim to explore engineering educators' responses to questions that align with Dr. Long's call to action in areas of culture, pedagogy, curriculum, and personnel. Further, we analyze the answers through the lens of inclusive leadership in an effort to identify specific behaviors for engineering educators to begin

shifting towards cultures that support diversity, equity, and inclusion. For engineering leadership educators, inclusive leadership theory can be applied in course curriculum to support the development of engineering leaders who practice inclusive leadership behaviors.

# Key Terms Source: [13] EngineerInclusion.com

*Diversity:* Diversity means variety. In theory, it's the inclusion of different types of people in a group or organization (such as people of different races or cultures). However simply inviting people in, isn't inclusion. Typically, when we think of diversity from an organizational standpoint, we think of race, gender, sexuality, (dis)ability, neurodiversity, or personality, to name a few distinguishing identities. Diversity can be represented by a multitude of intersecting identities, different ways of knowing and doing, and cultural norms and values.

*Equity:* In education, the term equity refers to the principle of fairness. While it is often used interchangeably with the related principle of equality, equity encompasses a wide variety of educational models, programs, and strategies that may be considered fair, but not necessarily equal. Equity compensates for systemic inequalities, and it is an explicit effort to level the playing field with the goal of reaching equality.

*Inclusion:* Inclusion is the practice or policy of providing equal access to opportunities and resources for people who might otherwise be excluded or marginalized. When we focus on inclusion we remove institutional barriers, seek and celebrate diversity, and create a culture and climate that allows every person to be their true, authentic self.

*Marginalized Groups*: Marginalization is the treatment of a person, group, or concept as insignificant or peripheral. Marginalized groups refer to individuals who are consistently confined to the lower or peripheral edges of society or groups, because they are commonly seen as different from perceived norms and dominant cultures. They often experience disadvantage and discrimination that stem from systemic social inequalities and injustices. However, unintentional microinequities in interpersonal relationships can also cause marginalization. For example, women and people of color are marginalized groups in STEM careers, and, as a result, underrepresented.

*Privilege*: Privilege is a special right, advantage, or immunity granted or available only to a particular person or group. Privilege is characteristically invisible to people who have it. People in dominant groups may believe that they have earned the privileges they enjoy or that everyone could access these privileges if only they worked to achieve them. However, privileges are unearned, and they are granted to people in the dominant groups whether they want those privileges or not. Privilege operates on personal, interpersonal, cultural, and institutional levels, thus creating systems of advantage.

*Systems of Oppression*: Oppression is the combination of prejudice and power which creates a system that discriminates against some groups and benefits other groups. Examples of these systems are racism, sexism, heterosexism, ableism, classism, ageism, and anti-Semitism. Systems of oppression enable dominant groups to exert control over non-dominant groups by

limiting their rights, freedom, and access to basic resources such as health care, education, employment, and housing. There are four types of oppression: ideological, interpersonal, institutional, and internalized. These systems overlap and interact. Systems of oppression are designed by people, and upheld by people.

# Methodology

The executive team of the Engineering Leadership Development Division (LEAD) of ASEE recognizes the need for teaching about DEI and integrating it into the classroom for educating the engineers of tomorrow. This prompted LEAD to propose and organize a discussion panel session at the 2021 ASEE Annual Conference to address this important issue and to contribute to the advancement and promotion of integrating DEI in classroom instruction, with a focus on practice and effecting change at individual through institutional levels.

Goals for this panel were the following:

- Learn about diversity, equity, and inclusion and why it is important to welcome DEI in our workplace and in our classroom.
- Learn what we must do as educators to embrace DEI when designing and delivering our courses.
- Learn strategies to teach students to celebrate and support DEI to prepare them for the workforce.

A panel discussion can be a powerful event capable of enticing the audience to engage in and become enthused about the conversation as it promotes exchange of ideas, and surfaces notions of agreement and disagreement among the discussants as they reveal their position on the subject. However, a disadvantage of a panel session is that generally the great conversations and contributions of the panelists during the event are not documented, and hence are not accessible for use and review at a future time by other scholars and practitioners. Therefore, it was decided to collect the responses of each panelist in written form and to assemble the entirety of their collective thoughts and perspectives in the form of an edited paper.

The goal was to identify a group of educators who actively advocate, research, and practice DEI. Naturally, the first idea was to invite present and past chairs of ASEE Commission on Diversity, Equity, and Inclusion (CDEI). An abundance of skill, experience, and expertise on the subject and practice of DEI is credited and attributed to that distinguished group. However, a majority of individuals who comprise that team are white women. It would be antithetical to the core of this panel if members of it would not come from diverse backgrounds.

Another consideration was a desire for the panel to address implementation challenges that exist both at the organizational level and in the classroom. However, engaging and challenging students with DEI issues and to teach and incorporate it in the classroom can only be realized if the organizational culture is ripe and ready for accepting DEI, teaching it, and demanding it to be a part of engineering education by creating nurturing environments and processes to facilitate it. For these reasons, individuals who actively conducted, offered, and presented CDEI workshops in 2020 were the working population for this panel. A listing of the recorded sessions of all workshops is at: <a href="https://www.youtube.com/playlist?list=PLAEXutn4naklU4iALWIqbGecvcFd-EJGb">https://www.youtube.com/playlist?list=PLAEXutn4naklU4iALWIqbGecvcFd-EJGb</a>. From that list, a diverse group of individuals was selected and contacted to solicit participation on the panel. Attention was also paid to including individuals serving in different roles at their institutions and at different stages of their academic careers. For that reason, people identified as faculty, department chair, dean, and associate dean were invited to serve as panelists. Also invited was a consultant with expertise in DEI. Additionally, the moderators extended an invitation to a prominent national figure and advocate of DEI who is a long-time champion for ending racism in engineering education and profession, who graciously accepted to serve on the panel and contribute to this paper. Panelists are:

- Dr. Monica Cox; Professor and Chair, Engineering Education (The Ohio State University)
- Dr. Homero Murzi; Assistant Professor, Engineering Education (Virginia Tech)
- Dr. Meagan Pollock; Founder and Chief Inclusion Engineer (Engineer Inclusion)
- Dr. Alisha Sarang-Sieminski; Dean of the College and Professor of Engineering (Olin College)
- Dr. John Brooks Slaughter; Professor, Education and Engineering (University of Sothern California)

While one panelist did not reply, all others responded affirmatively to the question whether they would document their response to all questions for the purpose of publishing this edited paper. Using the pre-determined goals of the panel session (provided previously in bulleted form), the two panel moderators prepared an initial list of eight questions. The list was distributed to the panel for their review and comments, which resulted in two additional questions. The entire list is shown in Exhibit 1. Question 5 was added by one panelist and Question 8 is consolidation of suggestions made by two other panelists.

The complete questions list, description for the panel, and list of panelists were emailed to the entire group with a request to provide their written responses by January 8, 2021. With the timeline adjusted to January 31, Dr. Slaughter provided an essay and other panelists provided their responses to some or all questions which were used in preparing this paper.

| 1 | How does a DEI mindset impact engineering education and learning strategies in                |
|---|---|
|   | classrooms?   |
| 2 | Describe your DEI philosophy as it applies to the college classroom environment and           |
|   | teaching?   |
| 3 | Describe a time where you implemented a DEI strategy in the classroom. What made is           |
|   | successful or unsuccessful and why? What makes incorporating DEI into engineering             |
|   | classrooms so difficult?  |
| 4 | What are some strategies that you have personally used to "teach" DEI and incorporate it      |
|   | as part of your instruction, including in the technical subjects that you teach? Explain what |
|   | makes those strategies successful?  |
| 5 | How do we engage a student who is resistant to, opposed to, or just not interested, in DEI    |
|   | training?   |
| 6 | Whose responsibility is it to teach DEI to engineering students? Describe an ideal DEI        |
|   | course or program for engineering students.   |

#### **Exhibit 1: Panel Questions**

| 7  | What is needed to support engineering faculty to implement DEI in the classroom?          |
|----|---|
| 8  | How can (should) institutions better support a climate where DEI issues are important and |
|    | considered?   |
| 9  | How do we know if the faculty are prepared and equipped to address these issues in the    |
|    | classroom? What characteristics or behaviors are indicative of that?                      |
| 10 | Explain how knowledge and behaviors in DEI are important for engineering leaders.         |

Once responses were received, the panel moderators compiled them into a single paper, using panelists' responses as originally written. One panelist's responses were more general and long-form and panel moderators proposed to the group that they serve as the basis of the introduction. Panel moderators drafted summaries of each question and a methods section. The complete draft was then presented to the group of panelists for review. The group collaboratively edited the final work. Question responses continue to represent the original words of panelists, with minimal editing only for clarity. Positioning of the work (Introduction), and summaries of individual questions, Discussion, Recommendations, and Conclusions represent the collective views of all authors.

# Findings

*Question 1: How does a DEI mindset impact engineering education and learning strategies in classrooms?* 

# Q1: Homero Murzi

DEI has a direct impact on learning. Ambrose, et al., [14] explain that an important aspect of learning is the learner's ability to connect new knowledge to their previous experiences. Due to the U.S. education system's tendency to prioritize the cultural backgrounds of dominant groups (e.g., white male), DEI becomes critical for producing positive academic results for many constituents who are not often placed at the center of learning. Not only recognizing cultural, racial, linguistic, and economic diversity in engineering classrooms is important, but it is also important to value those differences. Moreover, the implementation of teaching practices that recognize DEI, like culturally responsive teaching (CRT) has proven to promote educational excellence for **all** students – the minoritized and non-minoritized, the marginalized and the mainstream, the privileged and the underprivileged. Gay [15] considers the implementation of CRT to be an urgent educational need in the United States (U.S.) because of the "*patterns of disproportionate underachievement for some segments of the African, Native, Latino, and Asian American student populations*" (p. 276).

To promote equity in engineering classrooms and recognize the growing number of diverse students in the U.S., Bonner, Warren, & Jiang [16] emphasized the need for changes at all levels of education in serving such diverse students, particularly in the classroom. Speaking to the STEM fields specifically, Garvin-Hudson & Jackson [17] emphasized that the increasing diversity in today's schools also makes it imperative that science classrooms adjust to meet their educational needs. STEM fields are expected to have considerable growth that will impact the economy. Despite demands by stakeholders and federal investment to diversify student populations entering STEM fields, reaching and engaging students from marginalized

communities continues to be challenging. Part of the problem in engineering education is the focus on attracting diverse students and the lack of focus on retaining and making engineering programs more inclusive and equitable for all students.

# Q1: Alisha Sarang-Sieminski

A DEI mindset means that instructors and curriculum designers are thinking about who might be in the room and about barriers to access. It means that instructors understand that the norms and invocation of dominant culture and identities can be a barrier to access, in and of themselves, by reinforcing ideas that people of color, women, people with disabilities, first-generation college students, and others with non-dominant identities do not belong. For those holding dominant identities, internalizing that understanding means examining and unpacking the ways that they take norms for granted and experience them as frictionless in order to recognize the subtle and overt ways that they reinforce those norms. For those with minoritized identities, it means finding ways to remain grounded in a sense of belonging.

A DEI mindset also means that multiple ways of knowing, learning, and seeing the world are recognized, valued, and seen as valid. In an ideal world, this goes beyond thinking about representation (which can become tokenizing); rather, it means to truly appreciate a diversity of perspectives that are derived from different lived experiences.

The impact of leading with a DEI mindset to create inclusive learning environments is that students (and instructors) become whole people who can bring their perspectives and experiences to each subject. In turn, this lends itself to a more contextually-based approach to engineering. When technical subjects are not divorced from the lived world, they can become rich with context, meaning, and history. This can result in an engineering education culture that is inclusive to a broader set of students and engineers who are broadly critical thinkers and thinking about context and consequences.

# Q1: Meagan Pollock

A DEI mindset is mostly useless unless it results in action that serves students. An engineering educator with a DEI mindset is someone who 1) holds values that DEI is intrinsic to quality education, 2) intentionally facilitates learning with inclusive and equitable pedagogical strategies, 3) is a guardian of the class culture, 4) is a lifelong learner when it comes to examining and reducing stereotypes and bias, 5) listens actively and empathically to all students, and 6) is agile in their methods, adjusting to meet the needs of every student. When all of these things are in place, students will learn more and are more likely to feel like they belong.

# Summary for Question 1

Recognizing the diverse backgrounds of students in the classroom and their varied experiences, challenges, and learning needs enables educators to use instructional methods and strategies that reach a wide range of individuals and enable them to contribute their unique and valuable perspectives to the learning environment. Educators with a DEI mindset are cognizant of the worth and value of DEI in the classroom. They are inclusive and equitable in their teaching,

manage the classroom culture to cultivate and promote DEI, strive to continually grow and learn how to reduce biases and stereotypes, and are agile and flexible in the classroom to meet the needs of all students.

### Take Action:

- Developing a DEI mindset is an ongoing journey. Create or join a learning group to support your personal and professional growth. The ASEE CDEI offers opportunities to do so. (https://diversity.asee.org/deicommittee/)
- Read: Pawley, A.L. (2017), Shifting the "Default": The Case for Making Diversity the Expected Condition for Engineering Education and Making Whiteness and Maleness Visible. J. Eng. Educ., 106: 531-533. https://doi.org/10.1002/jee.20181

*Question 2: Describe your DEI philosophy as it applies to the college classroom environment and teaching?* 

#### Q2: Homero Murzi

Most of my teaching practices are focused on inclusive pedagogy and culturally responsive teaching. I consider that in order to promote deep, transferable knowledge in engineering it is important that students feel safe to learn and their backgrounds and previous experiences are valued. To do that, I take time to know my students, learn about their lived experiences. I also spend time sharing my own personal experiences and my positionality. Sharing who I am and bringing my own teaching self into the classroom has helped me create more inclusive learning environments. I also work as the chair of the equity and inclusion committee in my department where I try to create institutional work to eliminate systematic racism from academic institutions. From my own experience, I think DEI issues need to be considered holistically and they are part of who I am as an academic, hence, they are present in my teaching, research, service, and mentoring.

# Q2: Alisha Sarang-Sieminski

My approach to DEI is to think about power and barriers to access. This approach necessitates thinking about larger cultural structures and the lived experiences of the people in the educational environment. To do this represents a real shift in how we have historically approached engineering education (i.e., objective and largely unconcerned with cultural baggage) and our relationships to it as educators, who have not been trained to think, let alone teach, in this way. On a practical level, my philosophy is to continuously bring DEI into our collective consciousness as educators and to make change accessible - by both breaking down concepts and offering concrete interventions and changes. This is long, slow work and takes patience. It will also require us to hold ourselves accountable to making real changes.

Long-term, it will ultimately mean grappling with the foundations of higher education in a power structure meant to maintain power among small, privileged groups, while excluding others and what it means to create an equitable education system. Invoking Audre Lorde, at some point we

will have to examine whether we can use the "master's tools" to "dismantle the master's house" [18].

# Q2: Meagan Pollock

There is a cultural boundary that defines engineering [19]. The boundary is a result of the historical status quo applied from those within the boundary and stereotypes applied from those outside the boundary, creating a rigidity that is in paradox with innovation, creativity, and inclusivity. In *The Courage to Teach*, Parker Palmer describes the paradoxical tensions in the teaching and learning space: "If boundaries remind us that our journey has a destination, openness reminds us that there are many ways to reach that end. Deeper still, the openness of a learning space reminds us that the destination we plotted at the outset of the journey may not be the one we will reach, that we must stay alert for clues to our true destination as we travel together ([20], pp. 74 – 75). An engineering education that is situated in openness allows an amorphous boundary that is ever-shifting and expanding to be inclusive of every type of student, instead of requiring students to find their way in an inaccessible and inequitable space. As an educator, I must create a learning environment, curriculum, and experiences that encourage a pluralistic mentality and structure my systems – policies and assessments – to accept its result.

#### Summary for Question 2

Application of a DEI philosophy in the classroom requires engineering educators to create safe spaces where both the student and the faculty bring their entire selves to the environment. Who we are, our identities and experiences, should be a part of our teaching, research and service. Further, it is important to recognize the power structures by which engineering educators operate to include the larger university system and the individual classroom. To grapple and then dismantle these power structures create safe spaces for learning by expanding our consciousness to include the experiences of the other, ultimately creating an openness to all types of learner needs and learner experiences.

#### Take Action:

- Write a personal DEI philosophy statement and share it.
- Learn about power structures and how they create both systems of advantage and systems of disadvantage. Once you begin to understand how these structures and systems work, develop a practice of thoughtfully examining the ways in which they marginalize students, or create barriers for minoritized students in every policy, practice, or normative assumption.

Question 3: Describe a time where you implemented a DEI strategy in the classroom. What made it successful or unsuccessful and why? What makes incorporating DEI into engineering classrooms so difficult?

# Q3: Homero Murzi

One example of implementing DEI into the classroom is by bringing examples from different cultural places. I teach a foundations of engineering course in a first-year general engineering

program at a large research technical institution. One example that always comes to mind is a product that help kids to drink water from the sink. I have students working in teams and ask them to be an engineering team with the task of making an upgrade to the product before we expand our sales to Canada and Mexico, our company goal is to dominate North America. Most students focus on the materials of the product, their functionality, etc. However, when the team has an international student from a developing country, they push back on bringing this product to Mexico, because people can't drink water from the sink in the country. This is something students in the U.S. most never think about. We do this practice to discuss the importance of recognizing that our views are not the only valid views and that even in engineering it is really important to recognize differences and value them as part of our design processes. I think the exercise is successful because of the great discussions happening after it. I have had international students telling me that that was the first time in their college experience where they felt that their ideas had value and they could contribute to the engineering field. Similarly, I have had U.S. students discussing how eye opening the exercise was.

I think what makes it difficult to incorporate DEI into engineering classrooms is that the majority of faculty members don't have pedagogical training. Most faculty members in engineering spend time doing a PhD that is mostly focused on research and have minimum exposure to pedagogy. Hence, when they are faced with teaching engineering topics, they will try to do it the way they learnt it. Since engineering have been culturally and traditionally dominated by white males, in the past they didn't feel like there was a need to consider DEI issues, hence, engineering programs are perpetuating a dominant culture and a way of teaching engineering that does not recognize nor value cultural, racial, linguistic, and economic differences.

#### Q3: Alisha Sarang-Sieminski

Drawing on the idea of stereotype threat developed by Claude Steele [21] and others, I think about how students' ability to thrive and succeed is impacted by their sense of belonging. My own work in the classroom falls into 2 categories. First is what I think of as creating an accessible and inclusive environment. This comes through intentional work in the course design and syllabus to make the environment welcoming to all students, calling out some of those elements, and signaling that I'm open to feedback and iteration. This starts with things like including accessibility and DEI statements on syllabi, using pronouns, talking a little about my background, identities, and acknowledging that I hold a certain perspective that is not the only one. Second is what I think of as the course content. This comes in different forms depending upon the course, but often includes explicitly noting whose work we are talking about, and noting when historical contributors hold dominant identities, as well as intentionally including examples from non-white or non-male people in STEM. I teach bioengineering and design courses, which also offer ample opportunity to talk about ethics by using historical examples of exclusion and abuse rooted in racism, sexism, and other forms of oppression.

The thing that makes incorporating DEI into engineering classrooms so difficult is that we (meaning most engineering educators) don't know how to do it. Not only do we largely lack formal pedagogical training but also the vast majority of us were not trained this way and we have few models for what it looks like in practice. Even for folks who are deeply thinking about equity and inclusion in their "other" lives, incorporating it is hard. It requires humility to know that it is a long, slow process, and not an endpoint.

#### Q3: Monica Cox

I included an assignment in a graduate engineering course that connected to DEI issues. Students had to engage with engineering course content and identify how it applied to diverse students and experiences. This infusion was successful because the course was populated with mature students who cared about the topic.

#### Summary for Question 3

To effectively integrate DEI into a classroom requires it to be an intentional part of the course design process that is infused throughout. The course syllabus documents course rules and policies and is a great venue to communicate the worth and value placed on DEI by including a statement on DEI, encouraging the use of pronouns, and assuring everyone of a safe place where everyone's views and contributions matter.

A popular approach is to use examples that highlight differences in cultures and life experiences of people across the globe with the purpose of bringing to the forefront that what some conveniences or liberties that some groups take for granted are challenges and turbulences that other groups of people experience on a routine basis. Encouraging dialog and exchange of ideas and viewpoints enables learners to identify biases in their beliefs and values and to open up their minds and views, and to be accepting and welcoming to others. Another approach is to highlight ethical considerations of a particular topic, or even evaluating the contributions made to the topic, not just by white men, but also women, people of color, and other marginalized groups.

One of the reasons for the difficulty to implement DEI in the classroom is the lack of adequate faculty training in pedagogy and successful teaching strategies. Most doctoral programs prepare future faculty as subject-matter-experts in a particular topic in their discipline. However, very few universities include mandatory instruction for Ph. D. students to learn how to be effective teachers.

#### Take Action:

- Participate in workshops that improve your teaching skills, particularly in culturally responsive ways.
- Evaluate your texts, curricula, readings, or whatever learning element is part of your course for biases. Ensure you are bringing in diverse voices and perspectives.

Question 4: What are some strategies that you have personally used to "teach" DEI and incorporate it as part of your instruction, including in the technical subjects that you teach? Explain what makes those strategies successful?

#### Q4: Homero Murzi

There are several strategies to incorporate DEI into engineering courses and I think that it is all about connecting to the things we are teaching and promoting an inclusive learning environment. For example, I think it is important to know first who is in the room. Getting to know our

students is really important. I do that by using a pre-semester survey where I ask them who they are, facts about them, where they are from, I ask them about music the listen to, movies they watch, favorite food, etc. Learning their names but also who they are is really important. Then I use that information to shape some of my class discussions and incorporate that into class examples. For example, I start every class by playing music from a playlist that contains all the students' favorite songs and we promote discussions around that. I try to incorporate as much of their experiences as I can and to demonstrate that there are no good or bad examples, there are just different examples.

I think it is also important to help students learn how their own development of racial consciousness is linked to mastery of professional competency. For example, if they were designing cars, I ask them to think about what problems they will face if they design the car for people that are exactly like them.

All these practices also demand for me to work on myself. I need to actively reflect on my race, ethnicity, and culture, identify my own biases, and continuously reflect on what that means to me and to my teaching practices. It is important to also recognize we are different and we bring unique voices to the classroom too.

I think what makes these strategies successful is that we create an inclusive and welcoming learning environment where all students feel safe to share and participate. When the atmosphere is created, we are able to have deep discussions about difficult conversations and no one feels attacked nor feel like they are forced to share their views because they represent one traditionally marginalized group. Instead, we all recognize that we are learning and we all agree to not judge anyone and to be respectful of others ideas. Also, by connecting the issues to the technical content students recognize how important these issues are and how the engineering field MUST recognize these issues and act upon them.

#### Q4: Alisha Sarang-Sieminski

A lot of my work is in educating and engaging with colleagues about the importance of creating inclusive classroom environments and in collaboratively developing concrete guidance and approaches that can be shared. A critical part of making this work successful is that many of my colleagues are deeply invested in creating inclusive learning environments already and are looking to engage in deeper conversations about how to take action. This is where I see the biggest need in the area of supporting incorporation of DEI into engineering education -- widely available materials that translate theory into actionable recommendations that those not immersed in the research can incorporate.

In addition to the strategies mentioned above, I am involved in an ongoing extracurricular discussion seminar called "Identity and Engineering" (previously "Gender and Engineering") delivered by a group of faculty and staff, which provides a place for students to go deeper into understanding the ways that our identities impact our experiences. For students who hold non-dominant identities, this is a place to synthesize some of their experiences and to name them as part of a larger cultural problem, not something that happened to them individually. Discussions about experiences in STEM across different identities also allows students to see the commonalities and differences in experience between different groups (e.g., between racism and

sexism). This space, outside of classes, is also important as a place to step back and analyze our experiences, grounded in a light foundation in the study of identity and bias in the workplace.

# Q4: Monica Cox

I use real-world DEI examples and do not tell students there is a right or wrong DEI response. I allow students to learn from each other and connect to literature and to resources that support or disprove their assumptions. The creation of a community throughout the course offers opportunities for such conversations to occur safely. Vulnerability and transparency are key in the facilitation of these conversations. This requires that instructors model courage and share their own DEI weaknesses and development so students can do the same.

# Summary for Question 4

Strategies for implementation of DEI in the classroom requires faculty that are willing to know themselves and their students. Creating safe spaces requires faculty to have courage to check their own biases and assumptions, practice self-awareness of behaviors, and have courage to share DEI experiences within the classroom. Taking time to get to know students and incorporate their identities into the classroom allows students to interact with different perspectives. This approach can then foster discussion on design that is inclusive of other identities and perspectives, an imperative lesson for students as they enter into the engineering profession. Faculty need to be willing to participate in training sessions and have courage to apply strategies to foster DEI in the classroom and we need to create more resources to share. Ultimately creating awareness of self and others is a key element of successful DEI implementation.

#### Take Action:

- Intentionally get to know your students.
- Examine your positionality. Positionality is the social and political context that creates your identity and how your identity influences and biases your perception of and outlook on the world. Positionality affects research, teaching, leading, policymaking, as well as common interactions. (Download a free resource at <a href="https://engineerinclusion.com/what-is-positionality/">https://engineerinclusion.com/what-is-positionality/</a>)
- Build self-efficacy and skill (or at least reduce fear) to be able to discuss DEI topics, especially as they relate to real-world applications of technical content.

# *Question 5: How do we engage a student who is resistant to, opposed to, or just not interested, in DEI training?*

# Q5: Homero Murzi

I think we need to create an inclusive learning environment first. As mentioned before, if we are able to create an environment where all students feel safe, and we promote healthy discussions even on hard topics, it is more likely that all students will be involved in the conversation. I also think it is important to value small steps. It is unrealistic to think that everyone will become experts in DEI; however, every step in the right direction is a gain. It is important to focus our

conversations on the problems with the systems and move away from identifying people as the problem. Including some self-reflection as part of assignments is helpful too. If students must reflect on why they do not care about this issue, that can be a great opportunity for them to grow in this space.

# Q5: Alisha Sarang-Sieminski

While generally the "objectivity of engineering" may create barriers to incorporating DEI training, engineering students have an affinity for and propensity to explore effective problemsolving strategies. Hence, an approach that might be effective for students who are somewhat open to thinking about DEI but do not see why it is relevant, is to leverage preparation for "the real world" of the future workforce and to frame the worth and value of DEI as an opportunity to bring multiple perspectives together for the purpose of improving the problem-solving process.

As (if?) the culture shifts and being fluent in ideas of cultural competency and thinking about equity become the norm, there will be a motivation to learn and incorporate these concepts. For example, many tech companies are striving to be more inclusive to people of color, women, people with disabilities, etc. Companies like Microsoft are working to incorporate thinking about accessibility for people with disabilities throughout the organization; experience in this space is a competitive advantage in hiring and training on designing for accessibility is part of onboarding. While they are not always "getting it right," movement in this direction will pull academic culture forward.

# Q5: Monica Cox

Students should be reminded that, as engineers, they will meet and work with people whose perspectives, experiences, and backgrounds differ from their own. It is vital to focus on communication and on the production of engineering deliverables that advance society. For that reason, framing DEI training as a tool to advance the profession is vital.

# Summary for Question 5

Forcing someone to engage with DEI is not recommended as the experience may cause resentment and a guarded response. However, generally speaking, creating an inclusive environment in which all feel safe, valued, and appreciated is the best approach to engage students who are resistant to or not interested in DEI. This includes taking small steps, rather than placing grand expectations on some. Frame the dialog so that system changes are considered rather than singling out individuals as the focus of the conversation. A great learning opportunity is self-reflection as part of assignments for students to consider why they don't care about this matter, or if they do care already how they can advocate for DEI in their personal and professional lives.

Perhaps the most effective way is to remind students of the pragmatic advantage of being sensitive and welcoming to DEI. Engineering students are generally practical and logical by nature and training. The knowledge that diverse teams are better problem solvers and that employers value those who are able to work and communicate well with people from varied backgrounds and experiences, can be enticing enough for students to practice DEI.

#### Take Action:

- Incorporate self-reflection into assignments.
- To learn how to better facilitate tough conversations, read *Lemons to Lemonade: Resolving Problems in Meetings, Workshops, and PLCs* by Garmston and Zimmerman.

*Question 6: Whose responsibility is it to teach DEI to engineering students? Describe an ideal DEI course or program for engineering students.* 

#### Q6: Homero Murzi

I think everyone is responsible for teaching DEI to engineering students. This is a problem in our country; DEI should be part of everything we do. I do not think there is an ideal DEI course or program for engineering students. I believe a big part of the problem is that we keep trying to teach this issue in isolation from their engineering courses. Therefore, many students place less value on it. DEI must be incorporated into the engineering curriculum at every level. I find the issue of DEI in a similar situation to that of ethics in engineering. They are both regarded as something that we try to teach with an extra course, an additional lecture, or with online training. These issues are really important in engineering and society and I believe they should be incorporated in first-year engineering programs, in sophomore technical courses, in junior projects, and they should be one of the most important aspects of Capstone design projects.

### Q6: Alisha Sarang-Sieminski

In an ideal world, considering and actively working towards diversity, equity, and inclusion should be a through line integrated into the institutional culture (admissions, hiring, decision making, etc.) and the curriculum. As the people directly responsible for students' academic education, faculty are responsible. As the people responsible for development of students, student life staff are also an integral part of this education. In my dream world, faculty and student life staff members would collaborate on this aspect of student development. An added benefit of such collaboration is that student life professionals generally have more training in DEI and student development than faculty; hence they can be a valuable resource for faculty development.

# Q6: Meagan Pollock

DEI should not be additive to education or relegated to workshops and seminars. DEI should be part of the school, department, and educators' core values such that it drives a culture of collective responsibility to produce a future workforce that values the same. As educators, we either commit to serving all students or implicitly choose only to serve a few. Educators who make the latter choice should be held accountable for that choice.

#### Summary for Question 6

Everyone within the educational system has a responsibility to teach DEI to students. From administration, student life, to individual faculty, DEI education should be a part of a holistic approach to university students' education. DEI tends to be taught in isolation from curriculum. It is almost positioned as, this is something you should learn about instead of this is something imperative, a must, to learn about. Specifically, for engineering educators, a lack of integration into the curriculum is a disservice to our future workforce. Like ethics, DEI is an important society element of engineering, and must be required in order to educate future engineers who solve problems with the other in mind.

#### Take Action:

- Assess the culture of the organization to determine how DEI is prioritized and in what ways
- While there are likely a multitude of papers across ASEE's divisions and journals with examples of curricular integration, consider exploring the following groups for ideas: Equity, Cultural & Social Justice in Education Constituent Committee, Liberal Education/Engineering & Society Division, Minorities in Engineering, or the Women in Engineering Division

# Question 7: What is needed to support engineering faculty to implement DEI in the classroom?

# Q7: Homero Murzi

Resources and representation. We need resources to ensure everyone is appropriately trained on DEI issues, and on inclusive pedagogy. We need resources to promote initiatives, not only to attract diverse students but to create programs that support them and help them succeed in their engineering programs. We also need representation of more faculty members that are not part of the majority group (white male), so students from traditionally marginalized populations can find role models that look like them, to promote and encourage continued research on issues of DEI.

# Q7: Alisha Sarang-Sieminski

Educators want to be successful at educating students. That is their goal. Thus, my approach to engaging those who are not already invested in DEI is not to tell them to incorporate it because it is the right thing to do (which it is), but because it will make them more effective as educators. They will reach more students. As previously mentioned, it is equally important to talk about systems in order to understand that the individual engineering classroom filled with students and faculty are not in a vacuum, separate from cultural context and history. The biggest key, though, is providing actionable approaches, templates, and examples, of varying sizes, from small strategies to employ within an existing class to overall course or curricular change. In summary, there needs to be a will and the tools to do it.

#### Q7: Monica Cox

In the same way that the National Academy of Engineering identified personalized learning as an engineering grand challenge, organizations need to implement personalized training for engineering faculty. Such training allows people to learn and grow at their own pace without embarrassment since there is no one-size-fits-all DEI pedagogical model.

#### Summary for Question 7

Engineering schools must tap into the natural desire of educators to be effective teachers and tell engineering faculty that they can expand their reach and be better teachers for the whole population of students in their classes if they are sensitive to and practice DEI in their classrooms.

Another requirement is resources. Faculty must learn how to pedagogically create inclusive learning classrooms for their students which calls for training. Faculty must learn and have access and the opportunity to adopt actionable approaches, templates, and examples. They must learn to incorporate small and large practices in their small and large classes.

The role that the system plays in this endeavor must not be overlooked because institutional and departmental systems can make or break it. A must-change that can only come about by systematic changes is to curb hiring practices that favor the historical white, male persona of an engineer and to increase representation by recruiting diverse students and faculty. Holding symposia, inviting guest lecturers, and conducting faculty retreats with the sole subject of DEI, creating awards dedicated to DEI in teaching, and promoting a positive climate in which DEI is on top agenda item can pave the way, remove resistance, and encourage interest and involvement.

#### Take Action:

- ASEE has a variety of initiatives and resources related to diversity and inclusion. (<u>https://diversity.asee.org</u> and https://resources.asee.org)

# *Question 8: How can (should) institutions better support a climate where DEI issues are important and considered?*

#### Q8: Homero Murzi

I think institutions can help by addressing the institutional systemic issues of racism present in higher education. At the institutional level, it is important to recognize DEI issues as part of promotion and tenure processes. It is important to recognize DEI issues as part of teaching evaluations. It is important to recognize DEI issues as part of research portfolios. If we don't place importance on the things institutions show as valuable, faculty members won't be motivated to engage in these issues. Institutions need to be able to recognize that implementation of programs to recruit minorities into college, and committees on equity and inclusion are not enough. DEI issues must be present in everything we do as part of our

research, teaching, service, and advising and we need programs that help students succeed and move to the next level.

### Q8: Alisha Sarang-Sieminski

This has been said a million times, but it has to come from the leadership -- presidents, deans, etc. And the belief and message that DEI is integral to the work that we do has to be sincere and not performative. It has to be internally focused -- how does our organization and culture support inclusion, equity, and belonging -- and not just externally focused on how we educate our students to do good in the world. Leaders have to be willing to look in the mirror for the institution, to have humility, and to create real, sustainable change. All of this takes work and most people were not trained to do this work -- so institutions and their individuals need to put in the effort to learn about best practices and to make change.

At the faculty level, academic leadership needs to convey that understanding and incorporating DEI into teaching and other faculty work IS the work, even in engineering. And then to provide resources for faculty, many of whom were not trained with this mindset, to learn how to incorporate DEI thinking into their work. Additionally, the evaluation system for faculty has to move from penalizing DEI work (as is currently the case for the primarily BIPOC and women faculty doing it) to rewarding and incentivizing it as part of the work that faculty do.

# **Q8: Meagan Pollock**

A 3D printer prints what it is programmed to print. Our systems create what we programmed them to create. If our output doesn't match what we desire, how are we changing the system to facilitate an improved output? Climate is a function of the system and the people that hold it up. If we want DEI issues to be considered important, how does the system support that output? It's fair to say that most engineering professors are engineers who should have systemic thinking skills. How can you influence the system around you to create the climate you desire?

# Summary for Question 8

The commitment to DEI starts at the top. Leadership in higher education institutions have a responsibility to value and incentivize efforts towards DEI in the classroom and particularly in the tenure track process. DEI issues show up in every area of faculty performance, to include promotion and tenure, evaluations of teaching, research, and recruitment/hiring. A willingness to look in the mirror and ask, are we as an institution accomplishing what we say we want to accomplish or merely producing performative statements for austerity? As a system or an individual, your results show what you are committed to. The work to incorporate DEI requires an inward look and a commitment to doing the hard work to train ourselves and dismantle the systems that perpetuate bias and racism. Leadership is central towards this realization specifically in creating action that value DEI work in engineering classrooms, research, and service.

#### Take Action:

- Read: *How to Be an Inclusive Leader: Your Role in Creating Cultures of Belonging Where Everyone Can Thrive*, by Jennifer Brown

*Question 9: How do we know if the faculty are prepared and equipped to address these issues in the classroom? What characteristics or behaviors are indicative of that?* 

# Q9: Homero Murzi

I think we can observe departmental culture. I also think we can observe behaviors of faculty members. However, I think if institutions want to know if faculty members are prepared on DEI issues, they would need to take a more active role. There are different ways to do that. Climate surveys are one way, conducting focus groups or individual interviews, implementing systems where people can share their thoughts anonymously. That being said, since issues of DEI are so complex, I would assume most departments have faculty members that are at different levels of comfort, training, and knowledge. So, I would start by creating training programs that assume everyone is starting from zero.

# Q9: Alisha Sarang-Sieminski

We know that faculty are largely under-prepared now and that learning about DEI is life-long work. It is large-scale systems change that takes time. It is an iterative process involving attempts (prototyping), feedback (testing), reflection (learning from mistakes), and revised approaches. Thus, the characteristics indicative of being prepared are humility and the conviction and the will necessary to maintain a sustained effort in work that is deeply challenging. The supports needed to foster and maintain this are a leadership that prioritizes and rewards this work and continued affirmation that each step is valuable, even when there is more to do.

# Summary for Question 9

Practicing DEI and including it in one's instruction greatly rides on the institutional and departmental culture. To that end, administrators may conduct climate surveys, focus group studies, or individual interviews to gauge faculty preparedness. However, due to the inherent complexity of DEI and the fact that it must be a life-long endeavor, different people have different training, knowledge, and experience with DEI. Hence, it is advisable for institutions to create training programs that start with the basics for the novice and then form a tiered structure for increased complexity and use by the skilled.

To learn about and practice DEI takes time and is an iterative process. One must create a plan for implementation, test it out, collect feedback, reflect on the outcomes, learn from their mistakes, and try again. This type of learning requires humility, persistence, and dedication to gradually getting better at something that is quite challenging. It requires emotional intelligence and the ability to criticize oneself for the purpose of improvement. Therefore, personality tests and assessments and a discussion of the results with the individual will be quite helpful and are recommended.

# Take Action:

- Tune into, host, or watch a recording of webinars like the ASEE CDEI's DEI 100 and 200 sessions. (https://diversity.asee.org/deicommittee/)

- Explore the resources and recommendations by Black Engineering Faculty Engineering Speak (<u>https://blackinengineering.org/</u>)

Question 10: Explain how knowledge and behaviors in DEI are important for engineering leaders.

# Q10: Homero Murzi

I think leaders are the ones in charge of promoting change and implementing policies. If we want DEI issues to be better in the future, we need people in positions of power to recognize the importance of these issues and to start acting from an institutional level to eliminate systematic racism and to implement policies and practices that have DEI as a priority.

#### Q10: Alisha Sarang-Sieminski

As described previously, leadership plays a critical role in promoting DEI in engineering education. They set the tone, the direction, and are a model for their own organizations as well as others. And they are at the highest risk of approaching DEI as a status marker of "doing good", making it performative without real action. Thus, the work of leadership is to engage in the self and organizational work necessary to allow them to foster and promote real equity, inclusion, and belonging.

### Q10: Meagan Pollock

In her 2021 inaugural poem, Amanda Gorman said: "There is always light. If only we are brave enough to *see* it. If only we are brave enough to *be* it." When it comes to DEI, awareness is not enough. We must take action to change our behavior and the behavior of our systems and institutions. We must learn to see (knowledge) and be (behaviors) and choose to be brave and lead others to do the same.

For many of us from the dominant culture, it means listening - really listening - to marginalized and minoritized people. It means not reacting with our platitudes of intent and goodness but instead humbly championing historically silenced voices. I've seen far too many people step up as DEI leaders but remain not open, though perhaps unintentionally, to marginalized individuals' feedback, myself likely included. Engineering leaders must develop a lens through which they view every decision, always asking, "Who is best served by this? What else might be true? Whose voice is missing? and What am I going to do about it?"

#### Summary for Question 10

As mentioned previously, leaders drive this work. A leader builds awareness and knowledge of DEI issues. They listen and ask the tough questions. They model a commitment to DEI initiatives and are brave to ask the tough questions and demand change. Engineering leaders can practice these leadership behaviors at all levels of an institution to support a more diverse, equitable, and inclusive organization.

#### Take Action:

- Listen and learn from marginalized and minoritized populations. Practice really listening and truly hearing their stories and experiences.
- The ASEE Diversity Recognition Program (ADRP) was created to publicly recognize those engineering and engineering technology colleges that make significant, measurable progress in increasing the diversity, inclusion, and degree attainment outcomes of their programs. (<u>https://diversityrecognition.asee.org/</u>
- Explore resources by the ASEE EDGE Engineering Deans Gender Equity Initiative (<u>https://edge.asee.org/</u> or https://resources.asee.org/course\_catalog/egde\_initiative/)

#### Discussion

The panel of experts imparted wisdom from their experiences in working within an academic setting to foster DEI in the classroom and in administration. These responses, when viewed through the lens of inclusive leadership allow us to see how we may be able to begin our own journeys in practicing inclusive leadership behaviors and ultimately creating the DEI spaces we so desperately need. The inclusive leadership theory posited by Randel et al. [8] suggests that individual difference factors contribute to the propensity that an individual would practice inclusive leadership behaviors' responses, examples, and suggestions resonated within the individual difference factors of pro-diversity beliefs, humility, and cognitive complexity.

Pro-diversity beliefs suggest that an individual views diversity in a positive light and has had experiences that have provided exposure to other social identity groups. Thinking about who might be in a classroom or group when creating curriculum, creating time to learn about each other's lived experiences, and acknowledging powers and barriers to access were all examples of pro-diversity belief. One panelist, Meagan Pollock, exemplified pro-diversity beliefs by describing a philosophy of openness that "allows an amorphous boundary that is ever shifting and expanding to be inclusive of every type of student...". This pro-diversity mindset recognizes the value of diversity and the power of group differences.

Humility as an individual difference factor requires a high level of self-awareness, empathy, and seeing uniqueness as non-threatening. Panelists discussed life-long learning, active listening, and agility that align with humility as an individual difference factor. Further, practicing openness to feedback, self-awareness of bias, and reflection on personal perspectives provide opportunities to share "DEI weaknesses and developmental areas," as noted by Monica Cox.

Cognitive complexity signifies an ability to "perceive the behaviors of social information of others in a multidimensional manner" ([8], p. 197). One panelist, Alisha Sarang-Sieminski, described DEI mindsets as being able to recognize differences in the classroom which include multiple ways of knowing, learning and seeing the world. In fact, this area of perception within engineering was noted as lacking due to the white male dominated engineering culture. As the dominant way of teaching engineering, the multi-dimensional aspect of cognitive complexity is lost under a dominant cultural norm. Panelists pointed out that a systems-view of the problem

can help foster conversations to shift towards cognitive complexity that acknowledges this onedimensional view of engineering education.

Applying individual difference factors at the systemic level supports inclusive leadership across academia and creates the culture change needed for successful integration of DEI in the engineering classrooms. Answers to questions six through ten, recognize the need for a top-down approach where responsibility is held not only by instructors but by administrators as well. Pro-diversity beliefs, humility, and the cognitive complexity to recognize the challenges from a DEI perspective are also required at the institutional level.

Inclusive leadership facilitates belongingness and values uniqueness and the application of these actions impacts followers' perceptions of inclusions. Panelists described this application through integration strategies that included the incorporation of workplace examples, intentional course design to fit all learners, and reflection that includes a DEI lens.

Panelists' viewpoints and perspectives collectively affirm the individual difference factors and application of the inclusive leadership theory. Their suggestions are compiled into a set of recommendations that administrators and faculty may follow for advancing and integrating diversity, equity, and inclusion in engineering education and for practicing DEI in their classrooms.

#### Recommendations

Members of underrepresented and marginalized groups have much to offer a global economy that is in dire need of trained STEM professionals who come with unique mindsets, perspectives, and experiences because of their diverse backgrounds. To forge forward and to be a key player in preparing graduates who can address complex challenges facing the United States and the world community, the engineering discipline and educators must create and cultivate learning opportunities and environments that seek out, value, respect, and celebrate those diverse mindsets and perspectives from people of all cultures, genders, races, and backgrounds.

Those who have attempted to create a DEI mindset in their academic departments or classrooms have found it to be intolerably difficult or even impossible if the leadership of the college or university has not made DEI a priority. Accountability at all levels of organization's structure must be in place to ensure that DEI practices and principles are upheld. Hence, it behooves administrators at all levels in the hierarchy of educational institutions to pay more than lip service in support of diversity, equity, and inclusion.

Creating a culture that promotes DEI demands inclusive leaders who model the behavior and practice what they preach. Indeed, the road may be up-hill and change may materialize slowly. However, any incremental change to move the dial in the right direction is a positive step forward. The following represents some ways that administrators may demonstrate their commitment to DEI:

1. Make systemic changes by elevating DEI to be in the institution's mission and vision statements and to become part of the strategic planning and implementation in all units. At

the department level, this may involve educating promotion and tenure committees and search committees about implicit biases and about diverse, nontraditional ways that research, teaching, and service contributions may occur in their fields. It may even involve reevaluating the ways in which these categories are described, and the specific criteria used to evaluate faculty. At the School or College level, compensation for DEI work should be explicit such that DEI efforts are valued as much as the most lauded research, teaching, or service efforts in the organization. At the university level, an annual climate survey may be created, resulting in findings to inform DEI-related policies across the organization.

- 2. Operationalize the vision by incorporating DEI in all levels of decision-making: from recruiting policies and practices of students, faculty, staff, and administrators to promotion and advancement policies and practices, or even contractual practices with external vendors and organizations that enter into business agreements with the institution. Modeling DEI and practicing inclusive leadership and decision-making must permeate the entire organization. Evaluate policies periodically to ensure that original DEI goals are being implemented effectively and are being achieved.
- 3. Ensure that the faculty is informed and prepared to embrace and engage in DEI in the classroom. Get a pulse of the organization by conducting climate surveys, focus groups, and individual interviews. Follow up with appropriate education and actions in a timely manner if DEI issues need to be addressed.
- 4. Allocate ample resources for ongoing and continual webinars, seminars, lectures, training opportunities, and the like for all institutional members, and ensure that administrators are represented in the audience. Engage in sessions after these initiatives to ensure that relevant DEI actions are implemented in the organization.
- 5. Provide training that is customized for various tiers and target different groups with differing familiarity with or expertise in DEI. Periodically evaluate training to ensure it is effective and being used to inform policy creation and revision in the organization.
- 6. Incorporate DEI feedback into student course and teaching evaluations. Use diverse forms of evaluation to account for potential biases in evaluations. Interpret data thoughtfully, realizing that implicit biases may impact course evaluations for diverse groups.
- 7. Organize DEI retreat days on campus to engage *all* institutional members, including upper administrators to participate and engage in activities, and tough conversations.
- 8. Celebrate with awards, rewards, recognition, accolades, and kudos to individuals and units that practice, promote, and champion DEI and those who actively strive to develop the mindset. Distinguish between authentic DEI efforts that result in substantive change versus performative efforts that do not move the DEI needle.

Faculty have a distinct advantage to exercise inclusive leadership in their classrooms and to impart knowledge, appreciation, and a DEI mindset to learners. Those faculty who wish to introduce and implement a DEI strategy in their classrooms must first gain the trust of the students by their willingness to be vulnerable enough to share their own personal feelings and views on the subject and be sensitive to their students' sentiments and attitudes. They also must be thoughtful in their approaches to students who are reluctant or opposed to DEI by allowing them to express their opinions and by attempting to guide them to a place where they can engage in open and respectful DEI conversations with others. The following are some of the ways that faculty may prepare for and integrate DEI in their classrooms:

- 1. Recognize the need for learning and the power of training about DEI to effectively practice it and impart worth and value of it to students; remember that the road to discovery is a never-ending path.
- 2. Have the courage to check your own biases and assumptions, practice self-awareness of behaviors, and build trust with students by sharing your DEI experiences and displaying teachability and vulnerability about DEI issues.
- 3. Acknowledge the diverse backgrounds of students by implementing instructional methods that reach a wide range of individuals from diverse backgrounds.
- 4. Create a safe space where both yourself and students may freely contribute and unleash thoughts and talents.
- 5. Intentionally design DEI into your syllabus and in your course activities, particularly via self-reflections and crucial conversations.
- 6. Safe space must also be afforded to those who may resist, resent, or retaliate. Model DEI with your tolerance.
- 7. Promote the efficacy of diversity and inclusion with findings from the literature that indicate diverse teams are more effective and solve problems better.
- 8. Much like ethics, and unlike technical subjects, DEI must be integrated across the curriculum and as much as possible in students' educational experience and extracurricular activities. Otherwise, we are likely to fail in preparing and graduating well-rounded citizens and engineers.

# Conclusions

The panelists offered experienced advice and support for both faculty and administration to incorporate DEI into engineering classrooms and the academic culture. Core to effective implementation is pro-diversity beliefs, humility, and cognitive complexity differentiators of both the faculty and administration. Without these individual difference factors, the culture change needed to sustain DEI momentum would be lost. Inclusive leadership requires these difference factors to recognize the need for DEI within engineering education and the responsibility of leaders and faculty to dismantle systemic racism. When acted upon, these difference factors emerge as inclusive leadership which facilitates belongingness and values uniqueness within our classrooms and organizations. Panelists described actions that support inclusive leadership with examples such as intentional classroom design that include DEI statements, perspective taking activities, and using DEI examples from the workplace. The inclusive leadership theory suggests that these actions support member perceptions of inclusion which lead to member identification within a group and ultimately behavioral outcomes of increased creativity, job performance, and reduced turnover. Engineering educators have a responsibility to practice inclusive leadership to impact the needed change to dismantle systemic racism in the engineering field.

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