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A descriptive examination by race/ethnicity in how engineering faculty understand their efficacy and responsibility for engaging in equity-based initiatives for faculty of color

Dr. Linda DeAngelo, University of Pittsburgh

Linda DeAngelo is Associate Professor of Higher Education, Director of Graduate Studies with a secondary faculty appointment in the Gender, Sexuality, and Women's Studies Program at the University of Pittsburgh. Dr. DeAngelo studies social stratification, investigating how social inequities are produced, maintained, and interrupted. Currently her scholarship focuses on access to and engagement in faculty mentorship, the pathway into and through graduate education, and gender and race in engineering.

Christa E. Winkler, Mississippi State University
Blayne D. Stone, University of Pittsburgh
Charlie Díaz, University of Pittsburgh

Charlie Diaz is a PhD student studying Higher Education at the University of Pittsburgh. He is a recipient of the K. Leroy Irvis Fellowship. His research interests include minoritized student experiences in Higher Ed, student activism, and the development of inclusive policy and practice in Higher Ed.

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Abstract

This full empirical research paper addresses how engineering faculty perceive their roles and responsibility in creating an equitable environment within academia, an understudied but important area to address in organizational change efforts. To begin to fill this gap, we developed a survey to understand the ways that faculty take up responsibility for driving diversity, equity, inclusion, and belonging (DEIB) changes. The instrument included 7 scales measuring faculty perceptions of diversity, equity, inclusion, and belongingness (DEIB) policies and practices, professional development and support for faculty of Color, and efforts to recruit and retain faculty of Color, as well as their perceptions of personal responsibility and self-efficacy to enact DEIB change. We collected data from 179 engineering faculty at three private engineering institutions in the Northeast region of which 137 provided race/ethnicity data and make up our analytical sample - Asian faculty (n=29, 16.2%), Black, Latiné, Indigenous (BLI), and multiracial BLI faculty (BLI(M)) (n=18, 10.1%), and white faculty (n=90, 50.3%). Mean standardized factor scores were created for each scale and pairwise comparisons using t-tests with a Bonferroni correction were used to examine differences between groups. The results highlight differences and trends among Asian, White, and BLI(M) faculty in DEIB readiness and responsibility. The findings of this study have implications for understanding how faculty assess their environments and how they view their responsibility and readiness to engage in enacting equity-based initiatives.

Introduction

Faculty of Color[1] are integral to higher education's success. Yet, despite decades of effort to address underrepresentation in engineering, faculty of Color comprise just 12.8% of engineering faculty [2] and only 9% of tenure-track assistant professors are from historically underrepresented racial groups [3]. Efforts to address representational issues have included cluster hires [4] and mentorship programs [5]. These efforts have been only nominally effective overall as representation has remained stagnant with institutions struggling to recruit, retain, and support faculty of Color [6]. How faculty perceive their roles and responsibility in creating equitable environments within academia, sometimes termed change readiness [7] contributes to the slow pace at which representation has increased. For instance, faculty of Color, especially Black, Latiné, Indigenous (BLI), and multiracial BLI faculty (BLI(M)) are often expected to shoulder the burden of creating change in ways that not only overburden them with service early in their careers when building their scholarship is what is most crucial but must also do so within a racially hostile environment that devalues their success and competence [8], [9]. They also

[1] The phrase "of Color" is often used ambiguously. This does not honor the unique racial or ethnic experiences that individuals who are not white experience. We use the term "faculty of Color" to highlight the range of identities reported by those in our sample. These identities include Black, Latiné, Indigenous, Asian and Multiracial BLI. We utilize this phrase to underscore the instances of marginalization that participants of Color reported regularly enduring in engineering contexts [1]. We intentionally capitalize the word Color as an act of resistance against the culture of white hegemony often experienced within higher education.

must contend with the "hidden curriculum" of faculty life and tenure achievement. Faculty of Color often face higher expectations for their performance than those expected of their white colleagues [10]. In addition, white faculty who remain the large majority in engineering may not see it as their responsibility to advocate for change and may see themselves as ill-suited for this responsibility. These adversities can significantly impact sense of belonging, tenure attainment, and overall retention of faculty of Color within their institutions [11] limiting traction in increasing representation intended by change initiatives.

The purpose of this study is to explore how engineering faculty perceive their roles, responsibilities, and self-efficacy for creating equitable environments and supporting efforts within their departments to advance diversity, equity, inclusion, and belonging (DEIB) initiatives designed to foster sustainable growth in the representation and success of faculty of Color.

Theoretical Framework

Shared equity leadership is a framework for understanding the different roles and strengths of faculty as leaders in equity [12]. Organizational equity work in higher education seeks to address the tendency of systems in higher education to maintain racial stratification through race evasive mechanisms [13], [14]. DEIB goals must be widespread and multifaceted to address the embeddedness of inequity into different higher education systems. A crucial part of shared equity leadership is the development of critical consciousness, or awareness of how individual identities and experiences shape one's understanding of institutional context. Developing faculty awareness of how their students and faculty peers differentially experience academia highlights the need for collective action to create more equitable engineering spaces. We draw on shared equity leadership to understand how faculty members think about their role in advancing DEIB change within their institution, analyzing not only individual dispositions towards equity centered change, but how faculty understand equity as part of their role.

Literature Review

Experiences of Faculty of Color in Science and Engineering

Engineering faculty of Color often encounter racially charged and hostile academic environments that hinder their professional advancement and overall well-being. These challenges, which include racial microaggressions, limited institutional support, and a lack of representation in faculty leadership roles, significantly impact their sense of belonging and their ability to succeed in academia [9], [11], [15], [16]. These systemic inequities not only affect faculty of Color but also limit the broader academic environment. Faculty of Color are crucial for fostering innovative research and creating an educational atmosphere that reflects the diverse needs of students and society [17]. Faculty of Color play a crucial role in creating equitable changes for students, through the implementation of new pedagogies [18], curriculum [19], and culturally affirming mentoring [20]. For students of Color, having a faculty mentor can foster the development of career aspirations, and the development of a STEM identity which can encourage persistence in the discipline [21], [22]. Consequently, these harmful organizational structures, procedures, and standards continue to create unhealthy spaces for faculty and can also impact the success of students of Color.

The barriers faced by faculty of Color in engineering disciplines are deeply embedded in oppressive (e.g., racial, gender inequality) institutional structures. Racial and gender biases often emerge during recruitment, promotion, and tenure processes, resulting in professional isolation and a diminished sense of belonging [9], [23]. In engineering, these challenges are compounded by persistent stereotypes about who belongs in the field, which further limits opportunities for recognition and career advancement [17]. Studies indicate that these institutional barriers contribute to higher turnover rates among faculty of Color, many of whom leave academia due to a lack of support and the prevalence of exclusionary practices [6]. These experiences and exclusion from informal academic networks contribute to professional burnout and a reduced sense of self-efficacy in enacting institutional change [16]. In order to counter these persistent negative experiences of faculty of Color, changes in policy and practice are needed to disrupt these inequitable environments.

Cluster Hires and Mentorship for Faculty of Color

To advance DEIB initiatives and increase the representation of underrepresented faculty members (e.g., ethnicity, race, gender identity), universities have begun implementing cluster hire programs. This strategy has become popular in STEM fields, particularly in engineering because of the relative lack of diversity in faculty, and difficulty in recruiting and retaining faculty of Color [24], [25]. While the method of cluster hiring has gained attention and traction as a way to impact faculty diversity [25], scholars contend that the format can be problematic when done without proper support for the faculty who are hired through the initiative [26], [27]. Faculty of Color hired within a cluster hire can experience stigma for being a part of a "diversity" cluster hire, despite being expected to provide ample diversity related service to their institution [26]. For faculty of Color, who are already facing institutional pressures to do more service, this can impact their career trajectory and success.

The other common initiatives to support the success of faculty of Color, and advance equity at the faculty level include offering professional development and mentorship intended to support faculty of Color in navigating the unique challenges they face in academia. Mentorship programs specifically designed for faculty of Color can help mitigate isolation and provide guidance on research, teaching, and career advancement [5], [16]. However, such programs are most effective when they are supported by institutional resources and structured to address the particular barriers faced by underrepresented faculty. Without sufficient institutional support, these programs often fall short of addressing the systemic issues that contribute to the burnout and frustration experienced by faculty of Color [16], [28]. Insufficient mentoring relationships leave faculty of Color feeling neglected and out of place in their departments [29]. Mentorship programs can be a way to cultivate structured and intentional mentoring relationships [16]. These mentorship programs not only address individual challenges faced by faculty of Color but also emphasize a collective responsibility for shaping institutional cultures that prioritize DEIB.

Faculty Engagement in DEIB Initiatives

A central question in the study of DEIB initiatives is the degree to which faculty feel responsible for enacting change within their departments and institutions. Faculty engagement in DEIB initiatives is influenced by individual factors, such as racial and ethnic identity, as well as institutional culture and available resources. To be ready for change, faculty must see that change

is necessary, that the needed change will occur, and that there will be positive outcomes from the change [7], [30]. Faculty of Color often bear the additional burden of advocating for DEIB change while simultaneously navigating the challenges of systemic racism and discrimination [9]. For instance, even though Black faculty had higher service loads than their peers, they took on additional voluntary diversity service, like mentoring Black students and anti-deficit teaching strategies [31]. McGee describes this mindset as an equity ethic. An equity ethic requires social empathy, responsibility and a sociohistorical understanding of the group being advocated for, which promotes taking action to disrupt inequitable systems [32]. When Black engineering faculty advocate for Black engineering students, they also draw on linked fate, meaning the shared experiences within a racialized educational system [31]. In an effort to promote a more favorable future engineering environment, Black faculty frequently put their students' welfare ahead of their own.

While shared experience can be a powerful motivator, fostering a sense of responsibility for DEIB change among all faculty, regardless of race or ethnicity, is critical to advancing systemic transformation. Few studies have explored how faculty understand their responsibility in cross identity equity work. One example, Hampton [33] found that white men involved in broadening participation in engineering drew on their personal experiences and understandings of equity work, which involved reflection on their role as allies, their understanding of color-evasiveness in engineering fields, and what they viewed as the goal of broadening participation in engineering. These features ranged among participants, highlighting the need for deeper understanding of what experiences, mindsets or knowledge contribute to faculty commitment to equity work. Other research has found that men faculty allies for equity (in this case the focus was gender equity) are often motivated to engage in DEIB work after learning of the lived experiences of peers and students, and in particular their identity-related challenges; however, results from this study indicate that participants actively contribute to equity efforts at varying degrees with differing rates of success [34], underscoring a need for continued and enhanced education.

Positionality

Throughout the development of this study, the research team continuously engaged in reflectivity regarding their positionalities and worldviews [35]. This approach prompted us to reflect on our own perspectives and experiences as well as any potential biases in interpreting the data. With the diverse identities (e.g., race, gender, education, occupations, overall backgrounds) within our research team, it was essential for us to be reflective in our approach to the study. The team members include women, men, and non-binary identities, and white, Black, and Latiné, self-identifying individuals. All research team members hold advanced degrees from a variety of postgraduate institutions. Taken as a whole, the team's positionalities and varied experiences assisted us in advancing this scholarship.

Methodology

This paper utilizes a multi-institutional sample of survey responses to explore how engineering faculty perceive their roles and responsibility in creating an equitable environment within academia, with attention to differences along the lines of faculty racial and ethnic identities.

Sample. Engineering faculty were surveyed at three private institutions in the Northeast region of the United States. Respondents to the full survey included 179 engineering faculty who identified with varying racial and ethnic identities. For the purposes of this study, we focused on three aggregated subgroups: Asian faculty (*n*=29, 16.2%), BLI(M) faculty (*n*=18, 10.1%), and white faculty (*n*=90, 50.3%). Given that our focus was on differences across racial and ethnic identities, our analytic sample consisted of these 137 faculty who reported their racial and ethnic identity. Asian faculty in our sample included respondents who identified as East Asian, Southeast Asian, and Indian/Pakistani/Bangladeshi. BLI(M) faculty included respondents who identified as African American/Black, Central American, and South American or identified as multiracial BLI[2].

With regard to gender identity, the majority of respondents in the analytic sample identified as men (*n*=92, 67.2% men; *n*=41, 23.0% women; *n*=1, 0.7% non-binary; *n*=3, 2.2% not reported). Both tenure stream/track (*n*=108, 78.8%) and non-tenure stream/track (*n*=29, 21.2%) faculty were represented. Among the tenure stream/track faculty, varying ranks were represented (*n*=23, 21.3% assistant professor; *n*=11, 10.2% associate professor; *n*=73, 67.6% full professor; *n*=1, 1.0% not reported).

Instrument. A survey instrument was used to understand the ways that faculty take up responsibility for driving DEIB changes, as well as their self-efficacy and readiness for change.. The instrument included 7 scales (see Appendix) measuring various aspects of faculty perceptions of DEIB policies and practices, professional development and support for faculty of Color, and efforts to recruit and retain faculty of Color, as well as their perceptions of personal responsibility and self-efficacy to enact DEIB change. Cronbach's alpha estimates for all scales ranged from 0.752 to 0.945, leading us to conclude that internal consistency reliability was acceptable for use of the measures with the present sample [37]; all scale reliability estimates are reported in Table 1.

Analytical Approach. Using faculty responses to the survey instrument, factors scores were computed for each scale included on the survey instrument using the maximum a posteriori method in Mplus version 8.11. Factor scores – which, in this case, were derived from a confirmatory factor analytic framework – offer an invaluable analytical tool to quantify otherwise unobservable constructs via empirically validated measurement models [38]. Furthermore, factor scores account for error inherent in measuring theoretical constructs such as those included in this study [38], thereby providing more precise estimates. Altogether, 7 continuous factor scores were computed for each individual faculty member in the dataset. Factor scores were standardized with a mean of 0 and standard deviation of 1 for ease of interpretation and comparability across constructs.

[2] There were not enough multiracial BLI respondents (*n*=6) to more accurately represent the unique experiences of multiracial faculty via a separate analytical subgroup. Given the erasure of individual experiences that comes with removing small subgroups from analytic samples, we included multiracial BLI respondents in a broader BLI(M) subgroup. We explicitly refer to this subgroup as BLI(M) - with the M representing multiracial BLI faculty - to limit further erasure of this population via imposition of a monoracial identity [36]. Including those identifying as BLI(M) alongside other BLI faculty balanced sample limitations while also acknowledging the salient experiences of multiracial faculty with regard to DEIB.

Table 1: Internal consistency reliability of measurement scales

Scale	Items	Cronbach's Alpha
Belongingness	7	0.945
DEIB Policies and Practices	4	0.933
Self-Efficacy for DEIB Change	5	0.890
Personal Responsibility for DEIB Change	5	0.911
Professional Development for Faculty of Color	4	0.943
Recruitment and Retention for Faculty of Color	5	0.752
Faculty of Color Impact	4	0.909

Using the mean standardized factor scores for each of the 7 DEIB-related constructs, we examined differences across three aggregated racial and ethnic groups – Asian faculty; BLI(M) faculty; and white faculty. This allowed us to understand if, to what extent, faculty members' perceptions varied regarding their roles and responsibilities for driving equitable change. Pairwise comparisons were used to test for statistically significant differences between group means. Given the continuous measurement of the scores, t-tests were used to test for significant differences between each pair of mean scores on each construct (e.g., mean score of belongingness for Asian faculty compared to mean score of belongingness for BLI(M) faculty, mean score of belongingness for Asian faculty compared to mean score of belongingness for white faculty, etc.). The Bonferroni correction was applied to control the family-wise error rate and adjust *p*-values for the multiple comparisons conducted across groups [39].

Limitations. There are several limitations in this study worth noting. Given the small size of the analytic sample (N=137), we were limited by the representation of racial and ethnic identities, particularly among minoritized faculty. This guided our decision to examine differences across broad groupings of Asian, BLI(M), and white faculty, which ultimately limits the nuance in our findings across racial and ethnic identities. We recognize that racial and ethnic categorizations are socially constructed [40] and that Black, Latiné, Indigenous, and multicultural faculty are not a homogeneous group regarding identity and experiences with DEIB.

Results

Upon comparing standardized factor scores (M=0, SD=1) for each measured construct across Asian, white, and BLI(M) engineering faculty, several notable trends emerged. Descriptive trends are illustrated in Figure 1 and described in more detail in the sections that follow. Notably, the only constructs with positive trends for all faculty subgroups were belongingness and faculty of Color impact. Most evident in the figure are the contrasting trends across the remaining constructs; the downward bars indicate that – compared to their Asian and white colleagues – BLI(M) faculty reported less positive feelings regarding their departmental DEIB policies/practices, professional development for faculty of Color, and recruitment/retention for faculty of Color, as well as less agreement with their own self-efficacy and personal responsibility to influence DEIB policies. Furthermore, the figure illustrates a drastic change in that trend when it came to faculty of Color impact; that is, BLI(M) faculty reported more positive contributions from having adequate representation of faculty of Color in their department than their Asian and white colleagues.

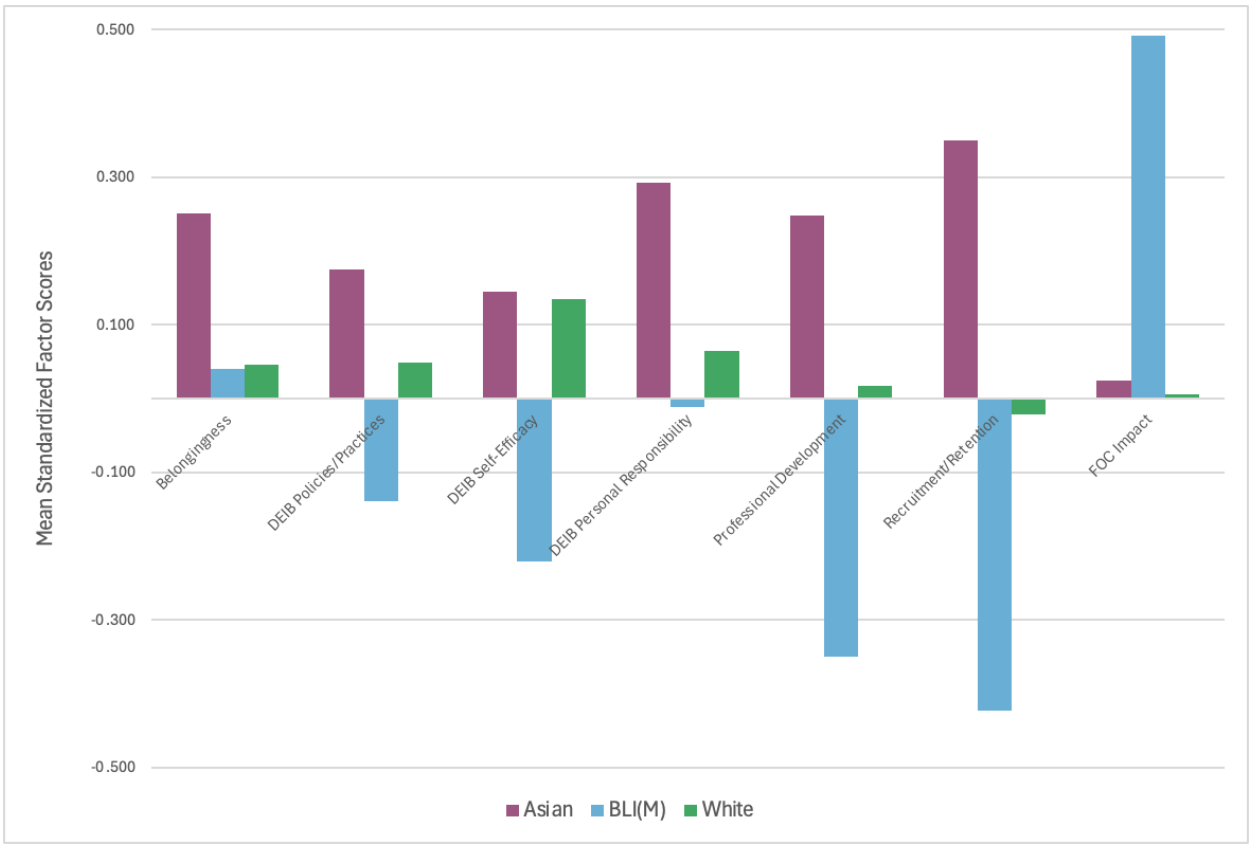

Figure 1: Mean standardized factor scores by racial and ethnic identity subgroup

Mean comparisons are reported in Table 2. Given the arbitrary nature of p-values (for example, see Gillborn [41]) and the practical significance of differences in faculty perceptions for unearthing systemic barriers to equity efforts, statistically significant differences up to $p < .10$ are reported and discussed.

Faculty Perceptions of DEIB Policies and Practices

As a whole, Asian faculty reported the most favorable impressions of DEIB policies and practices in the environment (*M*=0.174, *SD*=0.832), followed by white faculty (*M*=0.048, *SD*=1.001) and then BLI(M) faculty (*M*=-0.140, *SD*=0.906). Even larger differences in perceptions across racial groups were apparent in faculty perceptions of professional development and support for faculty of Color (Asian faculty: *M*=0.248, *SD*=0.941; white faculty: *M*=0.017, *SD*=0.990; BLI(M) faculty: *M*=-0.350, *SD*=0.975), as well as efforts to recruit and retain faculty of Color (Asian faculty: *M*=0.350, *SD*=0.820; white faculty: *M*=-0.022, *SD*=0.971; BLI(M) faculty: *M*=-0.424, *SD*=1.000). Notably, the difference between Asian and BLI(M) faculty perceptions of recruitment and retention efforts was statistically significant (*p*=.035).

Faculty Perceptions of Responsibility for and Readiness to Promote Equitable Change

Similar trends emerged in faculty perceptions of responsibility for and readiness to promote equitable change in their departmental environments. Asian faculty reported the strongest sense of responsibility for DEIB change in their departments (*M*=0.292, *SD*=0.887), followed by white

faculty (*M*=0.065, *SD*=0.957) and BLI(M) faculty (*M*=-0.012, *SD*=0.600). Additionally, while Asian faculty and white faculty both reported above-average self-efficacy to enact DEIB change in their departments (Asian faculty: *M*=0.145, *SD*=1.054; white faculty: *M*=0.134, *SD*=0.934), BLI(M) faculty reported below-average self-efficacy to enact DEIB change (*M*=-0.221, *SD*=0.845). These differences were not statistically significant.

Table 2: Differences in mean standardized factor scores across racial and ethnic identities

	Asian		BLI(M)		White	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Belongingness	0.250	0.894	0.039	0.710	0.045	0.984
DEIB Policies and Practices	0.174	0.834	-0.140	0.906	0.048	1.001
Self-Efficacy for DEIB Change	0.145	1.054	-0.221	0.845	0.134	0.934
Personal Responsibility for DEIB Change	0.292	0.887	-0.012	0.600	0.065	0.957
Professional Development for Faculty of Color	0.248	0.941	-0.350	0.975	0.017	0.990
Recruitment and Retention for Faculty of Color	0.350**	0.820	-0.424**	1.000	-0.022	0.971
Faculty of Color Impact	0.025	0.813	0.491*	0.434	0.005*	0.939

Note: ** indicates statistically significant difference between groups at $p < .05$
* indicates statistically significant difference between groups at $p < .10$

Faculty Perceptions of Faculty of Color Impact

Notable differences also emerged in faculty perceptions of the impact that adequate representation of faculty of Color offers to departments. For example, respondents who reported high impact more strongly agreed with statements that having adequate representation of faculty of Color increases departmental rigor, helps best serve student needs, is vital to the strength of the department, and improves the department's overall quality. BLI(M) faculty, by far, had the highest faculty of Color impact scores (*M*=0.491, *SD*=0.434). Asian and white faculty had comparatively lower scores (Asian faculty: *M*=0.025, *SD*=0.813; white faculty: *M*=0.005, *SD*=0.939). The difference between BLI(M) and white faculty was statistically significant (*p*=.098). Furthermore, the faculty of Color impact score had a small standard deviation (0.434) for BLI(M) faculty, relative to all other factor scores, indicating little variation in BLI(M) faculty endorsement of this sentiment.

Discussion and Conclusion

The study contributes a beginning understanding of engineering faculty's perspectives on their roles, responsibilities, and self-efficacy for advancing DEIB initiatives designed to create equitable environments in which faculty of Color flourish. Given the decades of effort in addressing the underrepresentation of faculty of Color in engineering, and stagnated progress in this area, understanding faculty readiness to address DEIB issues could not be more important. If

institutional DEIB efforts are to be transformative the presence of shared equity leadership is necessary [12]. In developing equitable environments, understanding and meeting faculty where they enter the work is a way forward that builds on and recognizes the various strengths and dispositions that faculty from all races and ethnicities bring, calling faculty uniquely forward and into the work as they continue to develop in ways that will support lasting change.

In examining the trends among Asian, BLI(M), and white faculty, it is important to recognize that these groups of faculty enter into this work differently. In fact, BLI(M) faculty score in opposite directions on all the measured constructs except for belonging and impact of faculty of Color. Although the faculty of Color impact scale was positive for all groups, BLI(M) faculty scored significantly higher on this scale than white faculty and considerably higher than Asian faculty indicating that these faculty groups may not understand the value faculty of Color bring to engineering even with this evidence documented (see for example [17], [18], [19], [20], [21], [22]). Thus, even with extant scholarship as well as current institutional and engineering society efforts aimed at highlighting how faculty of Color uniquely contribute within engineering, faculty in these groups may not understand either why change is needed or that enacted changes will bring positive outcomes, both of which are necessary factors for readiness to change [7], [30].

Although BLI(M) faculty are often the most called upon group to serve on diversity committees and to take leadership roles in equity initiatives, these faculty have the lowest scores on self-efficacy and personal responsibility to create change. Given how overburdened BLI(M) faculty are with this type of work and the professional peril that results for engaging in this work [8], [9], [10], it is incumbent upon engineering leaders to shift the balance of this work away from being a BLI(M) faculty responsibility. BLI(M) faculty certainly understand the value they bring to engineering, but their experiences in working to enact change as well as racial charged and hostile environments in which they do all of their faculty work are likely eroding any self-efficacy they bring in relation to creating change [16]. In terms of readiness to continue to engage in DEIB initiatives, BLI(M) faculty may be unlikely to believe that needed DEIB changes will occur as a result of their efforts or that even if some change does occur that it will alter their and other faculty's of Color experiences in ways that matter [7], [30]. In considering this it is important to recognize that faculty of Color often view DEIB efforts as insufficient and disconnected from their actual needs [16].

Asian and white faculty do score higher on both self-efficacy and personal responsibility for engaging in DEIB change initiatives but given their lower scores on understanding the importance of faculty of Color to engineering, bringing these faculty groups more centrally into DEIB work will likely require targeted professional development. For instance, Asian and white faculty may need to more fully understand how processes like faculty hiring and promotion are experienced differentially based on identity. Faculty may be drawing on personal referential experience in thinking about and working on these efforts. While drawing on personal knowledge and experience is a common impetus for understanding social and political forces impacting marginalized groups, for faculty to understand the need for change and how to go about creating change that matters and is lasting, it is important that faculty have an understanding beyond their own experience from which to draw. Thus, there is a need for greater awareness of inequitable practices and systems in higher education. Increased awareness and engagement in understanding the personal lived experiences of underrepresented groups has

been shown to make a difference [33], [34], though there are also limitations to its effectiveness as a means by itself in creating change.

Bolstering this recommendation are findings from this study in relation to faculty perceptions of DEIB policies and practices. Despite stagnation in representation of and success among faculty of Color, Asian and white faculty's positive trends and BLI(M) faculty's negative trends on the adequacy of current DEIB policies and practices, professional development and support for faculty of Color, and recruitment and retention of faculty of Color indicate that there is a mismatch with reality among these faculty groups. These results again point to readiness for change [7], [30], despite self-efficacy and responsibility Asian and white faculty may not see the need to continue to engage in or deepen to a systematic change level DEIB initiatives. That Asian faculty score considerably higher on these factors than white faculty, may indicate not only that both faculty groups experience engineering academia differently than especially BLI(M) faculty but that current efforts in DEIB are perhaps perceived as having been impactful enough for Asian faculty of Color. Signaling this as a seemingly reasonable conclusion are results from this study indicating that the differences in the measure related to perceptions on recruitment and retention of faculty of Color is significantly different between Asian and BLI(M) faculty. Creating critical consciousness will be needed in creating a frame for shared equity leadership [12] to take hold.

To conclude, we underscore the call from White-Lewis et al. [16] that DEIB policies must go beyond surface-level initiatives and focus on dismantling systemic inequities embedded within institutional policies and practices. Institutional and departmental efforts must understand and then address at a systemic level the specific challenges faced by various groups of faculty of Color [17] and meet and engage with faculty in building change readiness [7], [30] from where faculty enter into the work. This study offers a very beginning understanding of what Asian, white, and BLI(M) faculty bring in terms of dispositions towards and perspectives on responsibility and readiness for engaging in equity-based initiatives. Future scholarship from this research team will expand not only the scope and psychometric properties of the survey we are designing for this area of study but enlarge the sample size, studied institutional types, and complexity of the analysis significantly.

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References

[1] V. Basile, A. York, and R. Black, "Who is the one being disrespectful? Understanding and deconstructing the criminalization of elementary school boys of color," *Urban Education*, vol. 57, no. 9, pp. 1592–1620, Nov. 2022, doi: 10.1177/0042085919842627.

[2] National Center for Science and Engineering Statistics, "Diversity and STEM: Women, minorities, and persons with disabilities," National Science Foundation, Alexandria, VA, Special Report NSF 21-321, 2021. [Online]. Available: https://ncses.nsf.gov/wmpd

[3] American Society for Engineering Education (ASEE), "Profiles of engineering and engineering technology, 2021," Washington, DC, 2022. [Online]. Available: https://ira.asee.org/wp-content/uploads/2022/11/Engineering-and-Engineering-Technology-by-the-Numbers-2021.pdf

[4] M. Curran, Q. Bloom, and S. Brint, "Does cluster hiring enhance faculty research output, collaborations, and impact? Results from a national study of U.S. research universities," *Minerva*, vol. 58, no. 4, pp. 585–605, Dec. 2020, doi: 10.1007/s11024-020-09408-3.

[5] B. A. Montelone, R. A. Dyer, and D. J. Takemoto, "A mentoring program for female and minority faculty members in the sciences and engineering: Effectiveness and status after 9 years," *J Women Minor Scien Eng*, vol. 9, no. 3–4, p. 14, 2003, doi: 10.1615/JWomenMinorScienEng.v9.i34.40.

[6] Association of American Colleges and Universities, "Diversifying the professoriate: Recruiting, retaining, and supporting faculty of color."

[7] T. Holloman, J. Brisbane, N. Huggins, W. Lee, and D. Knight, "Exploring department readiness for equity-work and inclusive practices in engineering PhD programs: A competing values approach," in *ASEE Annual Conference Proceedings*, Portland, OR, 2024.

[8] B. Baez, "Race-related service and faculty of color: Conceptualizing critical agency in academe," *Higher Education*, vol. 39, no. 3, pp. 33–391, 2000, [Online]. Available: http://www.jstor.org/stable/3447916

[9] D. A. Chen, J. A. Mejia, and S. Breslin, "Navigating equity work in engineering: contradicting messages encountered by minority faculty," *Digital Creativity*, vol. 30, no. 4, pp. 329–344, Oct. 2019, doi: 10.1080/14626268.2019.1678486.

[10] N. W. Arnold, E. R. Crawford, and M. Khalifa, "Psychological heuristics and faculty of color: Racial battle fatigue and tenure/promotion," *The Journal of Higher Education*, vol. 87, no. 6, pp. 890–919, Nov. 2016, doi: 10.1080/00221546.2016.11780891.

[11] K. A. Griffin, "Institutional barriers, strategies, and benefits to increasing the representation of women and men of color in the professoriate: Looking beyond the pipeline," in *Higher Education: Handbook of Theory and Research*, vol. 35, L. W. Perna, Ed., in Higher Education: Handbook of Theory and Research, vol. 35. , Cham: Springer International Publishing, 2020, pp. 277–349. doi: 10.1007/978-3-030-31365-4_4.

[12] E. M. Holcombe, A. J. Kezar, N. Ueda, and D. Vigil, "Shared equity leadership: Working collectively to change campus cultures," *Journal of Diversity in Higher Education*, Dec. 2023, doi: 10.1037/dhe0000536.

[13] G. P. King, T. Russo-Tait, and T. C. Andrews, "Evading race: STEM faculty struggle to acknowledge racialized classroom events," *LSE*, vol. 22, no. 1, p. ar14, Mar. 2023, doi: 10.1187/cbe.22-06-0104.

[14] H. N. McCambly, "Rising tides don't create racialized change: Analyzing institutional change projects in postsecondary philanthropy's college completion agenda," *The Journal of*

Higher Education, vol. 95, no. 4, pp. 526–556, Jun. 2024, doi: 10.1080/00221546.2023.2203631.
[15] D. Rios and A. J. Stewart, "Insider and outsider-within standpoints: The experiences of diverse faculty in schience and engeineering fields," *J Women Minor Scien Eng*, vol. 21, no. 4, pp. 295–322, 2015, doi: 10.1615/JWomenMinorScienEng.2015010375.
[16] D. White-Lewis, J. Bennett, and K. Redd, "Framing the dialogue for systemic equity reform in STEM faculty careers," Jun. 27, 2022, *Open Science Framework*. doi: 10.31219/osf.io/qzmea.
[17] A. Smith and H. A. García, "Increasing the trickle: A proposed critical multiculturalist conceptual model to increase the pipeline to a more diverse STEM doctorate population," *Journal for Multicultural Education*, vol. 12, no. 3, pp. 206–220, Aug. 2018, doi: 10.1108/JME-09-2016-0052.
[18] M. Estefan, J. C. Selbin, and S. Macdonald, "From Inclusive to equitable pedagogy: How to design course assignments and learning activities that address structural inequalities," *Teach Sociol*, vol. 51, no. 3, pp. 262–274, Jul. 2023, doi: 10.1177/0092055X231174515.
[19] C. Cunningham and G. Kelly, "Curriculum design principles for equity in engineering (fundamental, diversity)," in *ASEE Annual Conference Proceedings*, Minneapolis, MN, 2022. [Online]. Available: https://peer.asee.org/curriculum-design-principles-for-equity-in-engineering-fundamental-diversity.pdf
[20] A. L. Garcia, M. Dueñas, and B. E. Rincón, "Culturally responsive mentoring: A psychosociocultural perspective on sustaining students of color career aspirations in science, technology, engineering, and mathematics (STEM)," *Journal of Diversity in Higher Education*, May 2024, doi: 10.1037/dhe0000587.
[21] M. Estrada, P. R. Hernandez, and P. W. Schultz, "A longitudinal study of how quality mentorship and research experience integrate underrepresented minorities into STEM careers," *LSE*, vol. 17, no. 1, p. ar9, Mar. 2018, doi: 10.1187/cbe.17-04-0066.
[22] L. N. Fleming, K. C. Smith, D. G. Williams, and L. B. Bliss, "Engineering identity of Black and Hispanic undergraduates: The impact of minority serving institutions," in *ASEE Annual Conference*, Atlanta, GA, 2013.
[23] J. Jackson, "The story is not in the numbers: Academic socialization and diversifying the faculty," *NWSA Journal*, vol. 16, no. 1, pp. 172–185, 2004, [Online]. Available: https://www.jstor.org/stable/4317040
[24] K. L. Melde, D. W. Hahn, and L. Folks, "Diversifying the engineering faculty hiring pool," in *2023 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (USNC-URSI)*, Portland, OR, USA: IEEE, Jul. 2023, pp. 753–754. doi: 10.1109/USNC-URSI52151.2023.10237702.
[25] J. Sailer, "Diversity statement, then dossier: The rise of DEI cluster hiring in higher education," National Association of Scholars, New York, N.Y., 2023. [Online]. Available: https://files.eric.ed.gov/fulltext/ED635770.pdf
[26] P. Davis, "Black women faculty transition experiences in a cluster hire initiative: A qualitative case study," University of Pittsburgh, 2024. [Online]. Available: https://d-scholarship.pitt.edu/46556/1/Davis%20ETD_Final%20Edit.pdf
[27] M. Stewart, "Cluster hiring grows in popularity as institutions act to increase faculty diversity," *INSIGHT Into Diversity*, vol. November 2021, pp. 20–21, 2021. [Online]. Available: https://www.insightintodiversity.com/wp-content/media/digitalissues/november2021/index.html

[28] L. C. Tillman, “Achieving racial equity in higher education: The case for mentoring faculty of color,” *Teachers College Record: The Voice of Scholarship in Education*, vol. 120, no. 14, pp. 1–18, Dec. 2018, doi: 10.1177/016146811812001401.
[29] M. M. Espino and R. E. Zambrana, “‘How do you advance here? How do you survive?’ An exploration of under-represented minority faculty perceptions of mentoring modalities,” *The Review of Higher Education*, vol. 42, no. 2, pp. 457–484, 2019, doi: 10.1353/rhe.2019.0003.
[30] A. E. Rafferty, N. L. Jimmieson, and A. A. Armenakis, “Change readiness: A multilevel review,” *Journal of Management*, vol. 39, no. 1, pp. 110–135, Jan. 2013, doi: 10.1177/0149206312457417.
[31] E. O. McGee, D. Naphan-Kingery, M. L. Miles, and O. Joseph, “How Black engineering and computing faculty exercise an *equity ethic* to racially fortify and enrich Black students,” *The Journal of Higher Education*, vol. 93, no. 5, pp. 702–734, Jul. 2022, doi: 10.1080/00221546.2022.2031704.
[32] E. A. Segal, “Social empathy: A model built on empathy, contextual understanding, and social responsibility that promotes social justice,” *Journal of Social Service Research*, vol. 37, no. 3, pp. 266–277, Apr. 2011, doi: 10.1080/01488376.2011.564040.
[33] C. Hampton, “Agency to change: A narrative inquiry of white men faculty in engineering engaged in broadening participation work,” Doctoral Dissertation, Virginia Polytechnic Institute and State University, 2021. [Online]. Available: http://hdl.handle.net/10919/115860
[34] D. V. Lewis, “Education, avoidance or ‘it depends’: Manifestations of men faculty’s allyship for undergraduate women in STEM,” Doctoral Dissertation, University at Buffalo, The State University of New York, 2023.
[35] J. P. Martin, R. Desing, and M. Borrego, “Positionality statements are just the tip of the iceberg: Moving towards a reflexive process,” *J Women Minor Scien Eng*, vol. 28, no. 4, pp. v–vii, 2022, doi: 10.1615/JWomenMinorScienEng.2022044277.
[36] K. S. Ford, A. N. Patterson, and M. P. Johnston-Guerrero, “Monoracial normativity in university websites: Systematic erasure and selective reclassification of multiracial students,” *Journal of Diversity in Higher Education*, vol. 14, no. 2, pp. 252–263, Jun. 2021, doi: 10.1037/dhe0000154.
[37] J. C. Nunnally and I. H. Bernstein, *Psychometric Theory*, 3rd ed. McGraw-Hill, 1994.
[38] T. A. Brown, *Confirmatory factor analysis for applied research*, 2nd ed. Guilford Press, 2015.
[39] O. J. Dunn, “Multiple comparisons among means,” *Journal of the American Statistical Association*, vol. 56, no. 293, pp. 52–64, Mar. 1961, doi: 10.1080/01621459.1961.10482090.
[40] W. Castillo and Strunk, *How to QuantCrit: Applying critical race theory in education*, 1st ed. Routledge, 2025.
[41] D. Gillborn, P. Warmington, and S. Demack, “QuantCrit: education, policy, ‘Big Data’ and principles for a critical race theory of statistics,” *Race Ethnicity and Education*, vol. 21, no. 2, pp. 158–179, Mar. 2018, doi: 10.1080/13613324.2017.1377417.

APPENDIX

Appendix 1: Description and sample items for constructs measured via survey instrument

Construct	Description	Sample Item
Belongingness	Measures faculty perception of their personal sense of belonging within their department and university.	I feel a sense of belonging at my University.
DEIB Policies and Practices	Measures faculty perception of their department's policies and practices to enact DEIB-related change.	I believe my department does an adequate job of creating an affirming mentoring environment for faculty of color.
Self-Efficacy for DEIB Change	Measures self-efficacy for enacting inclusive, diversity-related change.	I play an important role in increasing diversity, equity, and inclusion at my university.
Personal Responsibility for DEIB Change	Measures faculty feelings of personal responsibility to enact DEIB-related change on campus.	It is my responsibility to convince other faculty and institutional leaders that diversity, equity, and inclusion is a priority.
Professional Development for Faculty of Color	Measures faculty perception of their department's efforts to support faculty of Color via professional development opportunities.	I believe there is enough departmental support for faculty of color to thrive.
Recruitment and Retention for Faculty of Color	Measures faculty perception of their department's efforts to effectively recruit and retain faculty of Color.	My department is doing enough to effectively recruit faculty of color.
Faculty of Color Impact	Measures faculty perception of the contributions garnered from having sufficient representation of faculty of Color within their department.	Having adequate representation of faculty of color is vital to the strength of my department.