

MIT DEPARTMENT OF MATERIALS  
SCIENCE AND ENGINEERING (DMSE)  
DIVERSITY, EQUITY, AND INCLUSION (DEI)

ANNUAL REPORT AND FUTURE PLANS  
ACADEMIC YEAR (AY) 2020 - 2021

PREPARED BY THE DMSE DEI COLLABORATIVE

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## Executive Summary

The MIT Department of Materials Science and Engineering Diversity, Equity, and Inclusion Collaborative (MIT DMSE DEI Collaborative) was convened in Fall 2020 with an objective of reflecting upon, advancing, and integrating diversity, equity, and inclusion into the mission of MS&E, that is education, research, and development of materials for the benefit of society. The DEI Collaborative maintained the following vision: *To foster a diverse, welcoming, respectful, supportive, and engaged community and discipline which enables full human flourishing - academic, personal, and professional - of every member across race, ethnicity, gender, sexual identity, socioeconomic status, religion, ability, national origin, political philosophy, and other elements of background and lived experience.* Through the DEI Collaborative, DMSE stakeholders came together with a commitment to inclusive excellence, a belief in the enormous potential of our community, a desire to enhance the learning, research and working environment for all, and to lead by example both at MIT and within the field of MS&E. The DEI Collaborative strived to co-create a community-driven, deeply thoughtful, high quality, comprehensive evidence and asset-based strategy and set of initial actions. It aimed for a strategic approach that addressed root causes, structures, and cultures underlying under-representation and other manifestations of inequity and recognized the limitations of prior approaches, with a willingness to reflect upon and engage with the tragic histories that still affect our labs, classrooms, workspaces, and discipline.

The DEI Collaborative incorporated principles of inclusive collaboration, collective impact, civic engagement, and shared leadership in its structure and activities. It consisted of fifty (50) members within four (4) Stakeholder Working Groups: 1) administrative and support staff, 2) faculty, research, and instructional staff, 3) students - both graduate and undergraduate, and 4) postdoctoral researchers, each with a chair or co-chair who maintained membership on a Coordination Council. The DEI Collaborative maintained overlapping membership and collaboration with significant DEI efforts of the Departmental governance committees (i.e. Recruitment, Admissions, and Placement or RAP, Department Committee on Graduate Student or DCGS, Undergraduate Committee or UGC, Faculty Search and Hiring Committee, and Departmental Seminar Committee). More than 3000 person-hours were spent in dialogue, collaboration, programs, and initiatives related to DEI and enhancing the academic, research, and professional environment of our department. The identified priorities from the Stakeholder Working Groups were aggregated into strategic themes as follows: 1) inclusive departmental processes (e.g. recruitment, admissions, hiring, etc.), 2) inclusive learning, education, and dialogue, 3) inclusive research cultures and workplaces, 4) inclusive personal and professional advancement (e.g. mentoring, advising, etc.), and 5) inclusive narratives and external engagement, with a supporting theme of capacity-building (e.g. staffing, expertise, financial, etc.).

DEI activities resulted in historic advances in fostering DEI in departmental processes and advancing representation in faculty hiring, graduate admissions, and the DMSE seminar series. Broad community participation took place in learning, education, and dialogue events which fostered DEI core cultural competencies and engaged more than fifteen (15) external speakers and facilitators. DEI concepts were integrated into DMSE curriculum, including both core classes and electives (e.g. 3.010, 3.020, 3.091, 3.063/3.942, 3.087, 3.201). DMSE community members participated in many initiatives to advance DEI such as the MIT Summer Research Program (MSRP), The Guided Academic Industry Network (GAIN), The MIT Lemelson Invention and Inclusive Innovation Initiative, The MIT Initiative for Knowledge and Innovation in Manufacturing

(IKIM), and more. Activities to advance inclusion in DMSE research environments included public statements on lab webpages, inclusive practices within research groups, DMSE REFS (Resources for Easing Friction and Stress), and efforts to support LGBTQA+ community members. Significant dialogue and activity was spent on identifying foundational principles, values, and community feedback to advance inclusion in DMSE public communications. A search was launched for a DEI Staff Specialist shared with the Departments of Biological Engineering and Chemical Engineering, led by and with participation from DMSE community members, including a Student Search Sub-committee.

The Staff Stakeholder Working Group focused on priorities of engagement and DEI education and dialogue through an all-staff convening, contributions to departmental processes such as the search for the shared DEI Specialist, and enhancing inclusive procedures for postdoctoral scholars. The Faculty, Research, and Instructional Staff Stakeholder Working Group supported DEI efforts in the Departmental governance committees, at faculty meetings and community-wide convenings, and within their own research groups and environments. The Graduate Student Stakeholder Working Group led the inaugural DMSE Application Assistance Program (DAAP) program, developed a new Materials Initiative for Comprehensive Research Opportunity (MICRO) program and successful grant proposal through the MIT Abdul Latif Jameel World Education Lab (J-WEL), as well as The Materials Science and Engineering Distinguished Scholars Forum, and The Materials for Additive Manufacturing Inclusion initiative to be launched in the academic year 2022-2023. The Graduate Student Stakeholder Working Group also led the Thesis Area Exam (TAE) equity improvement initiative, supported the faculty hiring and search process and the shared DEI Specialist search, led DEI events at graduate student orientation and visit weekends, and worked with the DMSE communications officer on modifications to the DMSE website. The Undergraduate Student Stakeholder Working Group focused on equitable advising, and also held a screening event and discussion on the documentary *"Picture A Scientist"* in celebration of Women's History Month. The postdoctoral representative of the DEI Collaborative focused on fostering inclusion through opportunities to enhance the initial arrival and orientation of postdocs to DMSE.

Priorities for Academic Year 2021-2022 were identified by each Stakeholder Working Group for and included: enhancement and codification of DEI processes for faculty search and hiring and graduate admissions with an emphasis on rubrics and yield, the development of a DMSE-customized, high quality, asset and equity-based DEI education plan and set of activities focused on core DEI competencies (e.g. staff-focused, laboratory-focused, community-wide, etc.), enhancing inclusivity of onboarding and orientation processes for postdoctoral scholars, launching and continued participation and leadership of DEI programs (e.g. MSRP, MICRO, DAAP, High school outreach event, etc.), completion and distribution of undergraduate advising handbook, activities focused on enhancement of internal and externally-facing inclusive narrative and communications, hiring, onboarding, and integration of shared DEI Specialist staff member. Lead and collaborative Stakeholder Working Groups were identified for each priority, as well as evaluation metrics. While we have made historic advances this past year, we remain steadfast in our commitment to address enduring challenges. As we return to joining each other on campus and welcoming new members to our community, all are invited to join in these efforts and contribute to shaping an inclusive DMSE culture.

## 1. Background

The MIT Department of Materials Science and Engineering (DMSE) is a community with origins present in the incorporation of MIT in 1861. MIT DMSE has been foundational to the establishment and continued trajectory of the field of materials science and engineering (MS&E) as a professional discipline with global-scale societal impacts. MS&E seeks to understand the creation, composition, structure, properties, and performance of materials and to apply such knowledge for the benefit of society in areas such as health, communications, transportation, and sustainability [1–3]. While MS&E has contributed enormous benefits to society in these areas and more, simultaneously our discipline, like all STEM disciplines, has been entangled with historical and contemporary social inequities and injustices [4, 5]. The tragic events of 2020 catalyzed deep reflection throughout our community related to enduring violence and injustice, in particular the imperative to combat anti-Black and all forms of racism, as a core component of our mission and deeply integrated with our education, research, and work activities. Long-standing prior diversity and inclusion efforts at MIT [6–11] were amplified and reignited by student-led engagement and action, for example, codified in "An Open Letter on Racism and Inclusivity in MIT DMSE" [12].

It was in this context that the Diversity, Equity, and Inclusion (DEI)<sup>1</sup> Collaborative was convened in the Fall of 2020 with the following vision:

*To foster a diverse, welcoming, respectful, supportive, and engaged community and discipline which enables full human flourishing - academic, personal, and professional - of every member across race, ethnicity, gender, sexual identity, socioeconomic status, religion, ability, national origin, political philosophy, and other elements of background and lived experience.*

An initial set of actions and initiatives were carried out including:

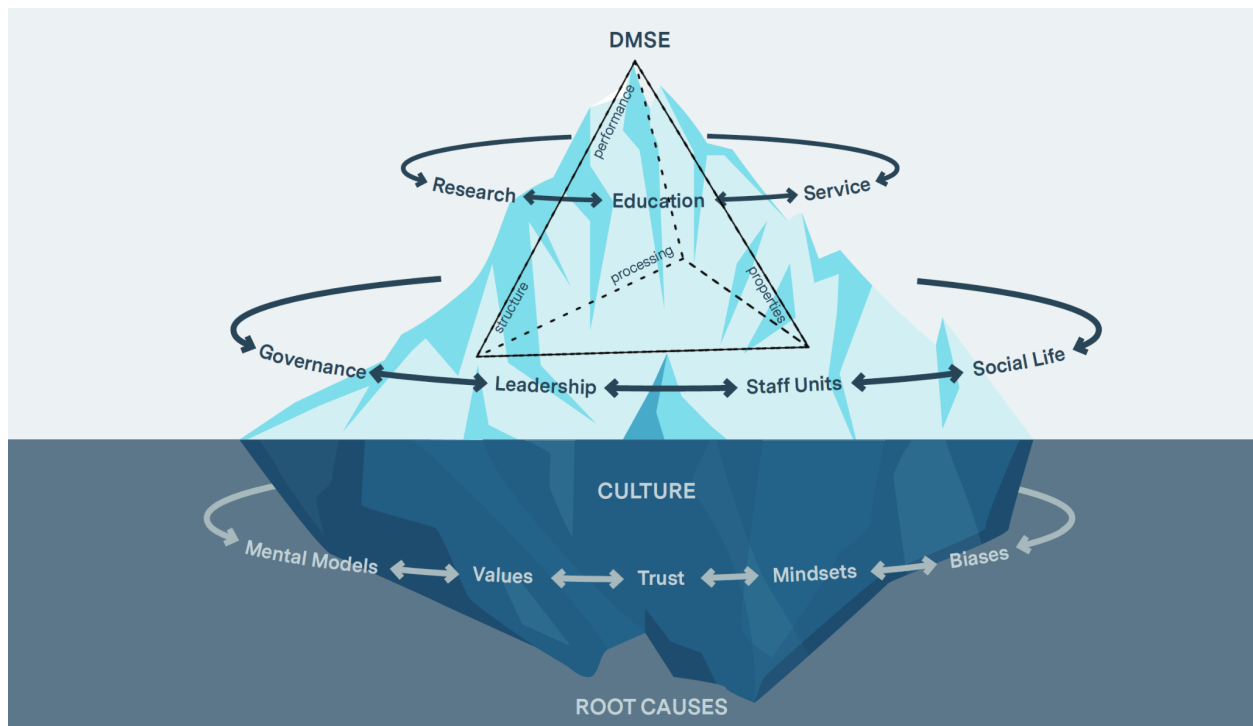
- Community-wide engagement, dialogue, listening, learning, reflection, co-creation, and collaboration;
- The collection and analysis of DEI related data;
- Critical evaluation and incorporation of relevant scholarship, reports, past work, and practices; and
- Consideration of historical, disciplinary, institutional, and social context.

Through the DEI Collaborative, DMSE stakeholders came together with a commitment to inclusive excellence, a belief in the enormous potential of our community, a desire to enhance the learning, research and working environment for all, and to lead by example both at MIT and within the field of MS&E. The members of this group were committed to creating more than words on paper, a plan, or a report without action. Hence, the DEI Collaborative strived to co-create a community-driven, deeply thoughtful, high quality, comprehensive evidence and asset-based

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<sup>1</sup>Diversity can be described as the composition of a population or group in race, gender identity, ethnicity, sexual orientation, socioeconomic status, age, disability, religious beliefs, political philosophy, national origin, and other identity characteristics and lived experience. *Inclusion* involves ensuring equal access to participation and opportunities. *Equity* involves recognizing and accounting for the fact that each person has different circumstances, with attention to historically marginalized groups. *Justice* involves removing structural and systemic barriers which foster inclusion and equity. *Belonging* is when a person feels seen, respected, recognized, rewarded, connected, and supported within a community or group. Frequently used acronyms include; DEI (diversity, equity, and inclusion), DEIJ (diversity, equity, inclusion, and justice), JEDI (justice, equity, diversity, and inclusion), and JEDIB (justice, equity, diversity, inclusion, and belonging).

strategy and set of initial actions. The DEI Collaborative aimed for a strategic approach that addressed root causes, structures, and cultures underlying under-representation and other manifestations of inequity and recognized the limitations of prior approaches (such as those focused on “pipeline” [13]), with a willingness to reflect upon and engage with the tragic histories that still affect our labs, classrooms, workspaces, and discipline.



*Iceberg model of strategic approach to DEI activities in the context of MS&E disciplinary framework [14-17]*

The DEI Collaborative remained optimistic that the work integrating MS&E and DEI holds enormous potential to further realize its mission of benefit to society and to mitigate past and possible future social and planetary damage and inequities - from environmental injustice to public health disparities to food insecurity to aging infrastructure to barriers to participation in innovation.

## 2. DMSE DEI Collaborative Structure and Process

### 2.1 DMSE DEI Collaborative Structure

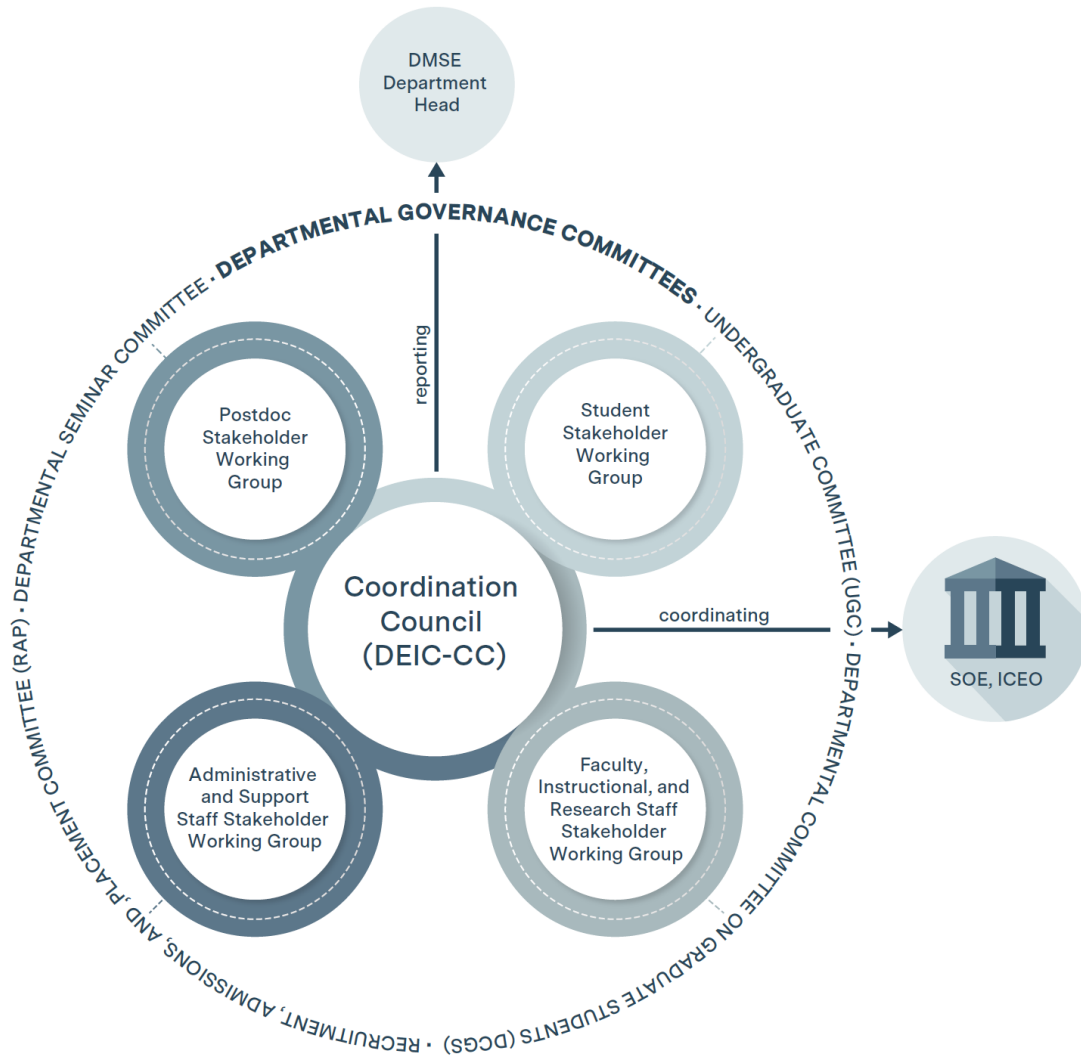
With the aim of creating a broad-based community-driven, inclusive, and high performing committee structure to template and catalyze action across DMSE, the DEI Collaborative was informed by key scholarship in models of shared leadership [18-24]. The DEI Collaborative structure consisted of four (4) Stakeholder Working Groups (listed in alphabetical order) as follows:

- Administrative and support staff;
- Faculty, research, and instructional staff;
- Students - Graduate students and undergraduate students; and
- Postdoctoral researchers.

Each Stakeholder Working Group was responsible for engaging their respective communities and also included members from departmental governance committees (e.g., Undergraduate Committee (UGC), Departmental Committee on Graduate Students (DCGS), Recruitment, Admissions, and Placement (RAP), Departmental Seminar Committee) to foster information and learning exchange. The chair of each Stakeholder Working Groups maintained membership on a DEI Collaborative Coordination Council (DEIC-CC) and was appointed for a term of one year via an open application and nomination process.



**DIVERSITY EQUITY INCLUSION COLLABORATIVE**



*MIT DMSE DEI Collaborative structure*



The DEI Collaborative comprised a total of **50 DMSE community members** (listed following) with diversity across gender, race, ethnicity, sexual orientation, country of origin, background and lived experience.

### 2.1.1 DMSE DEI Collaborative Coordination Council (DEIC - CC)

The membership of the MIT DMSE DEI Collaborative Coordination Council (DEIC - CC) was as follows:

Alfredo Alexander-Katz, Associate Professor, DMSE (09/01/2020 - 04/01/2021)  
Jennifer Camacho, Manager of External Relations, Office of International Activities (Staff to Committee)  
Cécile Chazot, (International) Graduate Student, DMSE  
Flor Garza, Undergraduate Student, DMSE  
Matthew Hauwiller, Postdoctoral Associate, DMSE (09/01/2021 - 01/31/2021)  
Casey Johnson, Human Resources Coordinator, DMSE  
Eesha Khare, Graduate Student, DMSE  
Christine Ortiz, Professor, DMSE (Chair)  
Ellan Spero, Instructor and Historian of Science and Technology, DMSE (Facilitator)  
Mike Tarkanian, Senior Lecturer, DMSE (04/01/2021 - 05/27/2021)

#### Additional Support and Expertise

Beatriz Cantada, M.A., Director for Engagement for Diversity and Inclusion in the MIT Institute Community and Equity Office (ICEO)  
Mark DiVincenzo, J.D., MIT Vice President and General Counsel  
Alyce Johnson, B.S. (sociology), Senior advisor to the vice president, MIT Human Resources Department  
Maryanne Kirkbride, MS/MBA, RN, Deputy, Institute Community and Equity Officer; Executive Director, MindHandHeart  
Sonia Liou, Assistant Director of MIT Institutional Research  
Jason McKnight, M.Ed., Assistant Director, Department Support Program, MIT Institute and Community Equity Office (ICEO)  
Anthony Moriello, J.D., MIT Associate Counsel

#### Reporting To:

Jeff Grossman, Professor and Department Head, DMSE



*MIT DMSE DEI Collaborative Coordination Council Members and Stakeholder Working Group Chairs*

The DEIC - CC members contributed a wide variety of DEI expertise, as well as a diversity of lived experience. One of the graduate student representatives (Cécile Chazot) is trained in conflict management and mediation and creator of the DMSE REFS (Resources for Easing Friction and Stress) program, which provides confidential support to graduate students who encounter conflict or difficult situations during their time at MIT. One of the graduate student representatives (Eesha Khare) has served on the executive leadership team of the WXOMS (Women and Gender Minorities of Materials Science), which hosted faculty talks, journal clubs, and community building events, as well as the Committee on Sexual Misconduct Prevention and Response (CSMPR). The undergraduate student representative (Flor Garza) participated in Interphase EDGE in 2017 and TAed in 2018 and 2020 for the Office of Minority Education, is involved with the MIT Latino Cultural Center, serving as publicity chair for one semester, as well as engaging as a desk worker at the SPXCE, “a collaborative initiative between the Office of Multicultural Programs and LGBTQ+ Services, [which] provides intersectional social justice education, support, community-building, and leadership development.”

The staff to the committee (Jennifer Camacho) contributed expertise in cross-cultural and international relations, international student support, and student residential life, and served as staff to the 2014 Institute-wide Working Group on International Student Support. The facilitator (Ellan Spero) is an MIT Ph.D. alumna (History, Anthropology, Science Technology and Society) with expertise in the historical and social context of science and technology with a speciality in materials, facilitation, inclusive pedagogies and curriculum development, graduate student governance having served as Vice President of the MIT Graduate Student Council, residential life having served as an MIT Graduate Residential Tutor, and support of high potential low resource student populations. The Chair (Christine Ortiz) has over two decades of participation in DEI activities within MIT and nationally, including serving on the 2010 MIT Initiative for Faculty Race and Diversity. As dean for graduate education (2010-2016), Ortiz oversaw institute-wide graduate diversity programs and served as the founding principal investigator and director of the MIT Alfred P. Sloan Foundation University Center of Exemplary Mentoring (UCEM) which develops best practices for the recruitment, retention, and academic success of underrepresented minority doctoral students. Ortiz chairs a grant-funded multi-institutional national Collaborative focused

on fostering equity in science and technology that includes Carnegie-Mellon University, Cornell University, Georgia Tech, Howard University, MIT, Station1, University of California - Berkeley, and University of Washington.

## 2.1.2 DMSE DEI Collaborative Stakeholder Working Groups

The membership of the DEI Collaborative Stakeholder Working Groups were as follows:

### Administrative and support staff

Dominique Altarejos, Senior Administrative Assistant, Academic Office, DMSE  
Mahia Brown, Financial Assistant, DMSE  
Priyanka Chaudhuri, Administrative Assistant II, DMSE  
Casey Johnson, Human Resources Coordinator, DMSE (Chair)  
Rachel Kemper, DMSE Communications Officer  
Angelita Mireles, Academic Administrator, Academic Office, DMSE

### Faculty, research, and instructional staff

Alfredo Alexander-Katz, Professor, PPSM Director, DMSE (Chair) (09/01/2021 - 04/01/2021)  
Polina Anikeeva, Professor, DMSE (09/01/2021 - 01/08/2021)  
Rafael (Rafa) Gómez Bombarelli, Assistant Professor, DMSE  
Dorothy Hosler, Professor of Archaeology and Ancient Technology, DMSE  
Rafael (Raf) Jaramillo, Associate Professor, DMSE  
Elsa A. Olivetti, Associate Professor, DMSE  
Mike Tarkanian, Senior Lecturer, DMSE (Chair) (04/01/2021 - 06/01/2021)

### Graduate students

Tunahan Aytas, Graduate Student, DMSE  
Jacqueline Baidoo, Graduate Student, DMSE  
Ki-Jana Carter, Graduate Student, DMSE  
Cécile Chazot, Graduate Student, DMSE (co-Chair)  
Ty Christoff-Tempesta, Graduate Student, DMSE  
Elad Deiss-Yehiely, Graduate Student, DMSE  
Allison Kaczmarek, Graduate Student, DMSE  
Eesha Khare, Graduate Student, DMSE (co-Chair)  
Daniel Koda, Graduate Student, DMSE  
Margaret Lee, Graduate Student, DMSE  
Maxwell L'Etoile, Graduate Student, DMSE  
Jaclyn Lunger, Graduate Student, DMSE  
Amina Matt, Graduate Student, DMSE  
Katherine Mizrahi, Graduate Student, DMSE  
Jonathan Paras, Graduate Student, DMSE  
Jatin Patil, Graduate Student, DMSE (GMC president)  
Eveline Postelnicu, Graduate Student, DMSE  
Kate Reidy, Graduate Student, DMSE

Maria Ronchi, Graduate Student, DMSE  
John Ryter, Graduate Student, DMSE  
Sara Sand, Graduate Student, DMSE  
Methely Sharma, Graduate Student, DMSE  
Sara Sheffels, Graduate Student, DMSE  
Avni Singhal, Graduate Student, DMSE  
Kierstin Torres, Graduate Student  
George Varnavides, Graduate Student, DMSE  
Haoxue Yan, Graduate Student, DMSE

### Postdoctoral Researchers

Matthew Hauwiler, Postdoctoral Associate, DMSE (09/01/2021 - 01/31/2021)

(It is noted that it was difficult to gain engagement from postdoctoral researchers and scholars as official members of the DEI Collaborative although numerous outreach attempts were made. However, there was significant participation and contribution by the postdoctoral representative who provided context on the postdoc experience and areas of importance from his perspective.)

### Undergraduate Students

Flor Garza, Undergraduate Student, DMSE (**Chair**)  
Nicholas Ignacio, Undergraduate Student, DMSE  
Alby Joseph, Undergraduate Student, DMSE (SUMs president)  
Sheikh Raima Mahmud, Undergraduate Student  
James Philips, Undergraduate Student  
Kierstin Torres, Undergraduate Student

## 2.2 DMSE DEI Collaborative Process

Prior to the launch of the DEIC, the Coordination Council organizing team (e.g. facilitator, staff, and chair) attended a series of workshops with the nonprofit organization, Sociocracy for all, and learned applicable inclusive leadership and collaboration practices for use in the DEI Collaborative. Sociocracy, also called dynamic governance, is a system of governance which seeks to create psychologically safe environments and productive organizations [19, 25]. The DEIC-CC members participated in a one-hour inclusive leadership training provided by Alyce Johnson, senior advisor to the vice president, MIT Human Resources Department. The DEIC-CC meetings incorporated principles of inclusive collaboration, collective impact, and civic engagement [18, 19, 25–32] including, for example:

- Utilization of a dedicated facilitator with a goal of relationship building, trust, and psychological safety, and enabling all voices to be heard[18];
- Co-construction of inclusive collaboration norms;
- Social identity dialogue [32];
- Discussion of definitions, language, and terminology
- Small group dialogue;
- Collaborative workshopping of guided questions;
- Collaborative program development;
- Participatory surveys for decision-making;

- Asset-based frame and learning mindset;
- Empowering members for inclusive leadership;
- Transparent and structured codification of collaborative work: use of a Google shared digital archive accessible to all community members; all agendas, collaborative working documents, summaries, data and background materials were posted in the [DMSE DEI Canvas file archive](#); and
- Rigorous research to practice methodology (i.e. literature and scholarship used in dialogues, activities, and program development).

### 2.2.1 DMSE DEI List of Activities

DMSE DEI activities, including the work of the DEI Collaborative, other DMSE groups and governance committees, along with many individual community members as part of formal programs as well as informal initiatives and dialogue, demonstrated the passion, enthusiasm, commitment, and dedication to enhancing and strengthening DEI in the DMSE community. More than **3000 person-hours** were spent in dialogue, collaboration, programs, and initiatives related to DEI and enhancing the academic, research, and professional environment of our department, with examples listed below. It should be noted that there were many DEI efforts prior to the official formation of the DEI Collaborative by DMSE community members (for example, in the summer of 2020, student-led engagement and action was codified in "*An Open Letter on Racism and Inclusivity in MIT DMSE*" [12]) and there are likely many more efforts and contributions that we are not aware of from individual DMSE community members and groups over the past academic year .

- DEI Collaborative - CC: 15 meetings + inclusive leadership meeting with Alyce Johnson
- DEI Collaborative Org Team Meetings - 15 meetings, 3 meetings, meeting with Jason McKnight, ICEO Office
- DEI Collaborative Stakeholder Working Groups
  - Administrative and support staff - 5 meetings + 7 working meetings
  - Faculty, research, and instructional staff - 16 meetings + 16 additional smaller meeting
  - Graduate students - 26 meetings + 26 smaller working meetings
  - Undergraduate students - 19 meetings + 19 SUMS Meeting + 5 small meetings + 1 event
- DEI Collaborative Community Wide Convenings
  - #ShutdownSTEM 06/10/2020
  - DEI Collaborative Community-Wide Convening #1 10/08/2021
  - DEI Collaborative Community-Wide Convening #2 04/08/2021
- DEI Collaborative All-Staff Meeting (02/26/2021)
- DEI Collaborative Faculty Retreat Meeting (01/29/2021)
- BE-CHEME-DMSE Shared Seminars
- DMSE seminars (José Luis Torero, Michele Manual DEI session, Thomas Epps DEI Session)
- Shared DEI Specialist (BE-CHEME-DMSE) Search Committee - 8 meetings including offering two bias trainings provided by Beatriz Cantada, Director of Engagement for Diversity and Inclusion, ICEO office and Megan Chester and Anthony Williams, Human Resources, Additional DMSE staff support (Ryan Kendall, Administrative Assistant II,

DMSE) and committee membership participation (Magdalena Rieb, DMSE Director of Finance and Administration)

- DEI Staffing Support (approximately 10% effort DMSE Communications Officer, 25% effort DMSE HQ Staff time, and 25% DMSE Human Resources)
- DEI Collaborative Chair
  - Presentation at Faculty Meeting
  - Meeting at Department Head Office Hours
  - Meetings with Search Committee Chair, RAP chair - 2 meetings
  - Individual meetings with Stakeholder Working Group Chairs - 5 meetings
  - Department Head DEI meetings - 10 meetings
  - SOE DEI Meetings - 10 meetings
  - Meeting with MIT RISE leadership (Reject Injustice Through Student Empowerment)
  - ICEO Departmental Office Hours and Research Sessions - 7 meetings
  - Meetings upon request with individual community members related to DEI activities
  - Meetings with other MIT Departmental DEI chairs
  - Moderating DEI sessions at DMSE Seminars - 3 meetings
  - 3.010 Curriculum Modules
  - Meeting with faculty and student members of Stanford University DMSE DEI committee
  - DEI Collaborative Chair is also member of Materials Council, DMSE Seminar Committee, and chairs Shared DEI Specialist (BE-CHEME-DMSE) Search Committee
- DMSE Department Head
  - Planning, coordinating, implementing, and follow-up on #ShutdownSTEM
  - Weekly Office Hours - 20 weeks
  - Individual meetings with students and other community members
  - Meetings with individual faculty
  - Meetings in Engineering Council as well as other MIT leadership-called meetings

### 2.2.2 Review of Prior Reports and Data

Prior relevant reports were posted in the DMSE DEI Canvas site and distributed as resources for the DEI Collaborative:

- (1999) A Study on the Status of Women Faculty in Science at MIT (<http://web.mit.edu/fnl/women/women.pdf>) [11]
- (2004) MIT Faculty Policy Committee Statement on Representation of Minorities on the Faculty and in the Graduate Student Body, May 4, 2004 (<https://facultygovernance.mit.edu/faculty-meetings#resolution>) [10]
- (2010) Paula T. Hammond, Lotte Bailyn, Emery Brown, Wesley Harris, Barbara Liskov, Leslie Norford, Christine Ortiz, Hazel Sive, Marcus Thompson, Report on the Initiative for Faculty Race and Diversity [6]
- (2012) A Report on the Workshop on Ethnic Diversity in Materials Science and Engineering Sponsored by the National Science Foundation, The Department of Energy

Office of Science, The University Materials Council, The MRS Foundation, The North Carolina State University (Arlington, Virginia) (December 9-11, 2012) [33]

- (2014) MIT Working Group on International Student Support; MIT Office of the Dean for Graduate Education [8]
- (2015) Edmund Bertschinger, Advancing a Respectful and Caring Community: Report of the MIT Institute Community and Equity Office [7]
- (2015) MIT Black Graduate Students Association (BGSA) Executive Board Recommendations for Addressing Racial Bias at MIT. Presentation to MIT Academic Council December 1, 2015 [9]
- (2018) MIT Department of Aeronautics and Astronautics Strategic Plan for Diversity, Inclusion and Innovation, November, 2018 [34]
- (2020) MIT Department of Materials Science and Engineering student-authored public document, "An Open Letter on Racism and Inclusivity in MIT DMSE" [12].

The DEI Collaborative considered diversity across a broad range of attributes such as race, gender, national origin, sexual orientation, gender identity, socioeconomic status, disability, religious beliefs, political philosophy, veteran status, and other identity characteristics and lived experience. For MIT data collection and reporting purposes the federal definition of a minority (under-represented minority or URM) includes all U.S. citizens, both naturalized or permanent residents, that have origins which are “American Indian, Alaskan Native, Black (not of Hispanic origin), Hispanic (including persons of Mexican, Puerto Rican, Cuban, and Central or South American origin), Pacific Islander or other ethnic group underrepresented in science and engineering” [35]. Black, Indigenous, and People of Color (BIPOC) is a broader definition for all people of color. URM data was compared to parity with the domestic U.S. population.

Relevant demographic data were compiled and posted on the DMSE DEI Canvas site at the launch of the DEI Collaborative and have been updated in the Appendix and in the Table below for 2021. While the DMSE population is diverse in its composition, hailing from 41 countries from across the globe, the demographic data draw attention to domestic historically marginalized populations which are under-represented.

International	<i>(alphabetical order)</i> Faculty (0%) Postdoc (90%) Staff: Administration (0%); Other - Academic (10%), Research (0%); Support (11%) Students: Undergraduate (6%); Graduate (57%)
U.S. Permanent Resident	Faculty (30%) Staff: Administrative (7%); Other Academic (13%); Research (22%); Support (6%) Students: Undergraduate (3%); Graduate (2%)
Female	Faculty (30%) Postdoc (17%)

	Staff: Administrative (67%); Other Academic (23%), Research (11%); Support (75%) Students: Undergraduate (57%); Graduate (33%)
African American or Black population as % of domestic	Faculty (0% - does not take into account incoming Fall 2021 faculty) Postdoc (2%) Staff: Administrative (13%); Other - Academic (0%), Research (%), Support (13%) Students: Undergraduate (5%); Graduate (1%)
American Indian or Alaska Native as % of domestic	Faculty (0%) Postdoc (0%) Staff: Administrative (0%); Other Academic (0%), Research (0%), Support (0%) Students: Undergraduate (0%); Graduate (0%)
Asian American as % of domestic	Faculty (7%) Postdoc (2%) Staff: Administrative (13%); Other-Academic (8%), Research (22%), Support (13%) Students: Graduate (18%); Undergraduate (25%)
Hispanic American population as % of domestic	Faculty (10%) Postdoc (2%) Staff: Administrative (7%); Other Academic (6%), Research (0%), Support (6%) Students: Undergraduate (19%); Graduate (12%)
Pacific Islander as % of domestic	Faculty (0%) Postdoc (2%) Staff: Administrative (0%); Other-Academic (0%), Research (0%), Staff - Support (0%) Students: Undergraduate (0%); Graduate (0%)

2021 DMSE population demographic data ( MIT Office of Institutional Research, Office of the Provost)

**3. Emergent Strategic Priorities and Themes**

Strategic priorities were identified from the DEI Collaborative activities and the Stakeholder Working Groups engagement and dialogue with their respective communities which were codified by two surveys completed by the chairs of the Stakeholder Working Groups, one prior to the launch of the DEI Collaborative and one at the conclusion of the first year of the DEI Collaborative.

The *Staff Stakeholder Working Group* identified engagement, DEI education and dialogue (for example through workshops relevant to the day-to-today work lives of staff), departmental



processes, and inclusive cultures as high priorities. Considerations for staff participation include appointments which restrict work beyond the 40-hours per week, workload, long commutes, family care needs, continuing education assignments and classes, and power differentials between staff and supervisors.

The *Graduate Student Stakeholder Working Group* identified the following as high priorities: capacity building (e.g. DEI staff, internal expertise, financial resources, etc.), departmental processes (e.g. recruitment, admissions, qualifying exams, etc.), and inclusive cultures and mentoring (e.g. lab cultures). The *Undergraduate Student Stakeholder Working Group* identified inclusive cultures and mentoring, in particular, improving academic support systems by revising the undergraduate advising model, outreach to make the field of MSE more accessible (e.g. high schools, local communities), DEI education and dialogue, professional and personal advancement, as high priorities.

The *Faculty, Instructional, and Research Staff Stakeholder Working Group* identified departmental processes (e.g. recruitment, admissions, hiring, and retention of student, staff, and faculty), external communications and perceptions, DEI education and dialogue, inclusive cultures, and capacity building as high priorities. A particularly important consideration is the strain of research fundraising (e.g. grant writing), which is a barrier to participation.

For *Postdoctoral Researchers*, professional and personal advancement, inclusive lab cultures, and mentoring were identified as a high priority.

The identified priorities described above were aggregated into strategic themes as follows: 1) inclusive departmental processes (e.g. recruitment, admissions, hiring, etc.), 2) inclusive learning, education, and dialogue, 3) inclusive research cultures and workplaces, 4) inclusive personal and professional advancement (e.g. mentoring, advising, etc.), and 5) inclusive narratives and external engagement, with a Supporting Theme of capacity-building (e.g. staffing, expertise, financial, etc.). A strategic set of intellectual themes which cross-cut across stakeholder groups has a number of benefits, including: 1) the ability to draw upon a rich scholarship and literature base focused on those themes and 2) incentivizing dialogue, learning, and collaboration across stakeholder groups thus fostering more social and intellectual cohesion within the department.



*DMSE DEI Emergent Strategic Themes*

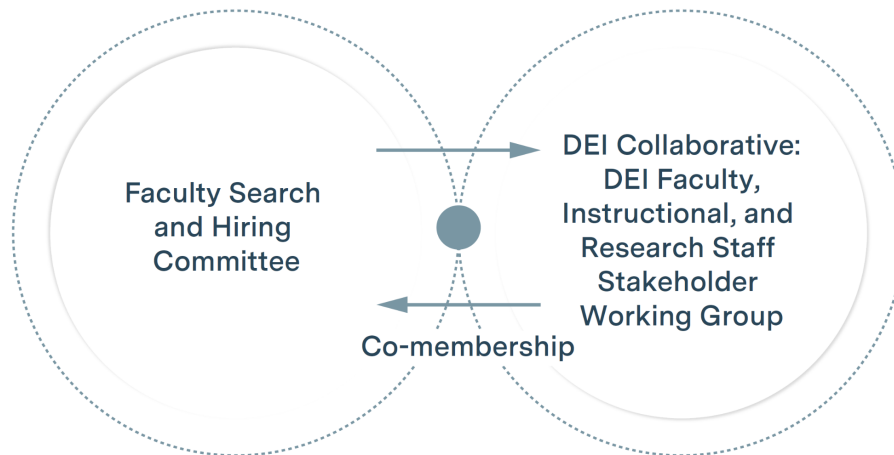
## 4. DMSE DEI Activities

### 4.1 DMSE DEI Activities by Strategic Theme

#### 4.1.1 Strategic Theme 1: Inclusive Departmental Processes (e.g. Recruitment, Admissions, Hiring)

*Improvements to the Faculty Search and Hiring Process* were supported by collaboration between the Faculty Search and Hiring Committee members and staff, the DEI Collaborative, in particular the DEI Student Stakeholder Working Group and Faculty, Instructional, and Research Stakeholder Working Group, and the DMSE Communications Officer. In addition, there was collaboration between The Faculty Search and Hiring Committee Chair, the DEI Collaborative chair, and the Department Head. Successful improvements focused on process change and mitigating cognitive biases, and aimed to embed DEI values, considerations, and best practices deeply throughout the entire search and hiring process [6, 7, 36–41]. Specific actions are described following:

- *DEI Education for the Faculty Search and Hiring Committee* took place with all members participating in a workshop focused on *Best Practices for an Inclusive and Equitable Search* provided by Beatriz Cantada, MA, Director for Engagement for Diversity and Inclusion in the MIT Institute Community and Equity Office (ICEO). Topics discussed included mitigating implicit / unconscious bias, stereotypes, and assumptions, processes for enhancing inclusion in a search (e.g. leveraging diversity of perspectives), fostering diversity of the applicant pool, co-creation of well-defined rubrics, standardizing interview questions, and explicit comparison of applicant qualifications against job requirements. The search committee also attended a session on *Legal Aspects of Hiring* presented by Mark DiVincenzo, MIT Vice President and General Counsel, and Anthony Moriello, MIT Associate Counsel. A comprehensive [resource document](#) was compiled by the DEI Collaborative chair and made available to the Faculty Search and Hiring Committee and DMSE community. It is important to note that these sessions should be viewed as one opportunity for continuous learning within a more comprehensive set of DEI strategic education activities.
- *Student Engagement and Participation in the Faculty Search and Hiring Process* took place through a highly successful [process for student and postdoc involvement in the faculty search and hiring process](#) which was initiated by and in collaboration with the DMSE Student Stakeholder Working Group. Components included student and postdoc dedicated meetings with the candidates, student and postdoc attendance at candidate “chalk talks,” targeted and enhanced communications for invitations for students and postdocs to attend open faculty candidate events, the opportunity for students and postdocs to provide feedback and evaluation in the context of a formal rubric. The data representing the feedback from the students and postdoc were organized, analyzed, and presented at the faculty meeting by the search chair where hiring was discussed and found to be extremely valuable.
- *Cross-membership Between the Faculty Search and Hiring Committee and the DEI Collaborative* took place via co-membership of a faculty member who served on both the Faculty Search and Hiring Committee and the DEI Collaborative, and as chair of the Faculty, Instructional, and Research Staff Stakeholder Working Group, providing integration and additional DEI perspective and expertise.



*Co-membership between DEI Collaborative and Faculty Search and Hiring Committee*

- Enhanced and Proactive Recruitment Processes* included extensive outreach to individual faculty with connections to diverse candidates and individual personalized outreach to potential candidates. The Faculty Search Committee Chair sent email communications to all faculty and also communicated at faculty meetings encouraging personal outreach to candidates of diverse backgrounds. The DEI Collaborative Chair and Professor Frances Ross spoke at the MIT Path of Professorship event sponsored by the MIT Office of Graduate Education and The DEI Collaborative Chair also participated in a postdoctoral researcher mentoring event sponsored by the National Academies and L'Oréal USA. A review was carried out of Integrated Postsecondary Education Data System (IPEDS) data for the higher education institutions in materials science and engineering and proximate fields producing the largest number of under-represented minority baccalaureates and targeted outreach to these department heads and graduate officers was carried out by the Chair of the Faculty Search and Hiring Committee. Targeted outreach was also carried out to relevant organizations (e.g. National Science Foundation Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF-INCLUDES) consortia, MRS Broadening Participation Committee, National GEM Consortium (National Consortium for Graduate Degrees for Minorities in Science and Engineering), Stanford DARE (Diversifying Academia, Recruiting Excellence) Program, National Society of Black Engineers (NSBE), MIT Office of Graduate Education – MIT Summer Research Program and Path of Professorship alumni, University of Maryland, Baltimore County Meyerhoff Scholars Program alumni, Princeton (Materials Research Science and Engineering Centers (MRSEC) Symposium on Soft Matter for All, and the Fall 2020 Materials Research Society. Advertisements were provided to the Society of Women Engineers, The Journal of Blacks in Higher Education, Society for the Advancement of Chicanos and Native Americans in Science and Engineering, New England Higher Education Recruitment Consortium, DiverseJobs (Diversity Issues), Insight to Diversity, and Women in Higher Education. Broad social media announcements were implemented by the DMSE Communications Officer and the DEI Collaborative chair.
- Diversity, Equity, and Inclusion Statements in Faculty Candidate Applications* were incorporated that included candidate philosophy, past activities, and future plans into

candidate applications. DEI statements were included in the application package distributed to evaluators, reviewed and scored as a component of the evaluation process.

- *A Formal Evaluation Rubric* with five categories was implemented to reduce the ambiguity of the selection criteria and mitigate implicit bias, where one category constituted DEI. There was explicit comparison of applicant qualifications against evaluation rubric.
- [Inclusive Hosting Practices](#) were codified and implemented in faculty candidate interviews including, for example, inclusive pre-hosting communications, explicit incorporation of DEI topics into the interview including a separate meeting with DEI Collaborative chair, offer for disability accommodations, offer to support childcare needs, communications and attentiveness to digital privacy, sufficient breaks built into the candidate schedule, an appointed schedule facilitator, etc.
- *DEI Considerations were Incorporated into Finalist Recruitment* by the Department Head including dialogue which included DEI topics, negotiations, and advocating for competitive start-up packages including support for DEI activities, with advice and support from the DEI Collaborative chair in selected areas.

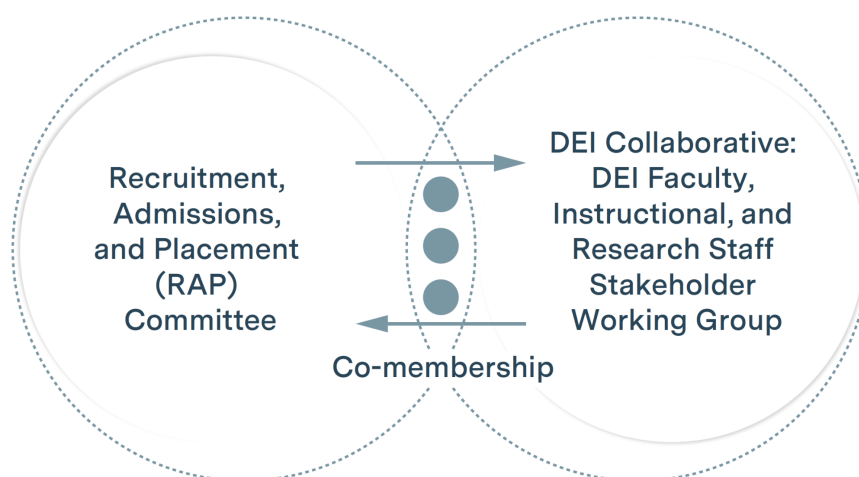
These efforts were highly successful, resulting in the hiring of two outstanding researchers, Dr. Iwnetim (Tim) Abate whose research focuses at the intersection of electrochemistry and physics to develop solutions for climate change and smart agriculture and Dr. Aristide Gumyusenge whose research focuses on novel organic materials for smart electronics.

Further discussions emphasized the importance of long term, sustainable engagement with colleges, universities, and organizations which serve diverse populations of students, tracking and engagement with alumni of diverse backgrounds, diversifying the graduate and postdoc population, enhancing and ensuring that the departmental environment, culture, processes, and resources enable faculty of diverse backgrounds to thrive professionally in DMSE. Continued efforts will be made in these areas.

*DEI Efforts at Graduate Student Recruitment, Admissions, and Placement* are described following:

- [The MIT ACCESS program](#) is an underrepresented student (URM) recruitment symposium where information is shared with URM students on the advantages of graduate studies in Chemical Engineering, Chemistry, and Materials Science. Students virtually met with MIT faculty, students, and alumni and learned about graduate student life at MIT. In 2020, a DEI panel was held with a member of the DMSE DEI Collaborative participating, the RAP chair and Department Head met with ACCESS participants. Topics include information on the graduate admissions process from faculty and student perspectives, learning and practicing communication and presentation skills with a coaching professional, discovering the research process with current chemistry, chemical engineering and materials science graduate students, meeting current graduate students and learning about diversity at MIT and available resources, and meeting alumni and learning about their journey from admission to graduation to their career paths.
- *The RAP Chair gives MIT-internal graduate recruitment talks* to the Center for Materials Science and Engineering (CMSE) REU programs and the MIT Summer Research Program (MSRP) students regarding DMSE admissions.

- [The DMSE Graduate Application Assistance Program \(DAAP\)](#) was developed by the DEI Collaborative Graduate Student Stakeholder Working Group in collaboration with the Recruitment, Admissions, and Placement Committee. DAAP is a volunteer-based, student-run program that provides assistance to DMSE applicants from underrepresented groups. Applicants are paired with a graduate student who can answer questions about DMSE and MIT, provide feedback on materials to create a stronger application, and guide applicants through the DMSE application process. DAAP mentors are trained by a faculty member on the Graduate Recruitment and Admissions Committee on DMSE's admissions criteria and on providing feedback for application materials. Further information is provided in the Graduate Student Stakeholder Working Group Activities section of this report.
- *Cross-membership Between the Recruitment, Admissions, and Placement (RAP) committee and the DEI Collaborative* took place via co-membership of three faculty members who served on both RAP and the DEI Collaborative, on the Faculty, Instructional, and Research Staff Stakeholder Working Group, providing integration and additional DEI perspective and expertise.



*Co-membership between DEI Collaborative and the Recruitment, Admissions, and Placement Committee*

- *Dialogue and explicit attention to scholarship and best practices in graduate admissions* in RAP, the DEI Collaborative Coordination Council (November 20, 2020), Stakeholder Working Groups (November, 2020), and first Community-Wide Convening (January 12, 2021). The topic of recruitment and evaluation processes explored departmental and/or institutional systems and cultures that are root causes barriers to representation of minoritized groups including:
  - Climate-related factors (e.g. Isolation, negative experiences of current minoritized graduate students, disheartened URM alumni, public image and narrative, New England racial climate);
  - Institutional partnership-related factors (e.g. Inequities and attitudes, past negative relationships, etc.);

- Informational-related factors (e.g. Lack of understanding of the admissions requirements and process, lack of follow-up with potential students, etc.);
- Personal and cultural-related factors (e.g. Finances; supporting family and/or extended family, lack of understanding and willingness to take on debt, separation, lack of understanding by family, do not think they will be accepted – not worth time, etc.); and
- Implicit and unconscious bias [42, 43].

These discussion also recognized the challenges with the “pipeline” metaphor and how might we might overcome them, promoting structured and inclusive long term relationships, projects, dialogue, engagements to mitigate biases and advance representation of minoritized groups (e.g. the “contact hypothesis” [44]), and application of key characteristics of equitable evaluation processes (e.g. contextualized, comprehensive, and structured, using explicit and shared criteria and rubrics) [39, 45].

- *The Graduate Record Exam (GRE) was put on hold for Academic Years 2020-2021 and 2021-2022 due to the challenging and additional strains of 2020 and dialogue about emerging research on efficacy and impacts on diversity [46] by the Recruitment, Admissions, and Placement (RAP) committee.*
- *DEI was explicitly included in the incoming graduate student orientation with members of the Graduate Student DEI Stakeholder Working Group participating in this event.*

The graduate admissions process resulted in a historic high of admitted URM graduate students and the percentage of URM enrolling increased relative to recent years (data in Table below, and historical data in Appendix). DMSE did lose a number of admitted URM graduate students to other universities this admissions cycle. Year-to-year first year enrolling URM percentage changes dramatically because the enrolling number of URM graduate students is small (2 students this year). Strong continued efforts and diligence are needed to ensure continued success.

URM graduate admitted as % of domestic	18% (6 students) including: <ul style="list-style-type: none"> <li>● Black or African American (6%)</li> <li>● Hispanic American (6%)</li> <li>● American Indian or Alaska Native (6%)</li> </ul>
URM graduate enrolling (1st year) as % of domestic	13% (2 students) including: <ul style="list-style-type: none"> <li>● Black or African American (6%)</li> <li>● Hispanic American (6%)</li> </ul>

*Fall 2021 URM graduate admission data*

*DEI efforts related to Graduate Student Processes* included the Thesis Area Exam (TAE) equity improvement initiative by the Graduate Student Stakeholder Working Group, in collaboration with the Department Committee on Graduate Students (DCGS). This effort focused on reform of departmental processes and communication materials to involve more inclusive language and evaluation rubrics.

*DMSE Professors served on Institute Committees related to DEI as follows.*

- DMSE Professor Craig Carter served on the [MIT Council of Family and Work](#) which serves in an advisory and deliberative capacity concerning family and work related issues as they

impact MIT's faculty, staff, and students. It is the Council's responsibility to: 1) identify family and work-related issues, 2) establish a process to evaluate and respond to these issues, and 3) make periodic recommendations to MIT's senior officers about courses of action relevant to these specific issues. DEI was a central topic to their deliberations in the past year.

- DMSE Professor Julia Ortony is a member of the [MIT School of Engineering Faculty Gender Committee](#). The School of Engineering Faculty Gender Equity Committee is made up of faculty representing all School of Engineering departments, including the Institute for Medical Engineering and Science (IMES), and reports to the Dean of Engineering. The committee is charged with monitoring and reporting to the Dean on the status of gender equity for faculty in the School. The committee also provides recommendations on best practices to the Dean and facilitates effective dissemination of relevant activities and policies to faculty within their respective units.

#### 4.1.2 Strategic Theme 2: Inclusive Learning, Education, and Dialogue

DMSE DEI Learning, Education and Dialogue events and activities included more than **fifteen (15) external speakers and facilitators**. Aspects of DEI core cultural competencies (i.e. self-awareness, understanding and valuing others, knowledge of societal inequities, skills to interact effectively with a diversity of people in different contexts, skills to foster transformation towards equity and inclusion) [47] incorporated throughout (with special acknowledgement to Beatriz Cantada of the Institute Community and Equity Office for providing scholarship on this topic and further supporting such efforts) . These events and activities are described following;

- On June 10, 2020, DMSE organized a three (3) hour long facilitated virtual forum attended by approximately 150 community members as part of the national initiative #ShutDownSTEM focused on eliminating racial injustice and actively working toward a vision of true inclusivity. This event provided time and space to reflect on, to learn, and to share experiences related to injustices and systemic racism and to develop plans to root out anti-Black racism in our institution. The event was facilitated by Beatriz Cantada, MA, Director for Engagement for Diversity and Inclusion in the MIT Institute Community and Equity Office (ICEO) and DMSE community members. Topics discussed included representation, recruitment, graduate admissions processes, faculty hiring processes, and the experience of BIPOC (Black, Indigenous, and People of Color) community members. This event set an excellent foundation for the work of the DEI Collaborative. [Notes from the #ShutDownSTEM forum](#) were posted on the DMSE DEI Canvas site.





*Beatriz Cantada, MA, Director for Engagement for Diversity and Inclusion, MIT Institute Community and Equity Office (ICEO)*

- On September 25 - 26, 2020, an NSF-grant awarded through DMSE funded an international workshop on *Socioresilient Infrastructure: Materials, Assemblages, and Systems* which focused on the development of materials and infrastructure which supports the ability of human communities to equitably cope with and adapt to stresses and shocks such as social, political, environmental, or economic change and integrated DEI topics throughout. The DMSE community was invited and included speakers such as Dr. Marccus Hendricks, Assistant Professor at the University of Maryland, School of Architecture, Planning, and Preservation and Director of the Stormwater Stormwater Infrastructure Resilience and Justice who spoke about stormwater infrastructure planning and management, social vulnerability to disaster, environmental justice, hazard mitigation, sustainable development, public health and the built environment, and participatory action research. Another outstanding speaker was Dr. Destenie Nock, Assistant Professor of Civil and Environmental Engineering and Engineering and Public Policy at Carnegie Mellon University who spoke on energy justice, sustainability, energy poverty analysis, and engineering for social good.



*Dr. Marccus Hendricks, Assistant Professor at the University of Maryland, School of Architecture, Planning, and Preservation and (Right) Dr. Destenie Nock, Assistant Professor of Civil and Environmental Engineering and Engineering and Public Policy at Carnegie Mellon University*

- On October 15, 2020, a one-hour inclusive leadership workshop was provided by Alyce Johnson, Senior Advisor to the Vice President, MIT Human Resources Department to the chairs of the DEI Collaborative Stakeholder Working Groups. Topics included theories of team development, co-creation of inclusive collaboration norms, inclusive meeting structures, inclusive narratives, and fostering inclusion in decision-making processes.



*Alyce Johnson, Senior Advisor to the Vice President, MIT Human Resources Department*

- The DMSE Departmental Seminar Series Committee made explicit efforts in the area of DEI, and maintained cross-membership with the DEI Collaborative. On October 20, 2021, DMSE hosted a departmental seminar by José Luis Torero, Professor and Head of the University College of London, Department of Civil, Environmental, Geomatic and Environmental Engineering on the topic of “*Materials Science in Support of Social Inequity.*” This seminar consisted of a discussion on the complex entanglement between materials technologies research and development and social inequities, using the case study of fire safety materials and disasters [48, 49]. Professor Torero described the interactions between disciplinary values and research funding incentive structures, relaxation of legal and regulatory restrictions to promote innovation, social vulnerability with increased design complexity, and unintended consequences and tradeoffs of new strategies for embracing socially focused goals such as sustainability. The [video](#) was posted on the DEI Canvas site for the DMSE community.



*Dr. José Luis Torero, Professor and Head of the University College of London, Department of Civil, Environmental, Geomatic and Environmental Engineering*

- On October 21, 2021, DMSE in collaboration with the Departments of Biological Engineering, and Chemical Engineering, hosted a shared seminar which featured Professor Angela Y. Davis, political activist, philosopher, academic, author, and professor at the University of California, Santa Cruz in a live discussion moderated by Senior Associate Dean Blanche Staton of the MIT Office of Graduate Education on allyship, anti-racism, and social activism. Professor Davis spoke on the importance of historical context, international perspective, humanistic fields, working across differences, and collective imagination and hope in building social movements. An article was posted on the MIT News site on October 30, 2020 written by E. Thomson entitled: “Activist and scholar Angela Davis addresses racism in MIT webcast. Davis, in conversation with Senior Associate Dean Blanche Staton, fields questions from the MIT community about the current moment of racial reckoning” [50].



*Professor Angela Y. Davis, political activist, philosopher, academic, author, and professor at the University of California, Santa Cruz and (Right) Senior Associate Dean Blanche Staton, MIT Office of Graduate Education*

- On January 12, 2021, the DEI Collaborative held the first DMSE Community-Wide Convening which included updates from the DEI Collaborative by the Stakeholder Working Group Chairs followed by dialogue and collaboration facilitated by the Stakeholder Working Group Chairs, on the following topics: 1) Inclusive mentoring and lab cultures [51–60], 2) Inclusive teaching and learning environments [22, 61–64], 3) Recruitment and evaluation processes (e.g. graduate admissions, faculty and staff hiring) [13, 39, 45]. The topic of inclusive mentoring and lab cultures focused on mindsets and mental models that could act as barriers to high quality inclusive mentoring and inclusive teams and lab cultures, structured orientation processes to foster inclusion, and strategies to enable all members of our teams, groups, and labs to feel included, to be empowered, to have voice, and to have equal access to academic and professional opportunities, mentoring feedback. The topic of inclusive teaching and learning environments included dialogue about foundational elements of what constitutes an inclusive environment, establishing community norms, strategies for building trust, psychological safety, and productive learning environments, and asset-based and inclusive feedback. The topic of recruitment and evaluation processes explored departmental and/or institutional systems and cultures that are root cause barriers to representation of minoritized groups, challenges with the “pipeline” metaphor and how might we overcome them, promoting structured and inclusive long term relationships, projects, dialogue, engagements to mitigate biases and advance representation of minoritized groups (e.g. the “contact hypothesis” [44]), and application of key characteristics of equitable evaluation processes (e.g. contextualized, comprehensive, and structured, using explicit and shared criteria and rubrics). There was a strong interest in support for promoting inclusive lab cultures, which will inform future plans. [Materials from the first Community-Wide Convening](#) were posted in the DMSE DEI Canvas site.
- On January 29, 2021, the DEI Collaborative facilitated a DEI working session at the Annual Faculty Retreat Meeting. The one-hour working session focused discussion and actions to foster high quality, effective, and inclusive mentoring environments. Background materials provided include a short eight-minute video [Stereotype Threat: A Conversation with Claude Steele](#) and the journal article: Cohen, G. L., & Steele, C. M. (2002) A barrier of mistrust: How negative stereotypes affect cross-race mentoring. In *Improving academic achievement* (pp. 303-327): Elsevier [59]. Further supplementary literature was provided for those with an interest [51–58, 65]. Examples of practices to foster inclusion were provided as follows:
  - “Wise feedback” [65];
  - Inclusive orientation of new colleagues;
  - Structuring collaborations: sub-groups, peer mentoring, digital environments, etc.;
  - Incorporation of social context, impact, and in/justice topics into research topics [66];
  - Providing and equalizing opportunity and resources;
  - Mitigating deficit frames and stereotypes [52, 56];
  - Engaging across differing work and communication styles (e.g. using the DISC assessment [67] or similar analysis);

- Facilitating productive disagreement and differing perspectives and conflict mediation [68];
- Hosting speakers for dialogue on relevant DEI topics; and
- Ways to acknowledge and express gratitude for contributions and labor that may not normally be recognized.

Breakout pairs discussed when individuals personally experienced stereotype threat or assumptions (positive or negative) related to social group and/or professional identity and asked each faculty member to identify a single action to promote inclusive mentoring environments. The latter are listed below:

- Create a best practices document on managing a class (lecture and labs) (do's and don'ts) to foster inclusiveness. Have faculty/TAs share experiences (success stories, surprises, etc);
- Use time in group meetings to discuss DEI topics;
- Create expectations in the classroom for tolerance, dignity, and respect;
- Embed examples within core curriculum that draw on broad connections to cultural competency and linked closely to the technical background;
- Provide inclusive and diverse introductions in classes;
- Learn more about mentoring to be more sensitive to DEI in order to be more effective mentors (targeted education with specific students in mind);
- Think about how MIT is perceived - its view of meritocracy. Members of the MIT community are very high achieving, but is it inclusive? Is it welcoming?;
- Be aware of implicit biases, and how past experiences of being stereotyped influences our current experiences;
- Have specific discussions with mainland Chinese origin students to emphasize MIT's support;
- Focus discussions on international students as well as URMs;
- Invite of topics and perspectives from researchers with related expertise from outside MIT as departmental speakers; and
- Make DEI goals visible in as many places as possible.

Significant discussion took place on the tension between communications related to narratives (e.g. "cutting-edge," "state-of-the-art," etc.) can be perceived as elitist and how such narratives can foster exclusion. This emergent area of inclusive narratives and communications, discussed further in later sections of this report,, will be a focus in the coming year.

- On February 26, 2021, The DEIC Collaborative, in collaboration with the Administrative and Support Staff Stakeholder Working Group, facilitated a DEI session at a DMSE All-Staff Meeting. The one-hour working session focused on creating a foundation for cultural competence and collectively identifying strategies for fostering inclusion in the workplace. The session focused on self-awareness, understanding, and appreciation of social identities, cultures, biases, and perspectives [32, 47, 69, 70] (more Information is provided in the Administrative and Support Staff Stakeholder Working Group Section)

- On March 09, 2021, Dr. Thomas Epps, Allan & Myra Ferguson Distinguished Chair of Chemical and Biomolecular Engineering at University of Delaware, Director of University of Delaware Materials Research Science and Engineering Centers (MRSEC) Center for Hybrid, Active, and Responsive Materials (UD CHARM) at University of Delaware and MIT alum (M.S. '99, B.S. 98) presented a departmental seminar on “From Biomass to Performance-Advantaged Polymers: Routes to Lignin Valorization.” He participated in a rich dialogue session on DEI topics moderated by the DEI Collaborative chair and well-attended by DMSE community members.



*Dr. Thomas Epps, Allan & Myra Ferguson Distinguished Chair of Chemical and Biomolecular Engineering at University of Delaware*

- On April 8, 2021, DEI Collaborative Community-Wide Convening #2 focused on two topics: 1) Understanding and fostering belonging [71–74] and 2) Building partnerships external to DMSE. Related to the first topic, characteristics were identified of *inclusion* (the practice or policy of providing equal access to opportunities and resources for people who might otherwise be excluded or marginalized) and *belonging* (when an individual feels seen, valued and respected for their unique contributions, connected to their colleagues, supported in their daily work and career development, and proud of their organization’s values and purpose). Guiding questions were provided to the attendees as follows: 1) Drawing upon your own experience of belonging, and in relation to your social identities, cultural background and perspectives, what characteristics of that time / circumstances / community were most impactful to you? and 2) Noting the core factors which contribute to belonging above, what are specific actions we might take to foster belonging within DMSE, for example in undergraduate advising, welcoming new members to our community, integration of regular and structured activities within research groups, new programs, etc.? Emergent themes in the discussion included elitism, recent anti Asian-American racism and the perception of “foreignness” and multiplicity of identity, long-standing systemic racism reflected in policy, conflation and targeting of groups linked to geopolitical events, safety and bystander/upstander roles, increasing an understanding of roles, titles, elevating hidden labor, and the culture of busyness - valued as use of time (how to make DEI official part of roles).

The second topic recognized that there has been an escalating interest in fostering more interaction, communication, and partnerships with a broader and more diverse range of US-based institutions, for example Minority-Serving Institutions (MSIs), Historically Black Colleges and Universities (HBCUs), Hispanic-Serving Institutions (HSIs), Native and Tribal Colleges, Community Colleges, etc. in order to foster DEI efforts, in particular in the context of recruitment and retention [75]. In the past, challenges have arisen related to deficit assumptions and “extractive” mindsets (unilateral rather than bilateral program structure), inequitable distribution of resources among partner institutions, lack of understanding of institutional contexts, poor student experience, and lack of continuity. Guiding questions included: 1) What experiences have you had with potential partner institutions (e.g. MSIs, HBCUs, HSIs, Native and Tribal Colleges, Community Colleges, etc.)? and 2) How might we avoid some of the potential pitfalls and what are some opportunities with program design to achieve more equitable, respectful, mutually beneficial, and impactful partnerships? Emergent themes included the desire to learn about institutional context possibly by a panel of current MIT community members who are MSI alums, identifying value and expertise of partners to contribute to MIT, challenges with joint research projects that include inequitable institutional resources, “scooping,” and that sub-disciplines/ topics may be different, and that MS&E is not universal across the higher education system.

- On May 03, 2021, DMSE in collaboration with the Departments of Biological Engineering, and Chemical Engineering hosted a shared seminar focused on “*Navigating Disability, Both Visible and Invisible*” which included a panel discussion on the issues that individuals with disabilities face on campus, in the workplace, and in society, and how they can be better addressed through education and institutional change. This panel featured Lizzie Velásquez, Activist and Author of *Lizzie Beautiful* and *Be Beautiful, Be You* and Darcy Gordon, Instructor of Blended and Online Learning Initiatives, MIT Biology Department, and was moderated by Mary Strawser, Doctoral Candidate, MIT Department of Mechanical Engineering.



(Left) Lizzie Velásquez, Activist and Author of *Lizzie Beautiful and Be Beautiful, Be You and* (Right) Darcy Gordon, Instructor of Blended and Online Learning Initiatives, MIT Biology Department



*Mary Strawser, Doctoral Candidate, MIT Department of Mechanical Engineering*

- On May 3, 2021, Dr. Michele Manuel, Professor and Department Chair, Rolf E. Hummel Professor of Electronic Materials, University of Florida presented a departmental seminar on “High Temperature Aluminum Alloy Design Approach for Additive Manufacturing.” She participated in a rich dialogue session on DEI topics moderated by the DEI Collaborative chair and well-attended by DMSE community members which touched on topics such as diversifying faculty hiring, inclusive mentoring and lab cultures, and inclusive communications.



*Dr. Michele Manuel, Professor and Department Chair, Rolf E. Hummel Professor of Electronic Materials, University of Florida*

- During the Spring term 2021 a workshop was provided to the DMSE Faculty Search and Hiring Committee focused on *Best Practices for an Inclusive and Equitable Search* provided by



Beatriz Cantada, MA, Director for Engagement for Diversity and Inclusion in the MIT Institute Community and Equity Office (ICEO). Topics discussed included mitigating implicit / unconscious bias, stereotypes, and assumptions, processes for enhancing inclusion in a search (e.g. leveraging diversity of perspectives), fostering diversity of the applicant pool, co-creation of well-defined rubrics, standardizing interview questions, and explicit comparison of applicant qualifications against job requirements. The search committee also attended a session on *Legal Aspects of Hiring* presented by Mark DiVincenzo, MIT Vice President and General Counsel, and Anthony Moriello, MIT Associate Counsel.



*(Left) Mark DiVincenzo, MIT Vice President and General Counsel and (Right) Anthony Moriello, MIT Associate Counsel*

Department Head DEI Office Hours were offered July-November 2020, allowing all members of the community to talk directly with departmental leadership on DEU issues.

DMSE curriculum development and delivery included:

- In Introduction to DMSE (currently 3.201, graduate-level class), a DEI talk was organized by Professor Elsa Olivetti.
- In 3.091 Introduction to Solid State Chemistry (a freshman-level class), Fall 2020, a pre-class survey on student attitudes and well-being was developed and administered by DMSE Professor Rafael Jaramillo in collaboration with DMSE undergraduate students. 389 survey responses were received and results were disseminated among Core Science instructors, and at DMSE faculty lunch meeting on September 18, 2020. Additionally, Professor Jaramillo developed content for and led discussion sessions during three recitation hours on DEI in science and engineering using case studies that focused on the interplay between science, ethnicity, gender, and bias (September 15, 2021, September 28, 2020, and December 03, 2021).
- In 3.010 Structure of Materials (a required Sophomore core class, led by Professor Caroline Ross, in the Fall of 2020, four (4) social impact modules were developed and

delivered by DMSE Professor Christine Ortiz and DMSE Instructor Dr. Ellan Spero which included DEI content throughout. Topics included: 1) Scientific visualization, tacit knowledge, and inclusion (09/23/2020), 2) Instruments, Labor, and Scientific Communities of Practice (10/07/2020), 3) Social Inequity and Equity-Based Design (10/28/2021), and 4) Sustainability & Environmental Justice (11/18/2020). This curriculum also engaged a guest speaker Dr. Francisco Martin-Martinez, Lecturer at University of Swansea (UK) in the Department of Chemical Engineering.



*Dr. Francisco Martin-Martinez, Lecturer at University of Swansea (UK) in the Department of Chemical Engineering*

### 3.010 Structure of Materials Social Impact Modules

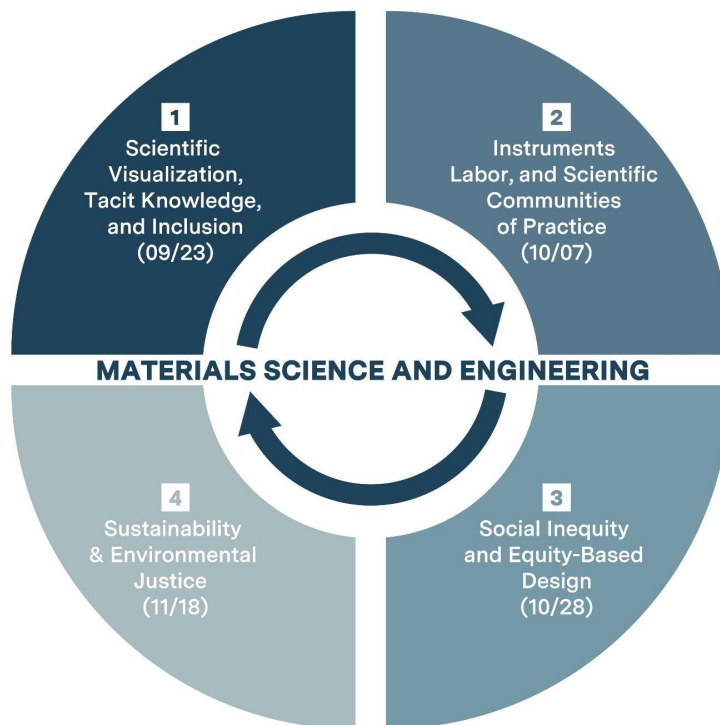


Figure 21: Fall 2020 3.010 Structure of Materials Social Impact Modules

- In 3.087 Materials, Societal Impact and Social Innovation, a joint undergraduate - graduate elective class taught by DMSE Professor Christine Ortiz and DMSE Instructor Dr. Ellan Spero, in the Fall of 2020, additional DEI-related topics were implemented. 3.087 hosted guest speaker James Hoyte, J.D. senior administrator and lecturer in environmental policy at Harvard University (retired) and Fellow of Harvard's W.E.B. Du Bois Institute for African and African-American Research, who spoke on the topic of environmental justice. 3.087 also hosted Dr. Maria Julia Brunette, Associate Professor, School of Health & Rehabilitation Sciences, College of Medicine at The Ohio State University who spoke on the topic of community-based participatory research.



*James Hoyte, J.D. (retired) senior administrator and lecturer in environmental policy at Harvard University and Fellow of Harvard's W.E.B. Du Bois Institute for African and African-American Research.*



*Dr. Maria Julia Brunette, Associate Professor, School of Health & Rehabilitation Sciences, College of Medicine at The Ohio State University*

Additional inclusive pedagogical approaches were also developed to build and maintain community within the transition to the virtual teaching and learning environment including: digital think-pair-share using breakout rooms for small group discussion and sharing within the main group on topics that bridged personal experience with course themes, co-creation of norms with attention to the challenges of remote learning and diversity of learning styles and physical environments, and syllabus statement of course values and explicit commitment to DEI (below).

*Learning Environment:*

*It is our goal that all students in this course feel that they are working in an environment in which they can comfortably and productively learn. Thus, we want to make explicit that diversity of backgrounds (including but not limited to: gender, race, ethnicity, sexual orientation, age,*

*socioeconomic status, religion, abilities) is an asset to all of us. A learning community built on mutual respect with a diversity of voices and minds is a foundation for our productive engagement with the questions of our shared world.*

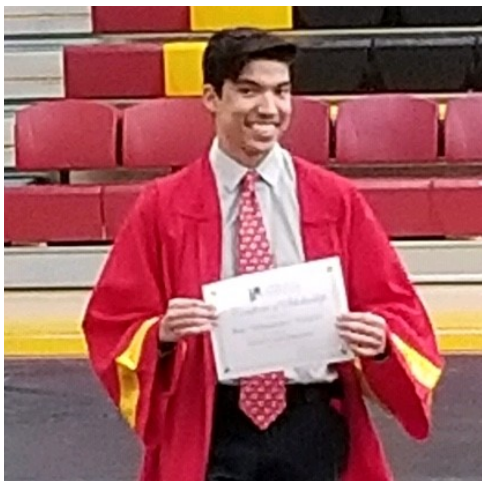
On November 19, 2020, a senior celebrations and reflections event was held which was a moving opportunity for community-building where faculty and seniors expressed deep appreciation and recognized accomplishments and resiliency.

In 3.020, Thermodynamics of Materials, Spring 2021, Professor Rafael Jaramillo developed content and led hour-long discussions on social, political, and personal aspects of science and engineering research, including selected reading assigned before class (April 7th, 2021 and May 17, 2021).

In 3.063/3.942, Polymer Physics, Professor Alfredo Alexander-Katz added content to diversify case study examples of science and engineering inventors.

#### 4.1.3 Strategic Theme 3: Inclusive Research Cultures and Workplaces

*Participation in the MIT Summer Research Program (MSRP) included hosting six (6) students within DMSE laboratories, which serves to promote inclusive research cultures, as well foster diverse graduate recruitment (see Strategic Theme 1: Inclusive Departmental Processes section). MSRP seeks to promote the value of graduate education; to improve the research enterprise through increased diversity; and to prepare and recruit the best and brightest for graduate education at MIT. Below includes the MSRP and their corresponding host laboratories in DMSE.*



*MSRP Biology undergraduate student Jorge Marquez Chavez, New Mexico State University, Physics; Engineering Physics-Mechanical Engineering, hosted by the research group of DMSE Professor Polina Anikeeva*



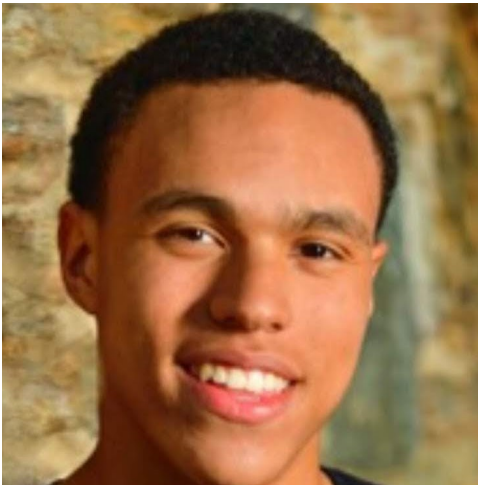
*MSRP Undergraduate student Manuel Cortes, University of Florida, Biomedical and Medical Engineering hosted in the research group of DMSE and BE Professor Prof. Darrell Irvine*



*MSRP Undergraduate student Samuel Figueroa, University of California, San Diego, Materials Science and Engineering hosted in the research group of DMSE Professor Chris Schuh*



*MSRP undergraduate student Jesse Garcia de Alva, Electrical Engineering Undergraduate at University of California, San Diego hosted by the research group of DMSE Professor Polina Anikeeva*



*MSRP undergraduate student Micah Thorpe, University of Maryland, Baltimore County, Department of Mechanical Engineering, was hosted in the research group of DMSE Professor Yet-Ming Chiang*



*2020 MITx Intern, Alejandro Aponte, University of Puerto Rico, Mayaguez, Mechanical Engineering, who was hosted by the research group of DMSE Professor Michael Cima and worked on the development of micro-peristaltic implantable pump for sampling brain interstitial fluid*

Professor Rafael Jaramillo also participated in the MIT MSRP program by serving as an application reviewer and speaking to the cohort at “Meet the Faculty” chats on three occasions: 6/21/21, 6/28/21, and 6/30/21.

The research group of Professor Rafael Jaramillo participated in the Guided Academic Industry Network (GAIN), a NSF-funded two-year program connecting Boston-area community college students with career opportunities in the advanced materials industries. During the 2020-2021 academic year:

- On September, 2, 2020, Mandalina Kozicki, Bunker Hill Community College, presented on her MIT (summer 2019)GAIN internship experience in Jaramillo research group to class Introduction to Engineering at Bunker Hill Community College, 9/2/20
- From January – June 2021, Tsedey Ayele, Roxbury Community College, participated in Jaramillo group internship project “ZnS Tape Casting” P
- From June – August 2021, Peter Ssemwogerere, Bunker Hill Community College, participated in Jaramillo group internship project “Solid State Synthesis of BaZrS<sub>3</sub>, BaSnS<sub>3</sub> & SrSnS<sub>3</sub>”

On August 12, 2021, Professor Jaramillo gave a presentation at the Materials Research Laboratory Summer Scholars poster session.

Another event which promoted inclusive research cultures was the NSF-grant awarded through DMSE funded an international workshop on *Socioresilient Infrastructure: Materials, Assemblages, and Systems* held on September 25 - 26, 2020 (see Strategic Theme 2: Inclusive Learning, Education, and Dialogue section for more details).

Other activities which promoted inclusive research cultures were DEI-related events by DMSE departmental seminar speakers Professor José Luis Torero, Professor Michele Manuel, and



Professor Thomas Epps (see Strategic Theme 2: Inclusive Learning, Education, and Dialogue section for more details).

DEI Collaborative activities which focused on Inclusive Research Cultures and Workplaces included:

- On January 12, 2021, the first Community Wide Convening included topics and dialogue related to inclusive mentoring and lab cultures [51–60] (see Strategic Theme 2: Inclusive Learning, Education, and Dialogue section for more details).
- On January 29, 2021, the DEI Collaborative facilitated a DEI working session at the Annual Faculty Retreat Meeting. The one-hour working session focused discussion and actions to foster high quality, effective, and inclusive mentoring environments and commitments to action (see more detailed description in section on Administrative and Support Staff Stakeholder Working Group activities).
- On February 26, 2021, The DEIC Collaborative facilitated a DEI session at a DMSE All-Staff Meeting. The one-hour working session focused on creating a foundation for cultural competence [47] and collectively identifying strategies for fostering inclusion in the workplace (see Strategic Theme 2: Inclusive Learning, Education, and Dialogue section for more details).
- On April 8, 2021, DEI Collaborative Community-Wide Convening #2 focused on understanding and fostering belonging [71–74] (see more detailed description in Strategic Theme 2: Inclusive Learning, Education, and Dialogue section).

A number of research groups in DMSE have implemented lab DEI initiatives:

- Lab DEIJ Slack channel (example from Anikeeva Research Group);
- Dedicated time / quarterly meetings within lab meetings for DEI discussions (example from Anikeeva Research Group);
- Coordinating a DEIJ Lab Working Group from members (example from Anikeeva Research Group);
- “Diversity Minute” in the beginning of each research group meeting where the presenter shares their stories for a couple of slides before their talk, for example their hometown, or upcoming DEI events to encourage lab members to participate (example from Olivetti Research Group);
- Public visibility of support for DEI on research group websites (examples include Ortony lab, Anikeeva Lab, and Irvine lab below)

The research lab website of **Professor Julia Ortony** includes on the [front page](#) “*We support diversity, equity, and inclusion*” directly under the research mission. Her lab also includes on the front page the “You are welcome here” card (below) with a statement “*Our lab values diversity and inclusion. Our team values and celebrates diversity and we pride ourselves in fostering a culture inclusive to all identities.*”



The **Ortiz research group** maintains a statement on its front page as follows:

*“The Ortiz Research group values, is committed to, and aims to foster diversity, equity, inclusion, and justice, including embracing the strengths of social, cultural, and identity-based differences, in all aspects of its research, collaboration, education, and external activities.”*

The research lab website of **Professor Polina Anikeeva** includes on the [front page](#) a commitment to diversity statement as follows:

*“Our Commitment to Diversity*

*Our group’s philosophy is that a team diverse in racial, socioeconomic, cultural, and gender identity can achieve far more than one that lacks diversity. Each member of our group has a responsibility in upholding diversity:*

*Professor Anikeeva is committed to reducing bias in hiring practices and protecting the voices of each member of our group.*

*Graduate students and postdoctoral scholars are expected to build diverse collaborations both within and beyond our group. They are also expected to develop opportunities for the mentorship of diverse undergraduate scholars.*

*Undergraduates are encouraged to actively contribute to the scientific and cultural diversity of our group.*

*Every member of our group is required to respect each other’s perspectives with patience and understanding.*

*Group members are prohibited from discriminating against any other member on the basis of sex, color, religion, race, sexual orientation, gender identity, disability, or age. Group members are required to follow the nondiscrimination policy outlined in the MIT Handbook.”*

The research lab of **Professor Jeff Grossman** includes a statement on their front [webpage](#) expressing commitment to diversity, equity, and inclusion as follows.

*“Diversity, Equity, and Inclusion:*

*A core value of our group is a commitment to diversity, equity, and inclusion, which connotes an awareness and appreciation of the value and strength derived from engaging the richness of multiple cultures including race, disabilities, gender, national origin, religion, sexual orientation, and skin color, among other attributes. We believe that we are best equipped to tackle the world’s*

most challenging scientific problems when we bring a wide variety of perspectives, backgrounds, personal experiences, and insights to our problem-solving endeavors.”

The research lab of **Professor Darrell Irvine** includes a [webpage](#) commitment to diversity, equity, and inclusion as core to the lab mission as follows:

### **MISSION STATEMENT**

*In the Irvine Lab, we believe that diversity fuels creativity. A plurality of skills, life experiences, and perspectives provides the strongest possible basis for innovative science. We strive to create a lab environment where all are empowered to express their identity and encouraged to contribute their talent.*

*As scientists we have the power and the responsibility to champion the cause of equality. Science has played a prominent role in perpetuating harmful stereotypes within its community and in society at large. Despite the progress made against acts of overt racism, sexism and other kinds of discrimination, pervasive structural inequities still remain. We strive to be at the forefront of change. We care about the mental and physical health of our lab members before the quality of their work. The Irvine Lab is committed to:*

**1. Advancing the cause of equity and social justice with the science we choose to pursue.**

*Our research is centered around diseases that have had a disproportionate impact on marginalized communities and communities of color, such as lung<sup>1,2</sup> and breast cancer<sup>3</sup>, HIV<sup>4,5</sup>, tuberculosis<sup>6</sup>, and COVID-19<sup>7</sup>.*

**2. Valuing differences as strengths.** *Our lab brings together talented people with vastly different backgrounds, nationalities, and cultures. We cherish the opportunity to work in a diverse team as it pertains to race, ethnicity, gender identity, sexual orientation, religion, age, socioeconomic status, neurocognitive differences, disability, and difference of opinion.*

**3. Creating an inclusive lab environment.** *The lab culture we aim for is one where each member is comfortable being their authentic self. This requires respect, understanding and mutual uplifting. Discriminatory behavior, overt or subtle, has no place in our lab. All members of the lab should contribute to identifying and addressing discriminatory behaviors, and, if called out for engaging in such behavior, respond with humility while making an effort to re-educate themselves.*

**4. Fighting anti-Black racism.** *Our lab recognizes that systemic anti-Black racism exists in all fields, with academic sciences being no exception. One consequence of this has been the disproportionately low representation of Black scientists in STEM. To fail to address this problem of institutionalized racism is to deny the field Black talent, to uphold inequalities in access to opportunities, and to continue the cycle of only allowing Black communities to marginally benefit from scientific advances. To aid in the dismantling of these racial barriers in science, our lab is committed to increasing opportunities for aspiring Black scientists, and to foster an environment that will enable them to reach their full potential within the lab and beyond. Furthermore, we support and we are actively engaged in research that can yield creative solutions targeted towards some of the diseases that extensively afflict black communities.*

**5. Seeking continuous education.** Through discussions and self-education, lab members are encouraged to improve their understanding of the privileges and disadvantages that each unique identity and their intersection carry in science and beyond. We believe it is important to recognize how the scientific community, and each individual within it, contributes to sustained inequality. Working in a diverse group, we must remain open to learn and challenge our unconscious biases.

**6. Reading and citing.** We recognize that the invaluable contribution of many scientists has gone unrecognized. We pledge to amplify the work of scientists who have historically been marginalized on the basis of their identity.

**7. Mentoring.** As a laboratory, we can enact sustained change by forming and supporting the next generation of scientists. We aim to provide training opportunities for all lab members serving in a mentoring role and encourage open and constructive feedback for both mentees and mentors. We will ensure all mentees are aware of resources and reporting mechanisms inside and outside of the lab group in the event of conflict.

**8. Recruitment.** We advocate for the MIT departments from which we typically attract students to actively recruit students from underrepresented minorities at both the undergraduate and graduate levels. By working directly with several undergraduate research programs, including the Undergraduate Research Opportunities Program (UROP) and MIT Summer Research Program (MSRP), we seek to recruit students from underrepresented minorities.

**9. Expanding participation in science.** According to their personal inclination, lab members are encouraged to engage in outreach activities in communities and schools that have largely been excluded from access to top-tier scientific research.

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*JAMA 2020 323(24): 2466–2467.*

- On February 26, 2021, The DEIC Collaborative, in collaboration with the Administrative and Support Staff Stakeholder Working Group, facilitated a DEI session at a DMSE All-Staff Meeting. The one-hour working session focused on creating a foundation for cultural competence and collectively identifying strategies for fostering inclusion in the workplace. The session focused on self-awareness, understanding, and appreciation of social identities, cultures, biases, and perspectives [32, 47, 69, 70] (more information is provided in the Administrative and Support Staff Stakeholder Working Group Section).
- [DMSE REFS \(Resources for Easing Friction and Stress\)](#) are graduate students who have received extensive training in conflict management and empathy. It is a confidential resource for all students in order to help them overcome difficult situations involving stress or conflict. DMSE REFS provides an attentive ear for student concerns, and helps graduate students to navigate the other resources available to them around campus. Their main role is to listen, help students understand the problem, and help brainstorm possible next steps to overcome the situation. To do so, they bring graduate students in an informal setting in a place where they feel comfortable and dedicate the amount of time necessary for them to share their experience and help them brainstorm potential outcomes and solutions.



*DMSE REFS: DMSE graduate student (Left) Cécile Chazot and (Right) Sonia Zhang*

- Graduate student Tunahan Aytas contributed to the development of video content with LGBT grad@MIT, MIT's LGBTQ+ graduate student community, where queer faculty were interviewed to make a welcome video for graduate student orientation. These videos will be re-made with a funding grant from the Office of Graduate Education in Academic Year 2021-2022 and will be an excellent resource to DMSE.



*DMSE graduate student Tunahan Aytas*

- DMSE Professor Lorna Gibson attended a feedback session of women faculty on the Institute DEIJ Strategic plan and noted a need for more attention to LGBTQ+ faculty. Professor Gibson attended feedback sessions for LGBTQ+ students and another for LGBTQ+ staff. The LGBTQ students brought up the lack of faculty role models, especially in the School of Science and School of Engineering and the need to collect demographic data on LGBTQ+ faculty, students and staff. Professor Gibson had several meetings with Professor and Associate Provost Tim Jamison and Lydia Snover, Director of Institutional Research, and the MIT General Counsel's office. They are currently drafting a memo to the senior officers about this topic.

#### 4.1.4 Strategic Theme 4: Inclusive Personal and Professional Advancement (e.g. Advising, mentoring, careers, etc.)

On July 14, 2021, DMSE Professor Alexander-Katz was honored with the Committed to Caring award sponsored by the MIT Office of Graduate Education. The Committed to Caring (C2C) program at MIT recognizes outstanding mentors and promotes thoughtful, engaged mentorship throughout the Institute. Awardees are honored for considerate and humanizing acts such as validating students' identities, inviting students to join in lab and departmental decision-making, and going to great lengths to ensure continuity in funding for students.

The Undergraduate Student Stakeholder Working Group focused on equitable advising as a high priority with activities that included dialogue of efficacy of the current advising system, codification of short-form documents and an Undergraduate Advising handbook, and dialogue with the Undergraduate Committee on this topic (more details can be found in the The Undergraduate Student Stakeholder Working Group Activities section).

Professor Cem Tasan has started the development of a new course for incoming graduate students on "Essential Skills."

#### 4.1.5 Strategic Theme 5: Inclusive Narratives and External Engagement

The power of narrative – the stories, words, and data that are used (or not) to describe the people and ecosystems of learning and work in the department – was a central thread throughout the

work of the DEI Collaborative. Narrative signals values and implicit assumptions, but also shapes perception of what is possible. Prior to the formation of the DEI Collaborative, an [MIT DMSE Faculty Statement on Student Well-Being, Diversity, and Inclusion](#) was created and made publicly available on the DMSE website as follows:

#### *MIT DMSE Faculty Statement on Student Well-Being, Diversity, and Inclusion*

*The MIT DMSE Faculty care deeply about the mental and physical health of our students, and both the health of our students and the quality of their academic work are extremely important to us. We value diversity and inclusiveness in our students, faculty, and staff with regard to their backgrounds and opinions, and we remain committed to MIT's goal of increasing the percentage of URM faculty and students expressed as a resolution of the MIT Faculty Meeting of 5/19/2004.*

*By ongoing review and improvement of our recruitment, hiring and retention practices and by promoting a supportive academic and social environment, the DMSE Faculty pledges to enhance diversity and inclusiveness within departmental faculty, students and staff. Our progress towards creating a diverse, caring community will be reviewed biennially by the DMSE Visiting Committee.*

*MIT and DMSE are committed to excellence in education and research. We recognize that excellence in science and engineering is a result of collaborative efforts and that a community with differing experiences, education, backgrounds, and interests has better collaborations.*

*The Massachusetts Institute of Technology is committed to the principle of equal opportunity in education and employment. The Institute does not discriminate against individuals on the basis of race, color, sex, sexual orientation, gender identity, religion, disability, age, genetic information, veteran status, ancestry, or national or ethnic origin in the administration of its educational policies, admissions policies, employment policies, scholarship and loan programs, and other Institute administered programs and activities, but may favor US citizens or residents in admissions and financial aid.*

*The Vice President for Human Resources is designated as the Institute's Equal Opportunity Officer. Inquiries concerning the Institute's policies, compliance with applicable laws, statutes, and regulations (such as Title VI and Section 504), and complaints may be directed to the Office of the Vice President for Human Resources, Room E19-215, 617-253-6512. Such inquiries may also be directed to the Manager of Staff Diversity and Inclusion, Room E19-215, 617-452-4516. In addition, inquiries about Title IX (which prohibits discrimination on the basis of sex) may be directed to the Institute's Title IX coordinator, Sarah Rankin, Room W31-223, 617-324-7526, [titleIX@mit.edu](mailto:titleIX@mit.edu). Inquiries about the laws and about compliance may also be directed to the Office for Civil Rights, US Department of Education.*

*As a recipient of research support from federal agencies, including NASA, MIT and DMSE follow federal guidelines and policies related to discrimination. NASA makes available resources for those who have been subject to discrimination.*

*Nondiscrimination and Equal Opportunity in NASA Assisted Programs: Title VI of the Civil Rights Act of 1964 and Related Laws. This brochure lays out NASA's obligations under the civil rights laws pertaining to federally assisted programs and activities. It provides program beneficiaries with*

information on how to file a discrimination complaint with directly with NASA, should they wish to do so.

The brochure also has a companion poster, *Equal Opportunity in NASA Assisted Programs*, which provides similar information.

The DEI Collaborative Coordination Council met on April 15<sup>th</sup> 2021 for a targeted discussion on this topic, joined by DMSE Communications Officer (Rachel Kemper), a member of the Administrative and Support Staff Stakeholder Working Group.

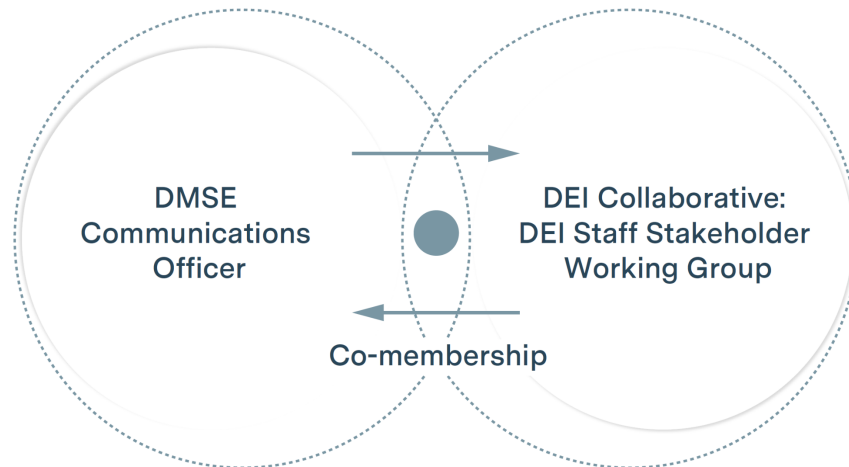


Figure 32: Co-membership between DEI Collaborative and DMSE Communications Officer

This working session considered and discussed the complexities, pitfalls, importance, and challenges of inclusive narratives. There is a tension in public-facing communications, which attempt to represent and reach a diverse community, while avoiding storytelling that sensationalizes adversity and trauma, tokenism, perceptions of performativity, and exploitation of vulnerability when highlighting personal and professional narratives of individuals. The DMSE communications and messaging strategy has traditionally been built on the imagery of materials science and engineering, one of the most visually appealing and stimulating scientific fields, telling the story of the research rather than stories of individuals. However, there is great value in communicating MSE’s historical impact and benefits (e.g., to health, transportation, quality of life) and potential future societal benefits and solutions to planetary and social perils (e.g., engineering grand challenges, United Nations sustainable development goals) – and it is also honest to communicate the entanglement of the field with historical and social inequities (i.e. environmental in/justice, etc.), and how our department could take a lead in communicating at this intersection. The group recognized the broader challenges surrounding narratives of science and technology which may emphasize the accomplishments of a single heroic individual and overshadow (or omit) aspects of collaboration, teamwork, and often hidden labor within systems of scientific knowledge creation. The Coordination Council discussed creating a set of key principles and values for inclusive narratives (to be followed up on next year) and developing a more comprehensive departmental DEI website).



Regarding the DMSE public diversity statement, the group agreed that compliance requirements often result in a “checking the box” non-authentic and committal tone and there is now an opportunity to craft a meaningful statement that expands the focus beyond academics and research productivity to be more inclusive to the entire DMSE community. The tension between compliance text, which can often result in a “checking the box” non-authentic and committal tone. Further feedback from the Stakeholder Working Groups was obtained. A question was posed regarding recommendations for the top important values to our department and that should be included in our public narrative (in addition to DEI). Values important to both undergraduate and graduate students included belonging, respect, support, well-being, community, and introspection. For staff, the most important values cited included collegiality, dignity, fairness, flexibility, and respect. For faculty, the most important values cited included belonging, collegiality, community, dignity, and engagement. Discussions in the Faculty, Instructional, and Research group emphasized the need to develop a DMSE mission statement that integrates DEI in the context of the field of MS&E.



*Word cloud representation of most important values cited by DEI Stakeholder Working Groups (in addition to Diversity, Equity, and Inclusion).*

Additional activities related to DEI external communications include the following:

- Public visibility of support for DEI on research group websites (see Strategic Theme 3: inclusive Research Cultures and Workplaces for more details)

- A public opinion piece co-written by DMSE Professor Michael Cima published on May 18, 2021 entitled “[Behold the power of invention](#),” in the *Commonwealth Nonprofit Journal of Politics, Ideas, and Civic Life*, in which he emphasized the important role that inclusion plays in the innovation process.
- Throughout 2020, Cima oversaw an initiative carried out by the Lemelson-MIT Program and The Lemelson Foundation and worked with RAND Corporation and History Associates Incorporated to study, document, and communicate the impact of prolific inventors who were awarded the Lemelson-MIT Prize. On February 11, 2021, National Inventors Day, RAND made public its report, *Measuring the Value of Invention*, which analyzed the social and economic impacts of the 26 Lemelson-MIT Prize winners. On May 4, 2021, RAND published “The Power of Invention – and the Value of Diversity and Inclusion” in the *RAND Review*, its online magazine. The article emphasized the significant social and economic impact created by Lemelson-MIT Prize winners, while also noting that greater societal benefits are not being realized due to the lack of support and encouragement for young inventors from diverse backgrounds.

External DEI-related external engagements by DMSE community members include:

- DMSE Professor Michael Cima has led and engaged extensively in DEI-related activities.



*DMSE Professor Michael Cima*

Professor Cima has:

- Served as faculty advisor for the Lemelson-MIT Program – a program funded by the Lemelson Foundation - dedicated to helping young women and people underrepresented in STEM learn ways inventors develop technological solutions to community problems, protect intellectual property and bring solutions to intended beneficiaries.
- Participated in hosting an online event, in tandem with MIT’s Innovation Initiative and the Technology Licensing Office, with the Director of the United States Patent and Trademark Office to encourage more young women to consider ways they can invent and protect their intellectual property through a patent. Currently, roughly 10% of those receiving patents are female. The event featured 2020 Lemelson MIT

Student Prize winner Shriya Srinivasan and faculty winner MIT Professor Sangheeta Bhatia.

- Oversaw the development of a new Invention and Inclusive Innovation initiative Lemelson MIT has developed in collaboration with the California Community College System that launched at four colleges in November 2020 and is continuing. Workshops with approximately 55 underrepresented students (ranging from 50 hours to 160 hours in duration) were held in summer 2021 at three of the four colleges. The effort to embed instruction in the regular offerings at the 4 colleges will expand to include 20 more colleges in 2022.
- Oversaw the InvenTeams grant initiative – Lemelson MIT’s premier hands-on invention experience for teams of high school teachers and students across the U.S. Lemelson MIT announced the selection of thirteen 2020–2021 InvenTeams, representing 10 US states, on October 27, 2020. InvenTeams’ projects were underway in November with teams working remotely (due to the ongoing COVID-19 pandemic) to complete research and outreach to beneficiaries/customers. Prototypes were built and iterated from December through early June. Students gave online presentations about their working prototypes of inventions at the annual EurekaFest celebration, a culminating event for the program. Recruitment for 2020-2021 InvenTeams resulted in 65% female student representation and 35% of schools with free or reduced-price lunch. In total, 160 InvenTeam students and 17 educator supervisors participated in InvenTeams. The prototype from the team at Drew Charter School in Atlanta Georgia, capturing data related to the safe operation of a car and relaying it to the cloud for storage if needed, demonstrates the types of needs and solutions developed by diverse teams. Work at the Archer School for Girls in southern California who developed a system for recognizing and addressing embers from fires on rooftops drew praise from Oprah Winfrey. One InvenTeam from a prior year earned a patent, increasing the total number of patents awarded to high school InvenTeams to 12. The educator for the team, Clara Mabour, had been an InvenTeam leader when she was in high school. Her water purification device for her native country of Haiti received recognition at the White House from former President Barack Obama.
- Served as PI of a Abdul Latif Jameel World Education Lab (J-WEL ) grant and led an effort to determine the viability of a new effort in which MIT would aggregate efforts across the institute to increase access and effectiveness of learning opportunities for BIPOC communities through the Co-Lab Studios.
- Continued work with Sisters With a Dream (grades 4-6) at Fletcher Maynard Elementary School (Cambridge, Massachusetts) to ensure that the young women get an early start on their pathway to invention.
- Launched a new hybrid online program, Invention Adventures, in fall of 2020 to prepare educators and students for invention activities in 13 underserved elementary and middle schools in California. A ten-week session of Invention

Adventures began in November following a professional development session with the after school educators. LMIT delivered 30 minutes of content while coaching 115 students and 13 educators. The experience culminated with a local invention convention. 40 inventors presented their inventions to judges. Of that group, 14 were invited to the 2021 California Invention Convention, three of whom won awards, and one inventor was selected to advance to the US Nationals at the Henry Ford Museum in Michigan. Sites hosted a modified Invention Adventures program in summer 2021. Invention skill building activities were taught. Over 1,000 staff participated in at least one of the 10 trainings.

- In 2020, a virtual curriculum was created for the California and Massachusetts Invention Conventions (CAIC and MAIC) for grades K-8 . Curriculum was created in three grade bands (K-2, 3-5, 6-8) and in early October training began to help teachers learn how to use the curriculum with their students. In total, 406 teachers attended the CAIC sessions from mid-October 2020 through March 2021. The 2021 California Invention Convention was held virtually on April 17. Students qualified for eligibility through classroom/school competitions. Approximately 6,000 students throughout the state of California participated in the CAIC program throughout the 2020/2021 school year. Of those, 180 students advanced to the statewide competition on April 17. 63% of the students self-reported as BIPOC, and 54% as female. From the state competition, 64 CAIC students advanced to the Raytheon Technologies National Invention Convention. CAIC was cited by Author Stephen Kay in an article published in Forbes magazine.
- Multiple professional development sessions were held for groups of educators in Massachusetts for the 2021 Invention Convention, including all teachers at the New Covenant School in Arlington, MA, which agreed to be a pilot school for the Massachusetts Invention Convention (MAIC) in order to train educators on how to bring invention education into the classroom. More than 100 educators attended the various sessions, which then led to five separate preliminary Invention Conventions held throughout March by schools and affinity groups (such as Cub Scouts). On April 21, the Massachusetts Invention Convention was held for the first time, with 83 students registered, of whom 55.5% were female and 38.8% were BIPOC. 26 of the MAIC students then advanced to U.S. Nationals.
- Served as PI for the Biogen-MIT Biotech-in-Action (BIA) program which serves underrepresented high school students across the world as they learn ways drug therapies are created for people with neurological disorders. The program also teaches students about the intersection of biotech and inventing. Speakers from MIT and Biogen help demystify the wide range of college and career paths that are associated with the field. Students engage in problem-solving exercises, interactive group projects, and lab simulations utilizing a wealth of technologies. Biogen also provides, free of charge, laptops and Wi-Fi hotspots to any students that may not otherwise have the resources or technology needed to participate.

- Program offerings were available in fall of 2020, spring 2021, and summer 2021. BIA staff collaborated with the MIT Office of Engineering Outreach Program (OEOP) to co-deliver the program to Spring 2021 SEED program participants on Saturdays. The Spring session allowed students (beyond the SEED program) to participate from around the world with live translations in Portuguese and Spanish. Biotech in Action welcomed 100 students each session for its two-week-long summer program, with four sessions running throughout late-June, July, and August 2021, reaching a total of 400 underrepresented students. Cima gave a keynote address to fall our cohorts of BIA students in summer 2021
- Participated in the MIT Office of Engineering Outreach Program (OEOP) SEED 2021 culminating event for underrepresented students served by the program.
- DMSE Professor Alfredo Alexander-Katz gave a DEI talk and spent a full day at the University of Massachusetts, Amherst in the Fall of 2020.
- The research group of DMSE Professor Julia Ortony participated in the American Chemical Society LGBTQ+ research symposium where her students presented and Professor Ortony attended. Professor Ortony is an organizer of the Systems Chemistry Gordon Research Conference Power Hour, which is about gender in this research area.
- DMSE Professor Christine Ortiz gave talks which included DEI topics as follows:
  - Celebrating Women in Science- a Virtual Event with the National Academies and L'Oréal USA (November 18, 2020)
  - National Academies of Science, Engineering, and Medicine, "Imagining the Future of Undergraduate STEM Education" Conference (November 19, 2020)
  - The 2020 Materials Research Society Meeting Symposium X (December 01. 2020)
  - She also served as secretary and on the board of directors of the National GEM Consortium (National Consortium for Graduate Degrees for Minorities in Science and Engineering)
  - Advisory board of National Science Foundation Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science Inclusive Graduate Education Network (NSF-INCLUDES IGEN)
  - Chair of a multi-institutional Collaborative For Fostering Equity in STEM Higher Education composed of eight (8) higher education institutions: Carnegie Mellon University, Cornell University, Georgia Institute of Technology, Howard University, Massachusetts Institute of Technology, Station1, University of California, Berkeley, and the University of Washington.
  - She also serves as founder and on the board of directors of Station1, a nonprofit higher education institution focused on socially-directed science and technology.

- Professor Ortiz also participated in the K12 outreach campaign “I am a scientist” an initiative for inclusive STEM education which involved a poster campaign for K12 schools nationwide and an online storyboard.
- DMSE Instructor, Dr. Ellan Spero is currently serving on the Virtual Task Force for the Materials Research Society (MRS) advising the Executive Committee and Board on identification of opportunity spaces and critical exploration of topics including remote engagement and community building, and integration of DEI themes into society practices. She also serves as co-founder and on the board of directors of Station1, a nonprofit higher education institution focused on socially-directed science and technology.
- Professor Kim C. Kimerling, in collaboration with Julie Diop, Executive Director of MIT’s Initiative for Knowledge and Innovation in Manufacturing (IKIM) and the AIM Photonics Center, and others, has led and been involved extensively in DEI activities.



*Professor Kim Kimerling and Executive Director Julie Diop*

These initiatives and activities include:

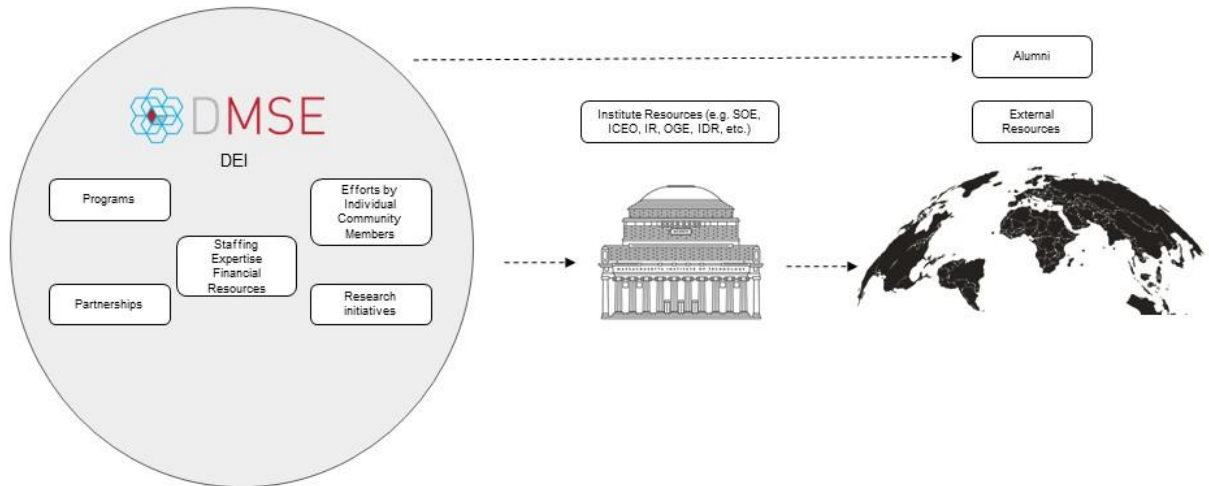
- The Stonehill College/Bridgewater State University (MA) Associates Degree Program in Advanced Manufacturing and Integrated Photonics for technician covers 100% tuition and places 100% of the students in paid internships including five (5) African-American and 1 (one) Hispanic-American students (out of 23 total) in the 2020-2021 and 2021-2022 cohorts. [The NPR show Marketplace](#) featured Claudia Cabrera, a student who despite many setbacks completed the program.
- Engagement with the Commonwealth’s MassBridge project, which is building education content to help students – especially students who are not headed to college – go into high-tech manufacturing jobs. An [awareness module](#) was completed that will go to high school students narrated by Katherine Torres, a junior in high school, with highlights of many people of color and women in manufacturing fields.
- Development and receipt of new grant funding to launch a technologist program, for students who completed the equivalent of an associate’s degree in collaboration with University of Massachusetts, Lowell and Cape Cod Community

College. This extra year of training will allow those students to compete for jobs that normally go to candidates with 4-year degrees. A grant proposal is currently under development to apply for grant funding through the U.S. Economic Development Administration for collaboration with minority-serving institutions, and to offer more complete wraparound services.

- Engagement with The MIT's Education Justice Institute (TEJI) through discussion of training opportunities for recently released prisoners through NAMC – the North Shore's MassHire Workforce Board office and facilitating connections with Apprenti, a technology apprenticeship program for newly released prisoners.
- Projects with Springfield Technical Community College (STCC), a Minority Serving Institution, through an NSF project to create problem-based learning modules in photonics by supporting STCC and its industry partner Convergent raise to raise \$2.5M LEAP (Lab for Education and Application Prototypes) in equipment with MA funding; current efforts include working with STCC on an NSF Advanced Technological Education grant to provide summer technician training.
- The AIM Photonics Summer Academy is a week of intensive short courses on integrated photonics: materials, devices, EPDA software training and integrated photonic circuit design, chip fabrication, packaging, testing, and system applications. [Erica Graham](#) was a student in the summer academy. After her professor reached out about placement opportunities, she was connected to five or six companies/research institutes including Draper Laboratory, where she started work in July of 2021.
- Julie Diop served on the diversity, equity, and inclusion committee for the manufacturing institutes, and participated in a panel with Maria Flynn, CEO of Jobs for the Future, on ways to improve diversity in high-tech manufacturing through education and workforce development.
- Secured funding to create a film version of the play “Young Nerds of Color,” about people of color in STEM. The producer decided she did not want to accept DoD funding, so we were not able to move forward.

#### 4.1.6 Supporting Strategic Theme: Capacity Building (e.g. Staffing, Expertise, Financial, etc.)

An overall multi-pronged strategy for capacity building within the department, including staffing, expertise, and financial resources, was developed that includes development of resources from department, institute, and external sources (*see Figure*).



*Schematic of DEI strategic capacity-building plan*

In the Spring semester of 2021 and through the Fall semester of 2021, a search was launched for a DEI Staff Specialist shared with the Departments of Biological Engineering and Chemical Engineering, with DMSE participation by Professor Christine Ortiz (Chair), Magdalena Reib, DMSE Director of Finance and Administration, and Ryan Kendall, DMSE Administrative Assistant (staff to committee). A student search sub-committee was formed in collaboration with the DMSE Student Stakeholder Working Group with membership by a DMSE undergraduate student (Flor Garza, who also serves as the DEI Collaborative Student Stakeholder Working Group Chair) and a DMSE graduate student (Sara Ann Sheffels). These committees worked diligently to recruit candidates, participate in anti-bias workshops, co-create an equitable and well-defined evaluation rubric, pre-screen CVs, develop phone pre-screen interview questions and evaluate candidates, develop and organize comprehensive finalist interviews and evaluate finalists.

The Graduate Student Stakeholder Working Group wrote a successful grant proposal to MIT-Abdul Latif Jameel World Education Lab (J-WEL) in collaboration with Jessica Sandland, Lecturer in DMSE, the chair of the Faculty, Instructional, and Research Stakeholder Working Group (Professor Alfredo Alexander-Katz), and the DEI Collaborative chair (Professor Christine Ortiz) for a new *Materials Initiative for Comprehensive Research Opportunity (MICRO)* online research and education program for minoritized undergraduate students which enabled its launch in the Fall semester of 2021 (for more information see Graduate Student Stakeholder Working Group section).

## 4.2 DEI Collaborative Stakeholder Working Group Activities

### 4.2.1 Administrative and Support Staff Stakeholder Working Group Activities

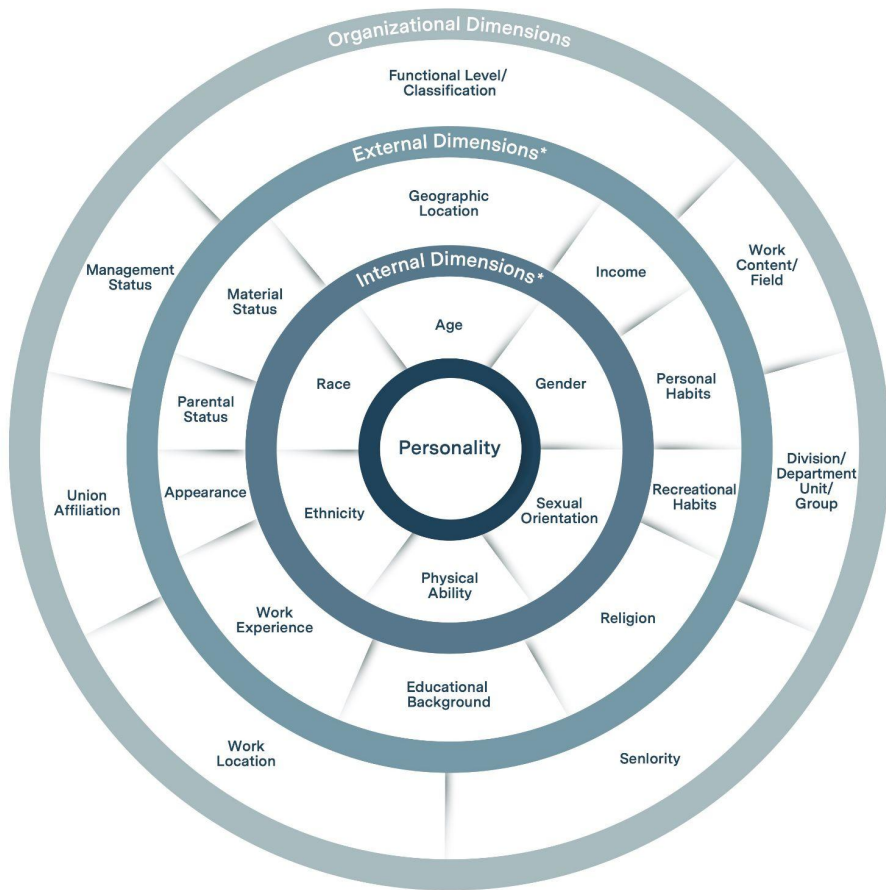
The Administrative and Support Staff Stakeholder Working Group discussed, identified, and articulated key aspects important for staff DEI efforts, engagement, and participation including, appointments which restrict work beyond the 40-hours per week, workload and attentiveness to constant institutional policy changes, long commutes, family care needs, new responsibilities and challenges due to the pandemic, continuing education assignments and classes, and power differentials between staff and supervisors.



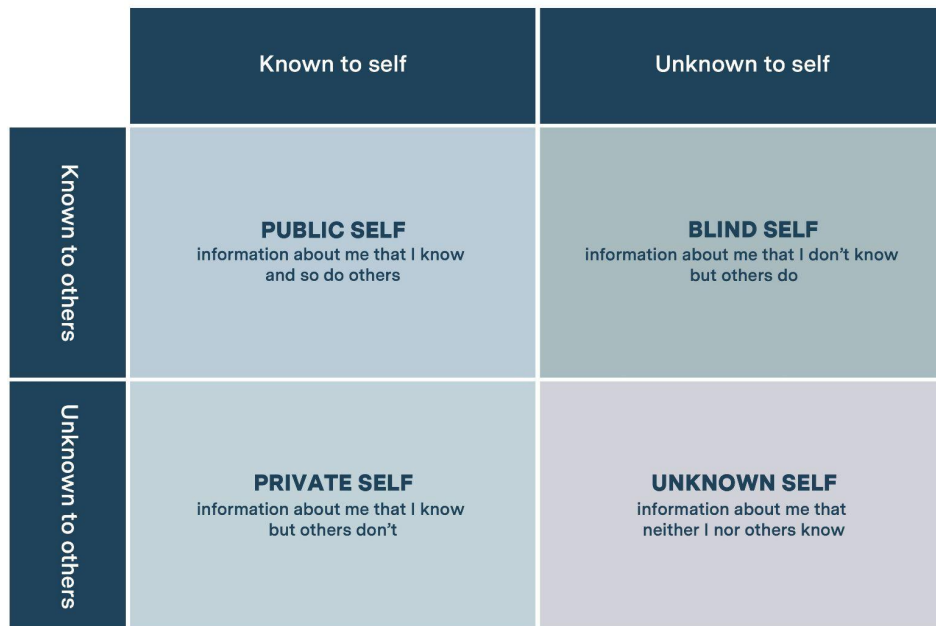
The Staff Stakeholder Group Chair (Casey Johnson) brought all of these insightful discussions and considerations to the DEI Collaborative Coordination Council meetings to ensure that staff perspectives and considerations were integrated throughout their work. Examples include significant contributions to the shared DEI Specialist position requirements and considerations for making this position attractive, realistic and setting up this new staff member for success, fostering department communications that were inclusive to staff, and supporting the design of community wide convenings which were inclusive to staff (e.g. timing, content, etc.). The Staff Stakeholder Working group also began the development of a survey to assess the desired DEI education activities of the staff.

The DEI Committee Staff Working Group has engaged in activities related to improving the postdoc scholar experience. As of May 2021, the DMSE Human Resources team added a 0.5 full-time employee which will provide capacity to create a comprehensive webpage for Postdoctoral Scholars on the DMSE site. The plan is to include a list of resources (e.g., steps to obtaining a visa, housing, childcare, health insurance, etc.), information on mentoring plans, Postdoc salaries, as well as job expectations and policies as determined by the MIT Office of the Vice President for Research. While this information is currently provided to every postdoc scholar during the onboarding process through multiple sources within DMSE and MIT Office of V.P. for Research, the Working Group seeks to place key information in an easily accessible location.

The Administrative and Support Staff Stakeholder Working Group, in collaboration with the DEI Collaborative Coordination Council (with particular leadership from the Staff Stakeholder Working Group Chair) organized a DEI one-hour working session at an all-staff meeting on February 26, 2021. This session focused on creating a foundation for cultural competence and collectively identifying strategies for fostering inclusion in the workplace. The session focused on self-awareness, understanding, and appreciation of social identities, cultures, biases, and perspectives. As background for the interactive session, staff were asked to reflect on social identity, that is the portion of an individual's self-concept derived from perceived membership in a relevant social group. Staff carried out a *Johari window model* exercise which aims to enhance the individual's perception of others and to build trust by sharing information related to social identity. The Johari model is composed of four quadrants where each quadrant represents information about a person and whether that information is known or unknown to oneself or others. The staff then discussed how related concepts of *stereotypes* (generalization of characteristics or expectations for a particular group of people) and *tokenism* (the practice of making only a perfunctory or symbolic effort to be inclusive to members of minority groups) manifest in our workplace environments counter to inclusion.



*Social identity wheel [69]*

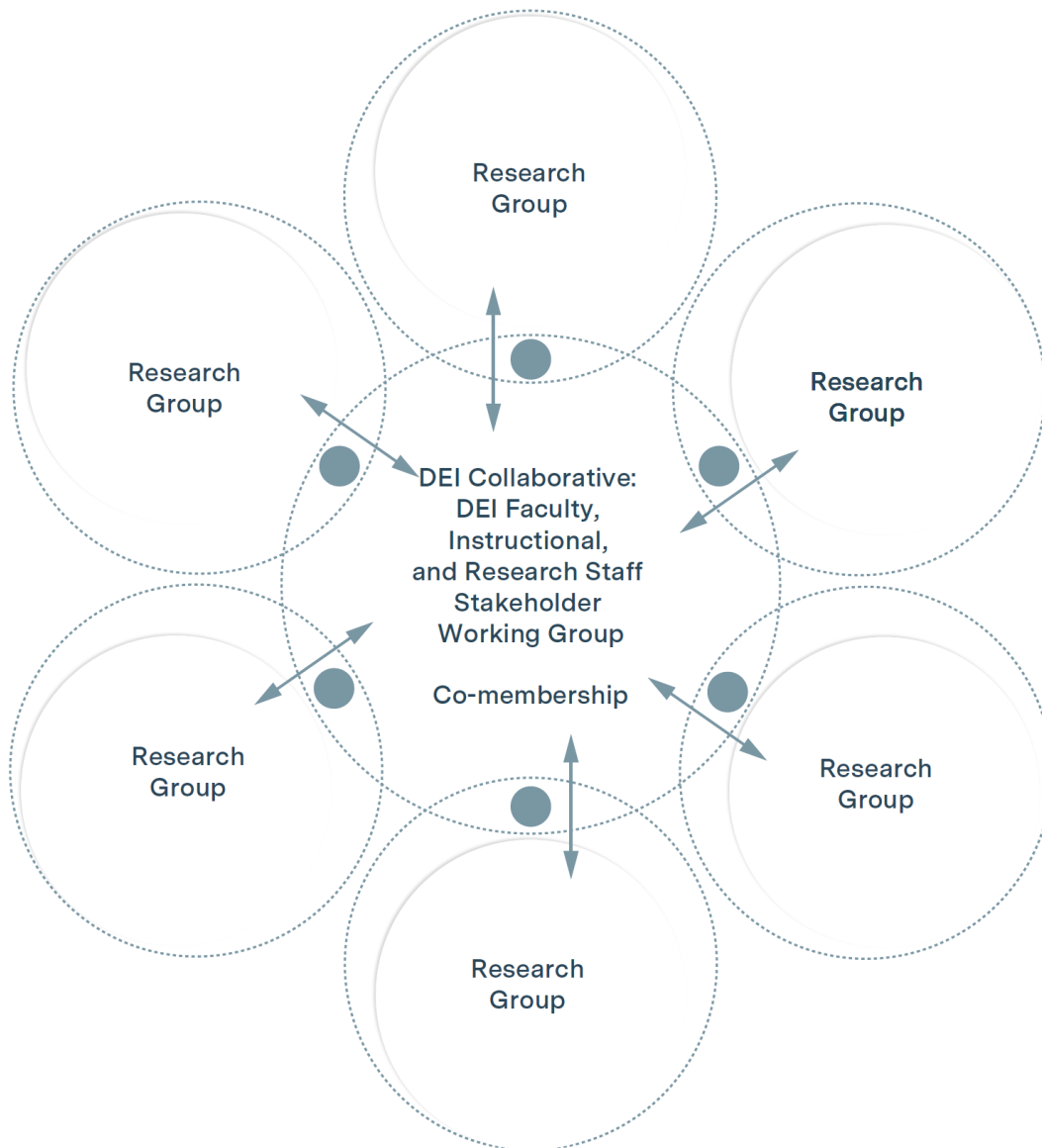


*Johari Window Model [32]*

Guiding Questions discussed in pair breakout groups included: 1) Which of your identities do you believe are most noticeable? hidden? a source of pride? a source of embarrassment or shame? and 2) What regular practice, event, or activity that you have encountered at MIT (or elsewhere) has made you feel welcomed and included - how might these ideas contribute to fostering inclusion in the DMSE work environment? Further background literature related to these topics was provided in advance of the session [32, 47, 69, 70].

#### 4.2.2 Faculty, Instructional, and Research (FIR) Staff Stakeholder Working Group Activities

The Faculty, Research, and Instructional Staff Stakeholder Working Group contributed many great insights and supported DEI efforts in the Departmental governance committees, at Faculty meetings, at community-wide convenings, and within their own research groups and environments through overlapping co-membership. The FIR Stakeholder Working Group supported DEI efforts in the successful Faculty search and hiring process, graduate admissions (RAP), and the MICRO program, where the chair of the FIR Stakeholder Working Group collaborated with the chairs of the Graduate Student Stakeholder Working Group and serves as PI on the grant proposal (see Strategic Theme 1: Inclusive Departmental Processes). The FIR Stakeholder Working Group identified the need to codify and institutionalize DEI processes, including anti-bias education, in departmental admissions and hiring practices. The FIR spent a significant amount of time discussing inclusive narratives and the need for the DMSE community to codify its disciplinary mission integrated with DEI, as well as garner data on the public perceptions of the department related to DEI.



*Overlap between DEI Collaborative and research groups leaders*

#### 4.2.3 Student Stakeholder Working Group Activities

Prior to the formation of the DEI Collaborative, student-led engagement and action was codified in "An Open Letter on Racism and Inclusivity in MIT DMSE" [12].

##### 4.2.3.1 Graduate Student Stakeholder Working Group Activities

The Graduate Student Stakeholder Working Group focused heavily on the need for increased efforts in the area of diversifying the graduate student population with an emphasis on graduate recruitment and admissions (*Strategic Theme 1: Inclusive Departmental Processes*). Their initiatives related to this area included the following:

- The first [DMSE Application Assistance Program \(DAAP\)](#) was launched in the Fall 2020 semester. DAAP is a volunteer-based, student-run program that provides assistance to DMSE applicants from underrepresented groups. Applicants are paired with graduate students who answer questions about DMSE and MIT, provide feedback to support a stronger application, and guide applicants through the DMSE application process. DAAP was a major success and showed great potential as a program to help DMSE applicants from underrepresented groups. DAAP accomplishments were as follows:
  - 93% response rate to the exit survey due to the personal connections that were made with the students;
  - 78% of mentees would rate the program 10/10; and
  - 63% of mentees felt they could form interpersonal relationships at MIT after DAAP, as compared to 12% beforehand.

DAAP's success is evidence that interpersonal relationships are key to ensuring students feel support throughout the graduate school experience. Out of 56 total DAAP mentees, 8 were offered admission to this year's entering cohort, which represents 15% of the total class, an unheard-of result in other MIT department's iterations of the program.

- The *Materials Initiative for Comprehensive Research Opportunity (MICRO)* is an online research and education program for minoritized undergraduate students developed by the DEI Collaborative Graduate Student Stakeholder Working Group in collaboration with Jessica Sandland, Lecturer in DMSE, Professor Alfredo Alexander-Katz, and Professor Ortiz. Professor Ortiz provided the Graduate Student Stakeholder Group with detailed information on a model virtual summer undergraduate research program designed at the nonprofit organization Station1 she founded as an example of best practice [66]. MICRO aims to provide more equitable access to research and education in the field of MSE. The MICRO program centers on a combination of online courses and online research experiences that aim to help participants 1) acquire key MSE knowledge that will allow them to effectively participate in a research project, 2) contribute meaningfully to a research project in a specific MSE discipline and 3) develop key research skills such as critical thinking and writing, and scientific discussion through engagement with an inclusive online community. Funding was secured through [Abdul Latif Jameel World Education Lab \(J-WEL\)](#) for the MICRO pilot to be run during the Fall 2021 semester and has been launched. MICRO is a critical opportunity to advertise Materials Science and Engineering to minoritized undergraduate students, as well as providing mentoring training for the researcher supervising the undergraduate researchers.

Following are the Fall 2021 MICRO participants:



*Fall 2021 MICRO participant undergraduate student Anastacia De Gorositza, University of Texas, Austin*



*Fall 2021 MICRO participant undergraduate student Eyobel Haile, Virginia Tech*



*Fall 2021 MICRO participant undergraduate student Joshua Chaj Ulloa, University of Texas, San Antonio*



*Fall 2021 MICRO participant undergraduate student Nicholas Layman, Grand Valley State University*



*Fall 2021 MICRO participant undergraduate student Rachel Myers, University of Maryland Baltimore County*



*Fall 2021 MICRO participant undergraduate student Samuel David Figueroa, University of California, San Diego*



*Fall 2021 MICRO participant undergraduate student Tobi Majekodunmi, University of Maryland Baltimore County*

Two other initiatives the Graduate Student Stakeholder Working Group developed related to graduate recruitment which are in progress are:

- The *Materials Science and Engineering Distinguished Rising Scholars Forum*, a speaker series for graduate students and postdoc in collaboration with other higher education institutions. It constitutes an opportunity to form long-lasting partnerships between HBCUs/ MSIs/HSIs and MIT through a two-way connection between MIT researchers and HBCU / MSI / HSI researchers.
- The *Materials for Additive Manufacturing Inclusion initiative* aims to build collaboration with external higher-education partners and industry to promote a learning experience



designed for minoritized students which is focused on materials for additive manufacturing.

The Graduate Student Stakeholder Working Group carried out the following activities:

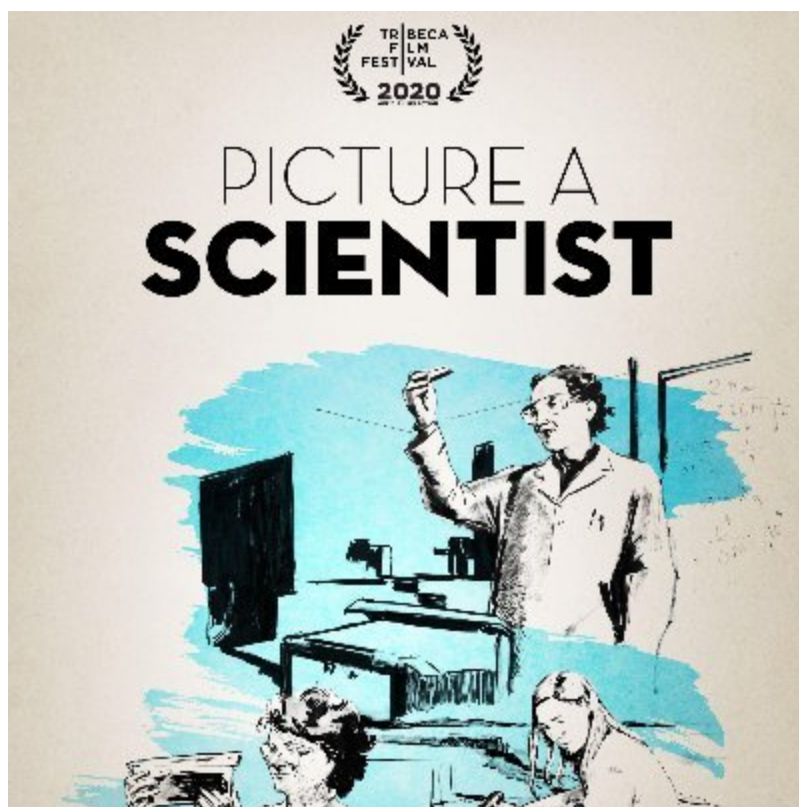
- The Thesis Area Exam (TAE) equity improvement initiative, in collaboration with the Department Committee on Graduate Students (DCGS), which focused on reform of departmental processes and communication materials to involve more inclusive language and evaluation rubrics (see Strategic Theme 2: Inclusive Departmental Processes section for more information)
- Involvement in the DMSE faculty search and hiring process by coordinating participation of students and postdocs, attending candidate seminars, chalk talks, and student-only discussions, and providing feedback on the final candidates (see Strategic Theme 2: Inclusive Departmental Processes section for more information)
- Coordination and facilitating participation in the Shared DEI Specialist search. Student representatives from BE, ChemE, and the DEI Collaborative Graduate Student Working Group developed a plan for student involvement in the search. This effort was led in collaboration with the search committee chair, Professor Christine Ortiz and resulted in the creation of a Student Search Sub-committee now involved in the DEI Specialist entire process from down selecting CVs to interviews. The Student Search Sub-committee also participated in anti-bias training and collaboratively developed the evaluation rubric for the search and hiring process to reduce bias in the search and hiring process. (see Supporting Strategic Theme: Capacity Building section for more information)
- Led DEI events at graduate student orientation and visit weekends to describe to incoming graduate students the group's DEI engagement and programs, as well as recruit new members to the Working Group (see Strategic Theme 3: Inclusive Research Cultures and Workplaces section for more information).
- Worked with the DMSE Communications Officer on modifications to the DMSE website to provide more guidance to DMSE applicants from underrepresented minorities such as guidance on fee waivers and publicizing the DAAP program (which also support equitable graduate student recruitment) (see Strategic Theme 5: Inclusive narratives and External Engagement section for more information).
- Identified the need for a codified graduate admissions evaluation rubric.

#### 4.2.3.2 Undergraduate Student Stakeholder Working Group Activities

The Undergraduate Student Stakeholder Working Group focused on equitable advising as a high priority. They noted that undergraduate advising in DMSE has not been standardized, and a student's experience has been left largely for them to define. With a lack of standards students who do not come from college-educated households or who maybe just don't get along with their advisor, can end up falling through the cracks and missing the support they deserve. The Undergraduate Student Stakeholder Working Group drafted a one-page document and met with the Undergraduate Committee, emphasizing the shortcomings of the current advising process, the

need for understanding the critical importance of advising, and setting expectations for advisor responsibilities. The Undergraduate Student Stakeholder Working Group has begun to codify an Undergraduate Advising Handbook as a guide and resource that would support DMSE advisors in their responsibilities and undergraduates in understanding what they can ask for and expect from their advisors.

On March 21, 2021, The Undergraduate Student Stakeholder Working Group organized a screening event and discussion on the documentary *"Picture A Scientist"* in celebration of Women's History Month. As detailed on the film website this documentary "chronicles the groundswell of researchers who are writing a new chapter for women scientists. MIT Biologist Nancy Hopkins, chemist Raychelle Burks, and geologist Jane Willenbring lead viewers on a journey deep into their own experiences in the sciences, ranging from brutal harassment to years of subtle slights. Along the way, from cramped laboratories to spectacular field stations, we encounter scientific luminaries - including social scientists, neuroscientists, and psychologists - who provide new perspectives on how to make science itself more diverse, equitable, and open to all."



*"Picture a Scientist" film advertisement*

The Undergraduate Student Stakeholder Working Group is aiming to create ties to the local community to make engineering and Materials Science more accessible and welcoming. By establishing trust with local high schools, they are working towards long term improvement of local outreach. They are engaged in planning a materials science outreach event for local high school students in the Spring semester of 2022.

#### 4.2.4 Postdoctoral Activities

It was difficult to gain significant engagement from postdoctoral researchers and scholars as official members of the DEI Collaborative although numerous outreach attempts were made. However, there was significant participation and contribution by the postdoctoral representative on the DEI Collaborative Coordination Council who provided context on the postdoc experience and areas of importance from his perspective. The postdoctoral member of the DEI Collaborative focused on areas such as fostering inclusion through opportunities to enhance the initial arrival and orientation of postdocs to DMSE including topics of departmental culture, DEI, teaching, mentoring relationship and conflicts with advisor, mentoring undergraduate and graduate students, mental health, and logistical details. These contributions were provided to DMSE Human Resources to inform ongoing efforts to enhance inclusion for postdoctoral scholars.

### 5. Future Plans and Evaluation Methods

Priorities were identified for academic year 2021-2022 by each Stakeholder Working Group and are listed below along with evaluation methods, the responsible lead Stakeholder Working Groups and collaborative Stakeholder Working Groups:

*Strategic Theme 1: Departmental Processes (e.g. Recruitment, Admissions, Hiring, etc.)*

- Enhancement and codification of DEI processes for faculty search and hiring and graduate admissions (RAP), with an emphasis on rubrics and yield (FIR Stakeholder Working Group, Faculty Search and Hiring Committee in collaboration with RAP, DCGS, UGC, Department Head);
- The [DMSE Application Assistance Program \(DAAP\)](#) will be run again in Fall 2021 (Graduate Student Stakeholder Working Group in collaboration with RAP).

*Evaluation Metrics:* Advancement of departmental URM population data towards parity relative to the U.S. population demographics

*Strategic Theme 2: Inclusive Learning, Education, and Dialogue*

- The development of a DMSE-customized, high quality, asset and equity-based DEI community-wide education plan and set of activities focused on core DEI competencies (DEI Collaborative Coordination Council and all Stakeholder Working Groups).

*Evaluation Metrics:* Participation data and survey instruments (e.g. learning objectives, content knowledge gained, opportunities for dialogue and relationship building, inclusive nature of the experience, mindset and behavioral changes, etc.)

*Strategic Theme 3: Inclusive Research Cultures and Workplaces*

- Identify needs, ongoing activities, and additional avenues of support for DMSE LGBTQ community (DEI Collaborative Coordination Council and all Stakeholder Working Groups);
- The development of DMSE-customized, high quality, asset and equity-based DEI education plan and activities focused of individual research laboratories [76] (Graduate Student and FIR Stakeholder Working Groups)

- Complete, administer, and analyze a survey to assess the desired DEI education activities of the staff and use survey results to inform planned DEI education activities (Staff Stakeholder Working Group);
- Creation of a comprehensive webpage for Postdoctoral Scholars on the DMSE site with a list of resources (e.g. steps to obtaining a visa, housing, child care, health insurance, etc.), information on mentoring plans, Postdoc salaries, as well as job expectations and policies (Staff Stakeholder Working Group, in collaboration with DMSE HR)
- Implementation of the *Materials Initiative for Comprehensive Research Opportunity (MICRO)* program (Graduate Student and FIR Stakeholder Working Groups);
- Launch the *Materials Science and Engineering Distinguished Rising Scholars Forum*, a speaker series for graduate students and postdocs in collaboration with other higher education institutions HBCUs/ MSIs/HSIs (Graduate Student Stakeholder Working Group).
- Launch the *Materials for Additive Manufacturing Inclusion initiative* to build collaboration with external higher-education partners and industry to promote a learning experience designed for minoritized students which is focused on materials for additive manufacturing (Graduate Student Stakeholder Working Group).

*Evaluation Metrics:* Participation data and survey instruments (e.g. learning objectives, content knowledge gained, opportunities for dialogue and relationship building, inclusive nature of the experience, mindset and behavioral changes, etc.).

*Strategic Theme 4: Inclusive Personal and Professional Advancement (e.g. Mentoring, Advising, etc.),*

- Completion and distribution of undergraduate advising handbook (Undergraduate Student Stakeholder Working Group in collaboration with UGC)

*Evaluation Metrics:* Assessment of usage of advising handbooks by faculty and undergraduate students.

*Strategic Theme 5: Inclusive Narratives and External Engagement*

- A working group with membership across stakeholder groups will be formed led by the DEI Collaborative Facilitator (and DMSE Instructor) in collaboration with the DMSE Communications Officer, with expertise drawn from others outside of DMSE. The focus on narrative for the coming year will have two primary areas: 1) analysis of existing narratives both within DMSE and more broadly in the field (professional societies, science writing etc.) and 2) shaping and creation of more inclusive narratives of MS&E that not only reflect the membership and experience of the DMSE community but also their aspirations for the future. Existing narratives will include historical and contemporary examples considering themes such as underlying assumptions about the roles and experiences of scientists and engineers, materials themselves in daily life, notions of progress, and relationship with environment and sustainability. This study will take into account changes in language usage especially as related to categories of personhood (gender, race, origin etc.). The activities of narrative shaping will include: 1) dialogue with science writers and experts in the amplification of diverse narratives in science and engineering, and 2) workshops to provide opportunities for DMSE community members to craft their own narratives of

personal and professional experience. The guided act of narrative crafting for community members will be designed as individually reflective and expressive while also promoting opportunities for community building. The group will also coordinate with the DMSE Communications Officer to offer potential material to be amplified more broadly (DEI Collaborative Coordination Council and all Stakeholder Working Groups in collaboration with DMSE Communication Officer).

- Gather information on the DEI perceptions of MIT/DMSE/greater Boston (FIR Stakeholder Working Group).
- Organization of a DMSE local high school outreach event (Undergraduate Student Stakeholder Working Group).

*Evaluation Metrics:* Metrics will include quantitative textual analysis which track shifts in language across DMSE communications, as well as workshop participants' own materials. For the DEI department perceptions, quantitative and qualitative data will be collected and analyzed.

*Supporting Strategic Theme: Capacity-building (e.g. staffing, expertise, financial support, etc.).*

- Hiring, onboarding, and integration of shared DEI Specialist staff members (DEIC Coordination Council and all Stakeholder Working Groups, in collaboration with DMSE HR, BE, and CHEM departments).
- Work with DMSE Alumni Development Officer in fund-raising for additional DEI-related activities, initiatives, programs, and staffing (DEI Collaborative Coordination Council and all Stakeholder Working Groups).

*Evaluation Metrics:* six (6) month performance review of DEI Specialist staff member and amount of DEI-related funds raised.

## 6. Appendix

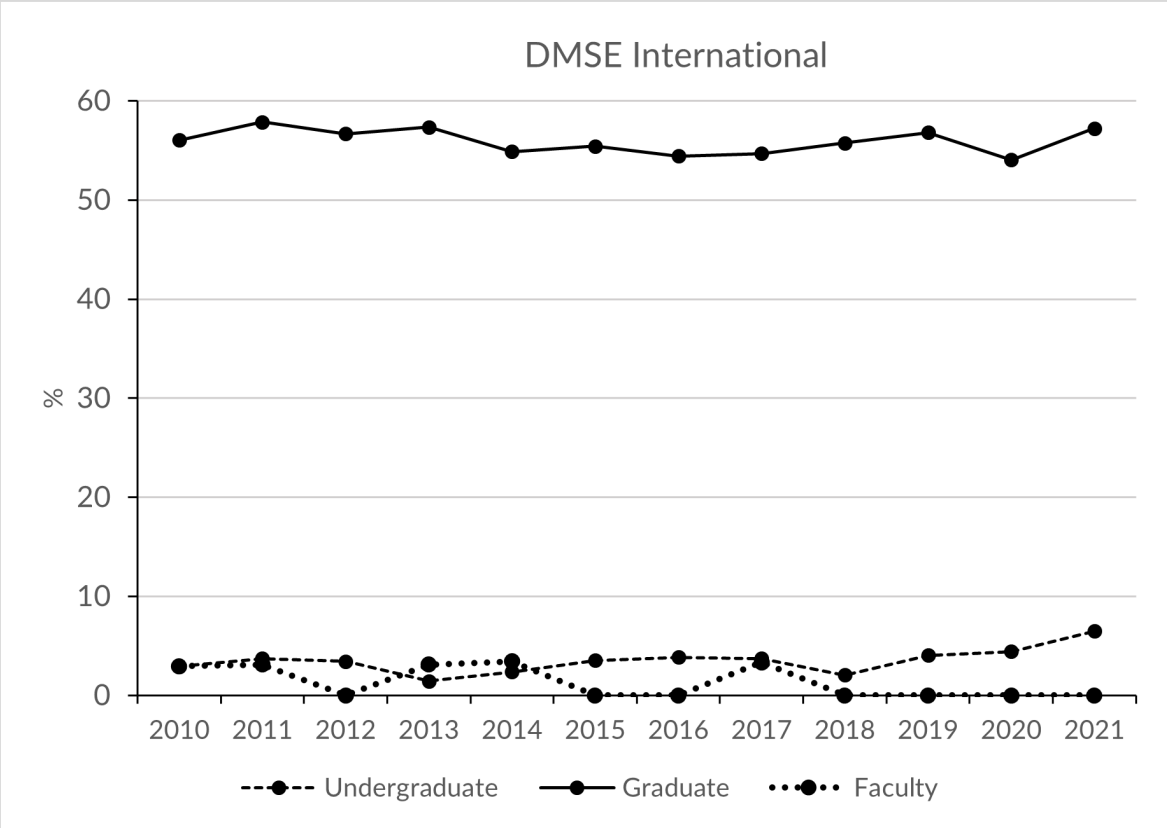
### 6.1 US Population Demographic Data - 2019

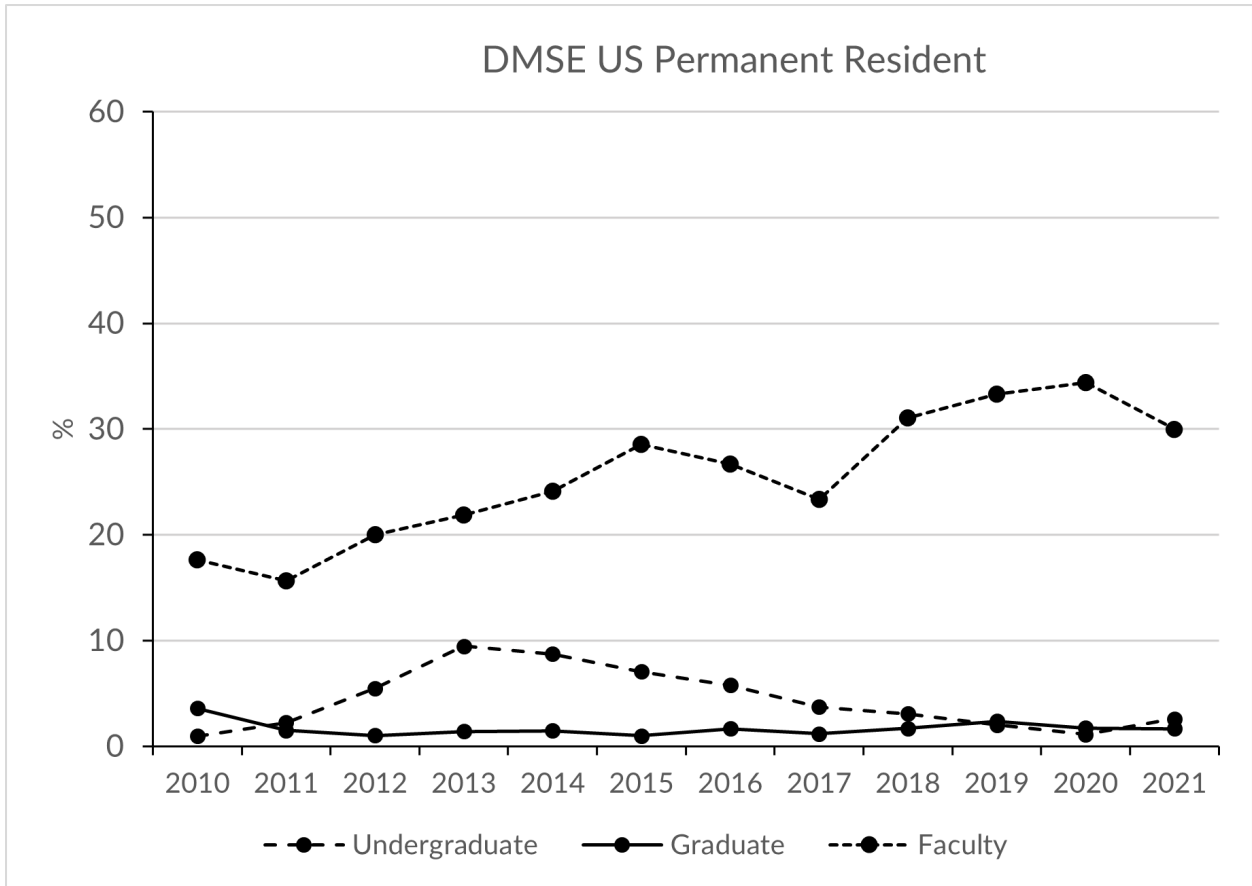
White, alone	76.3 %
Black or African American, alone	13.4 %
American Indian and Alaska Native, alone	1.3 %
Asian, alone	5.9 %
Native Hawaiian and Other Pacific Islander, alone	0.2 %
Two or More Races	2.8 %
Hispanic or Latino	18.5 %
White alone, not Hispanic or Latino	60.1%

(US Census [77])

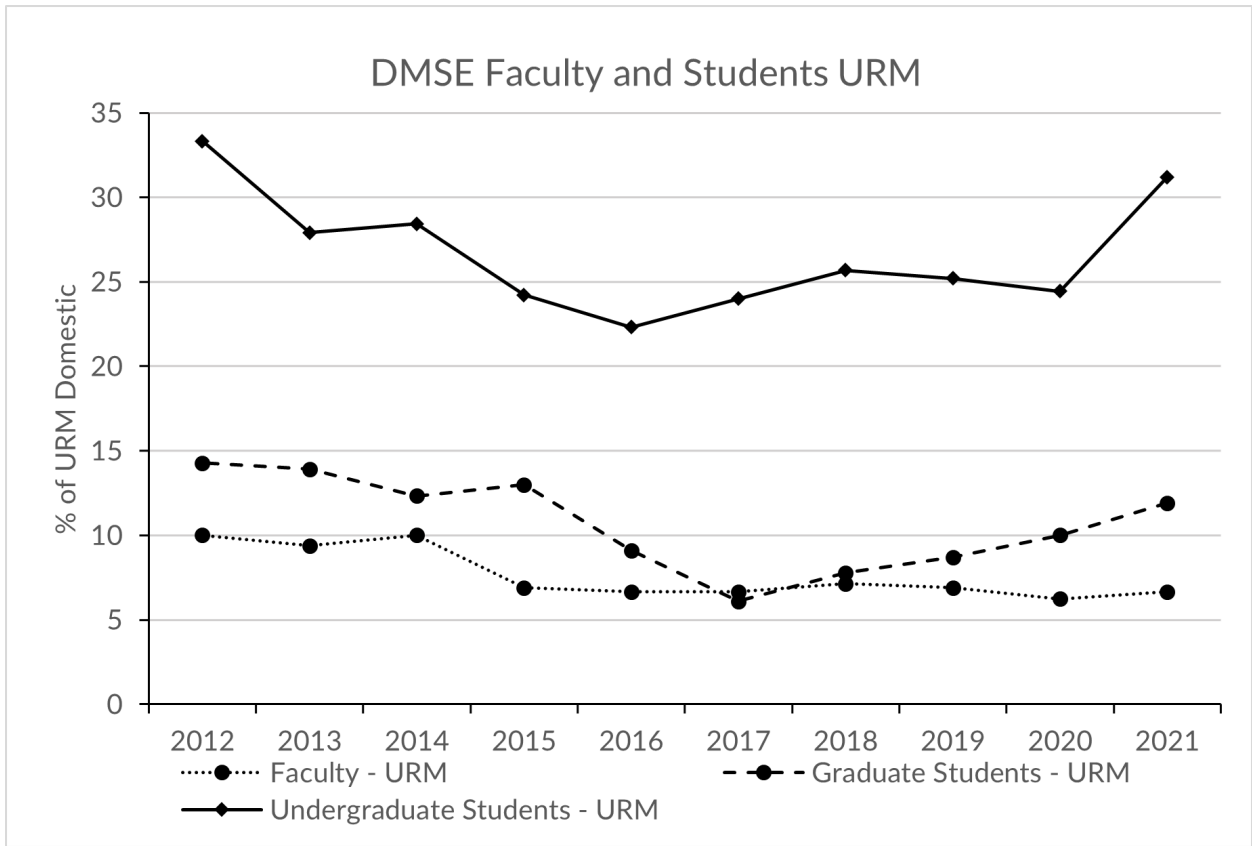
### 6.2 DMSE Diversity Data

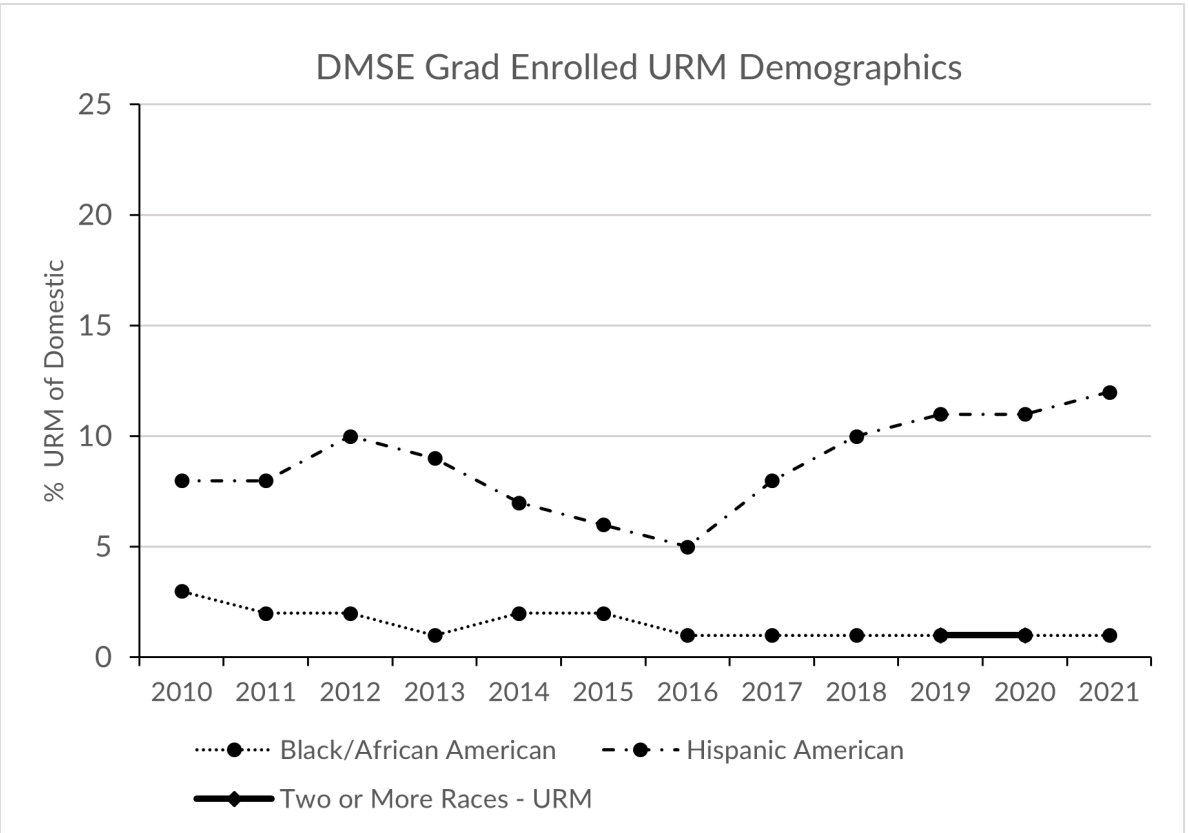
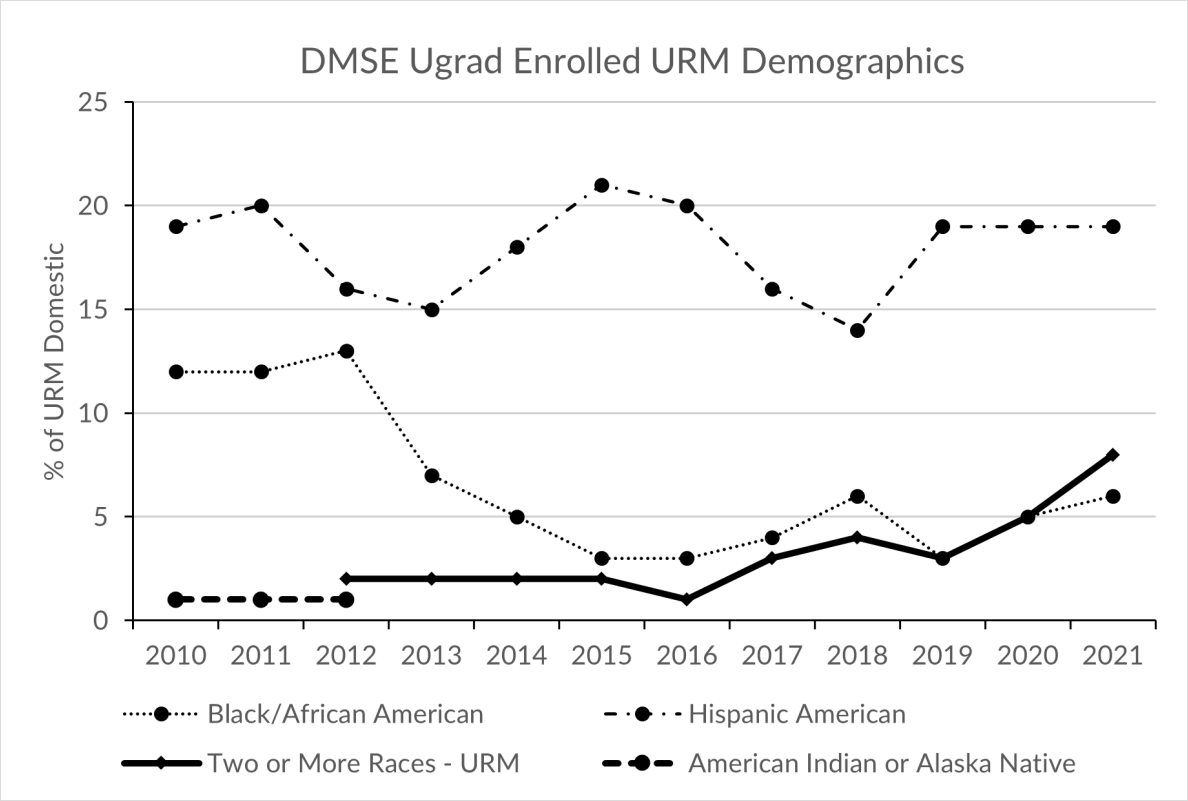
*(all data provided by MIT Office of Institutional Research, Office of the Provost)*

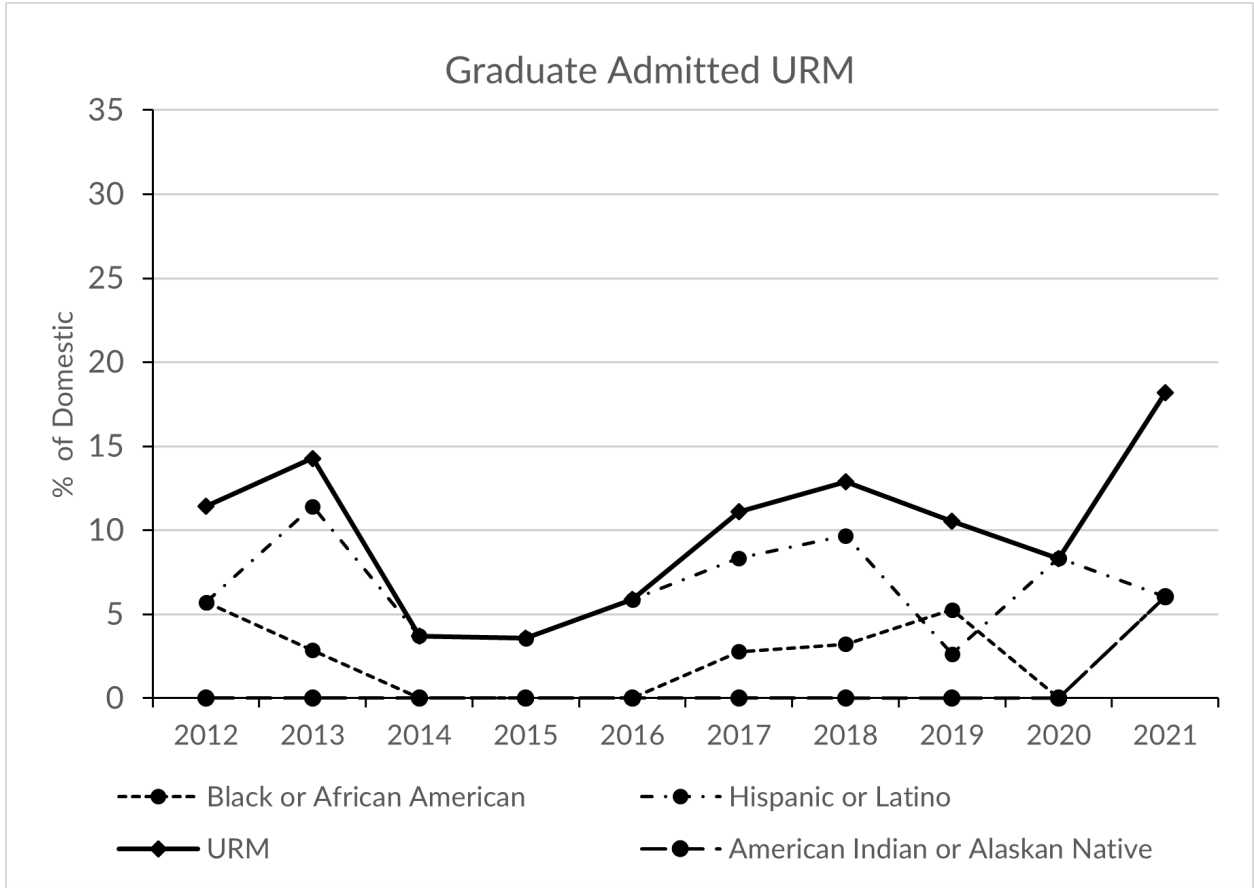




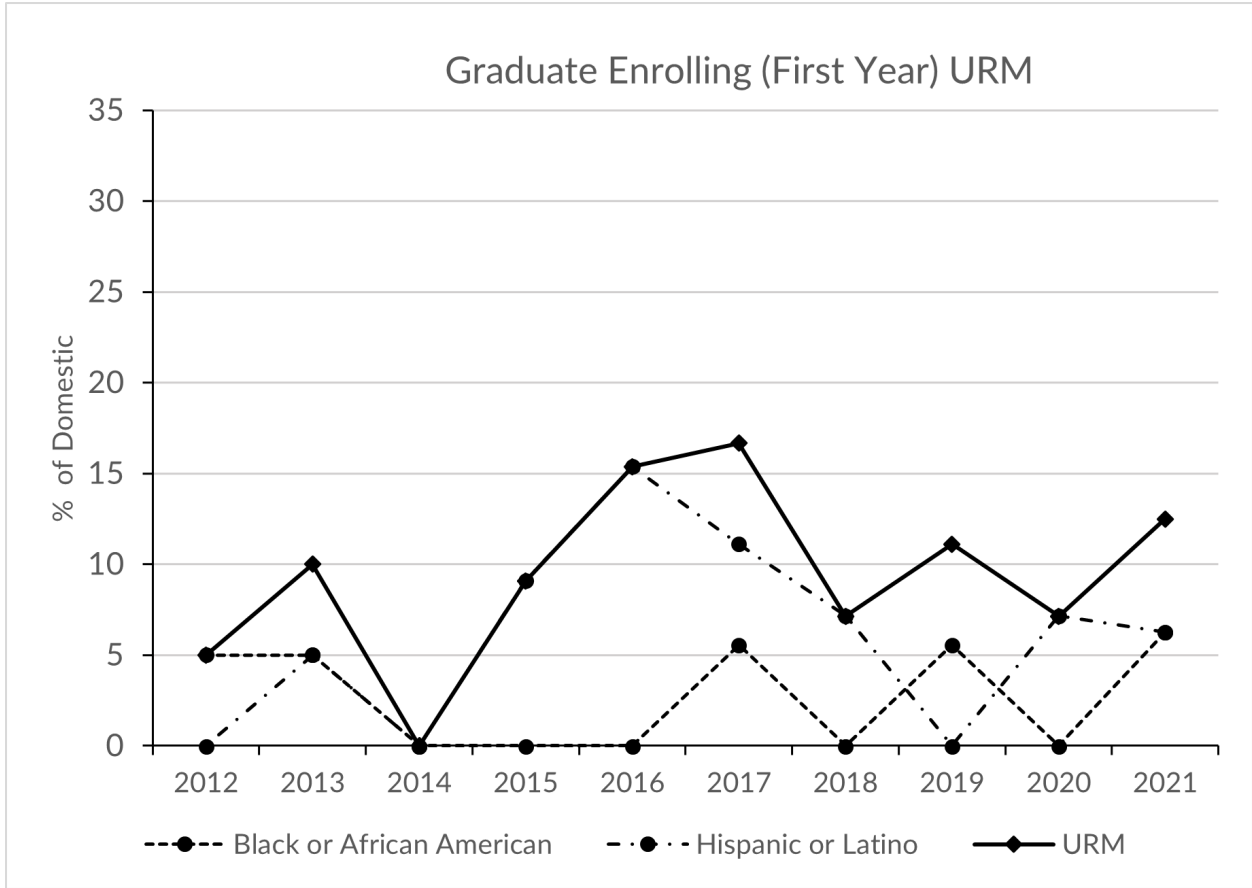








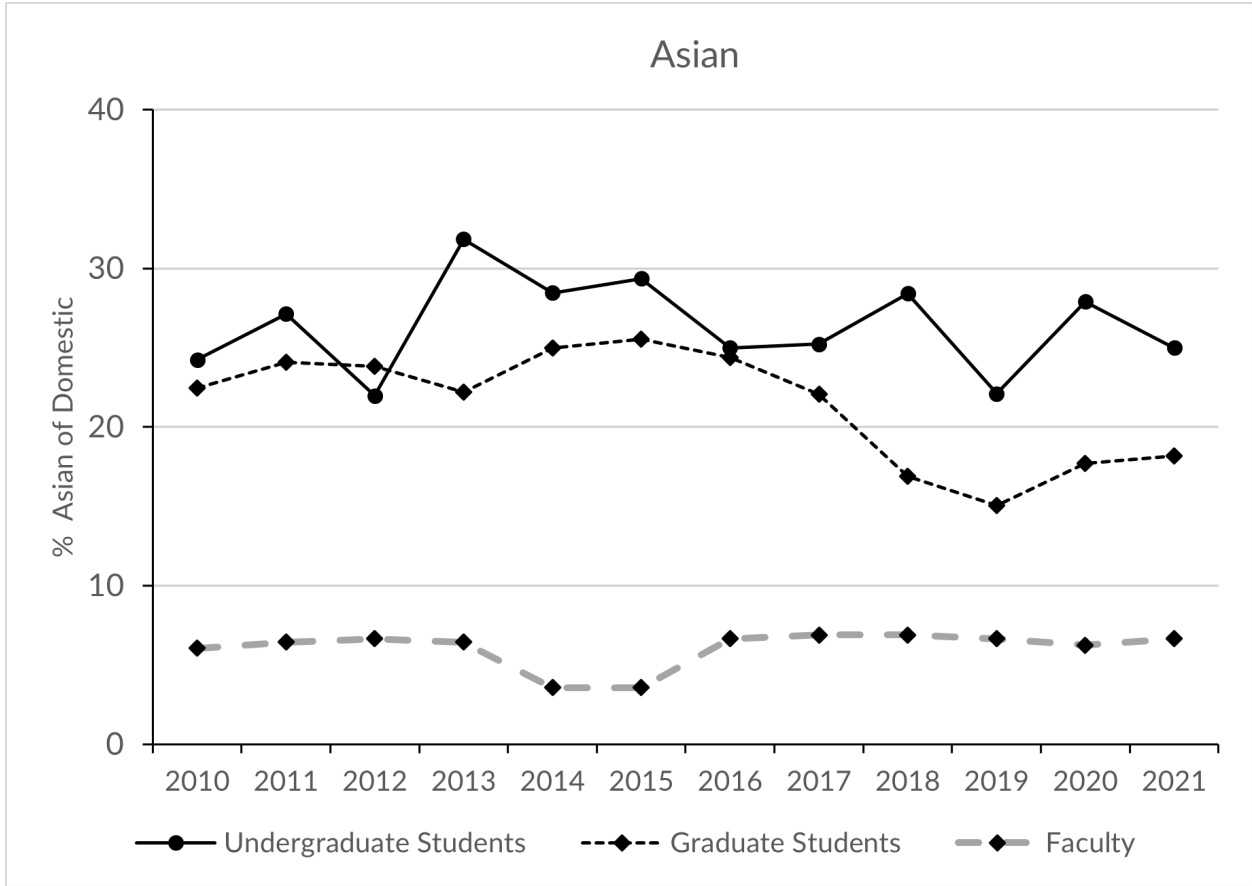
*(In 2021, 6 URM students were admitted)*

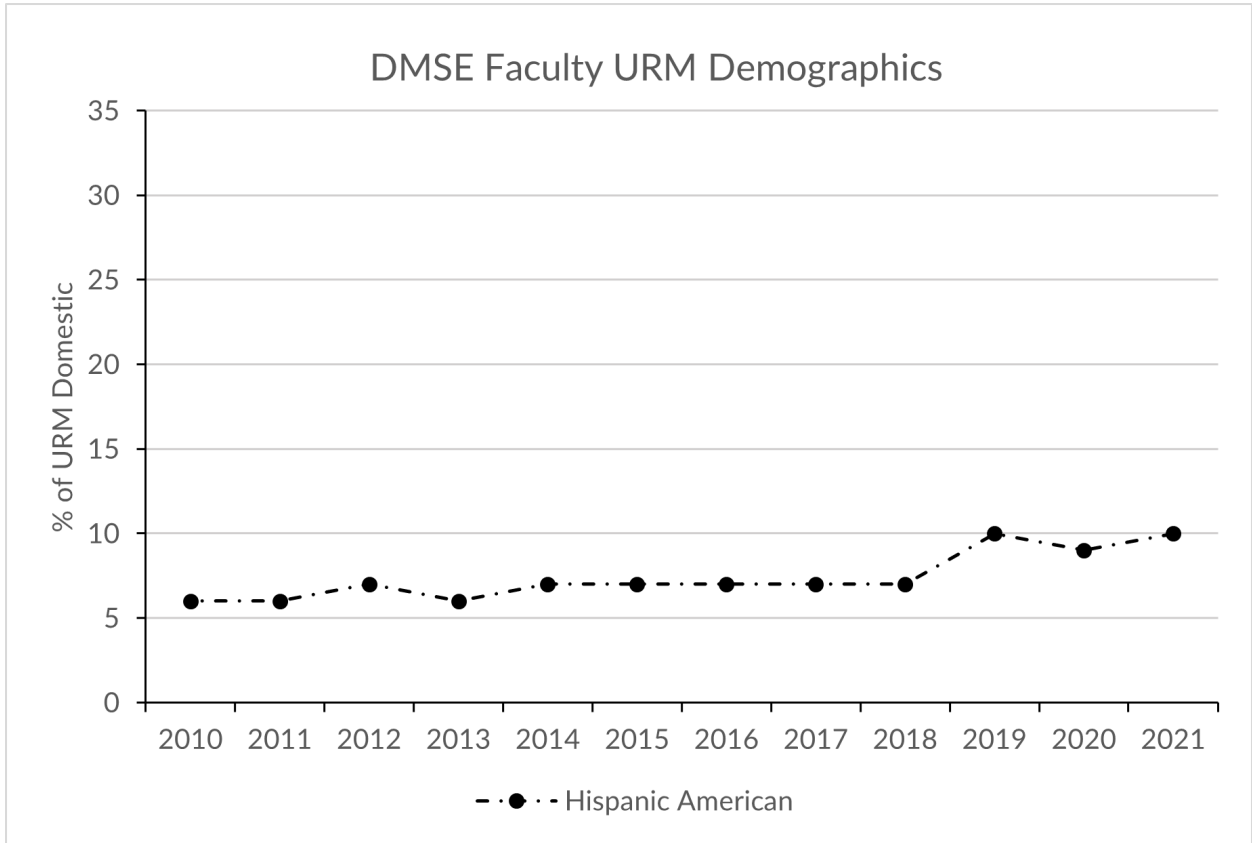


(In 2021, 2 URM students were enrolling)

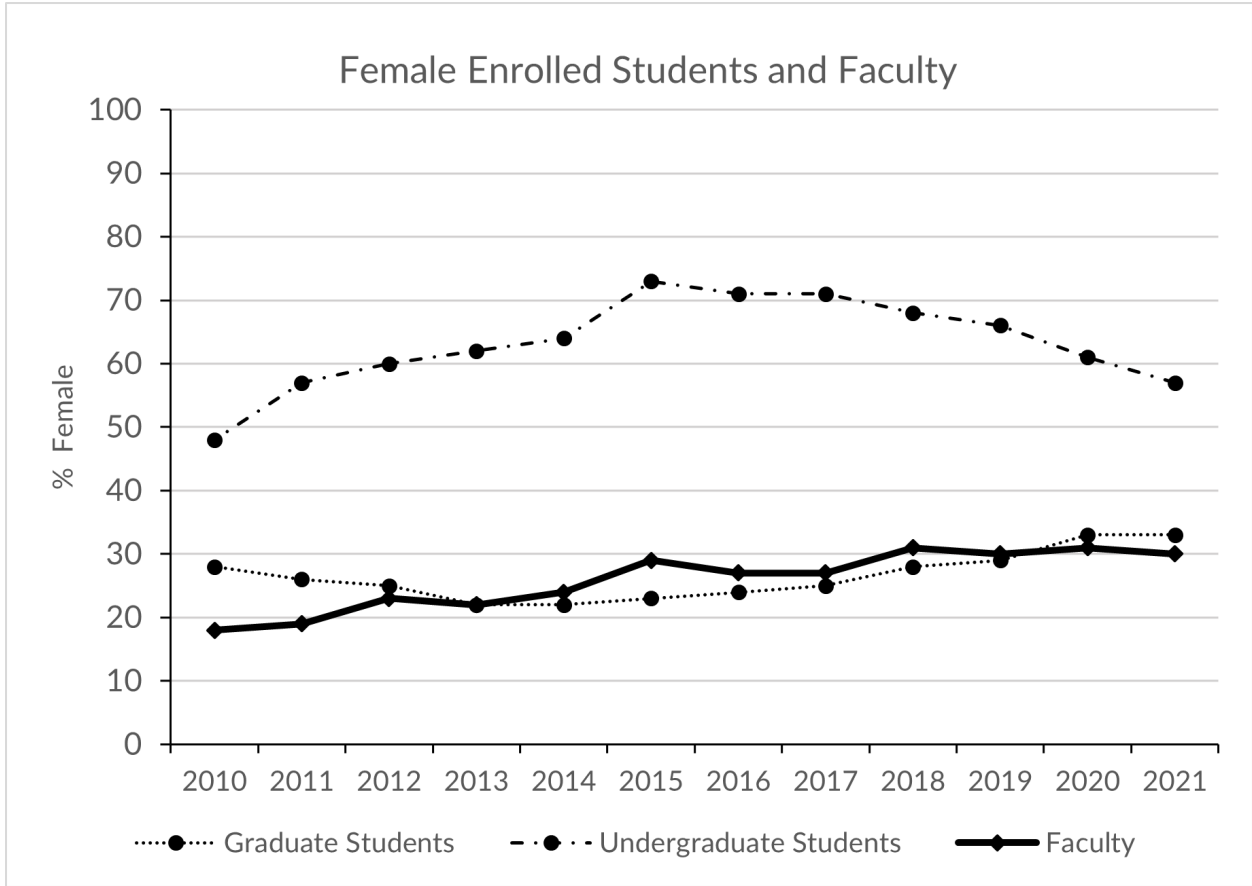
#### Postdoc URM Demographics

Year	Female	International	Latinx	Native	Asian	Black	Pacific Islander
2020	17%	90%	2%	0%	51%	2%	0%

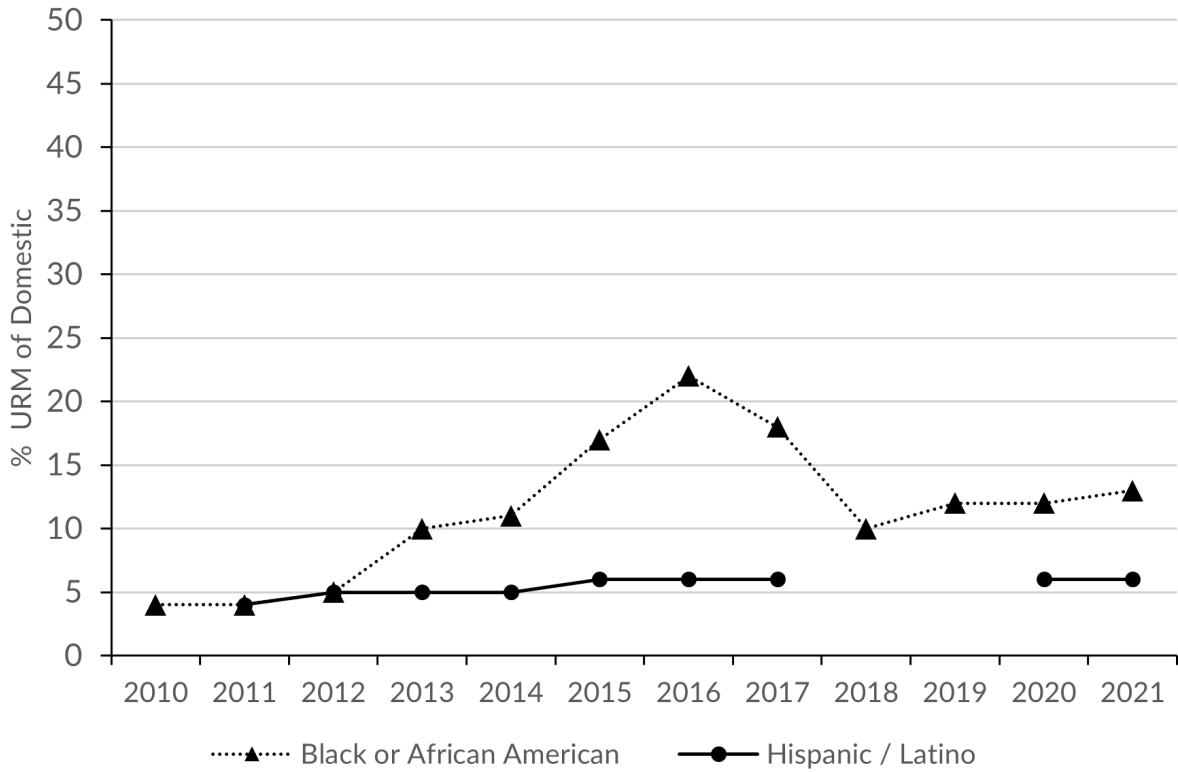




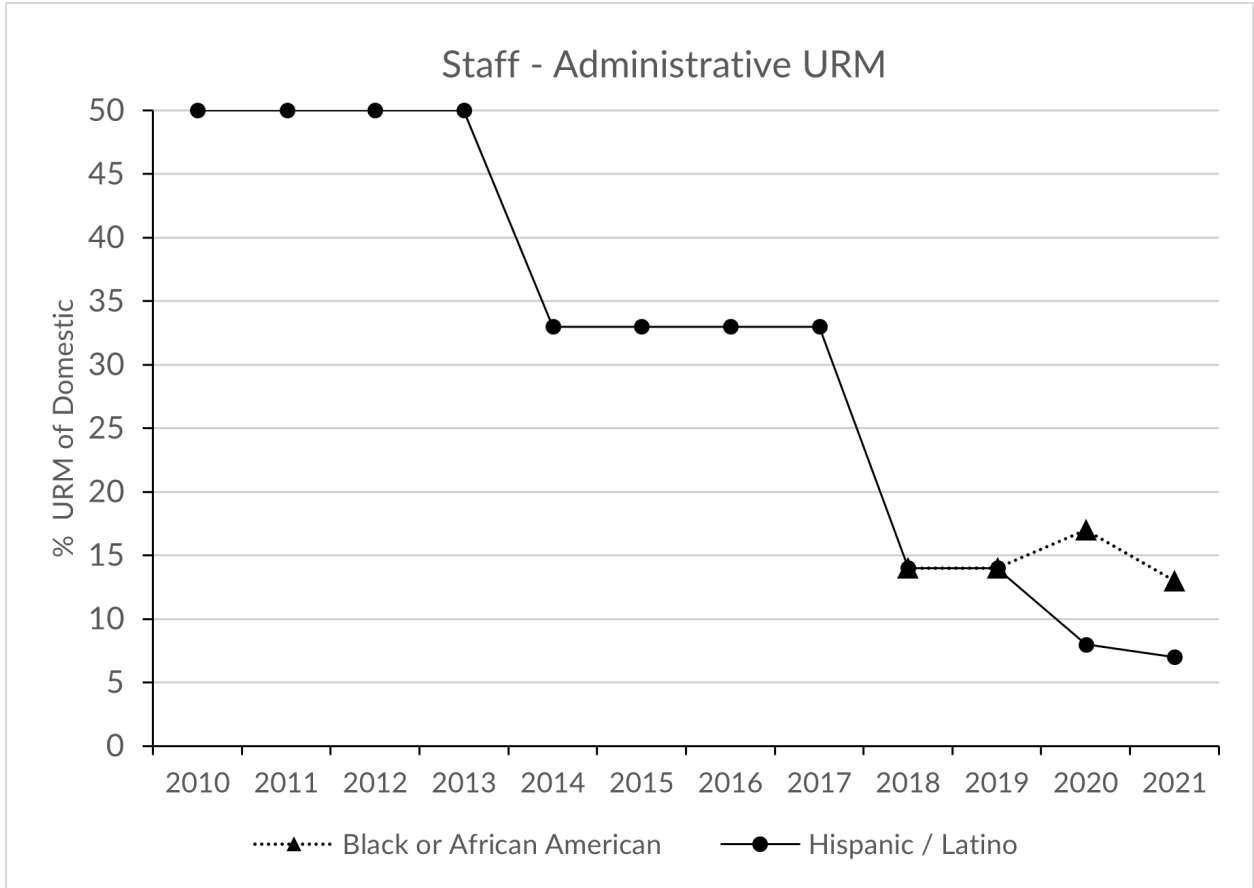
(\*Data does not include incoming Fall 2021 faculty hires)

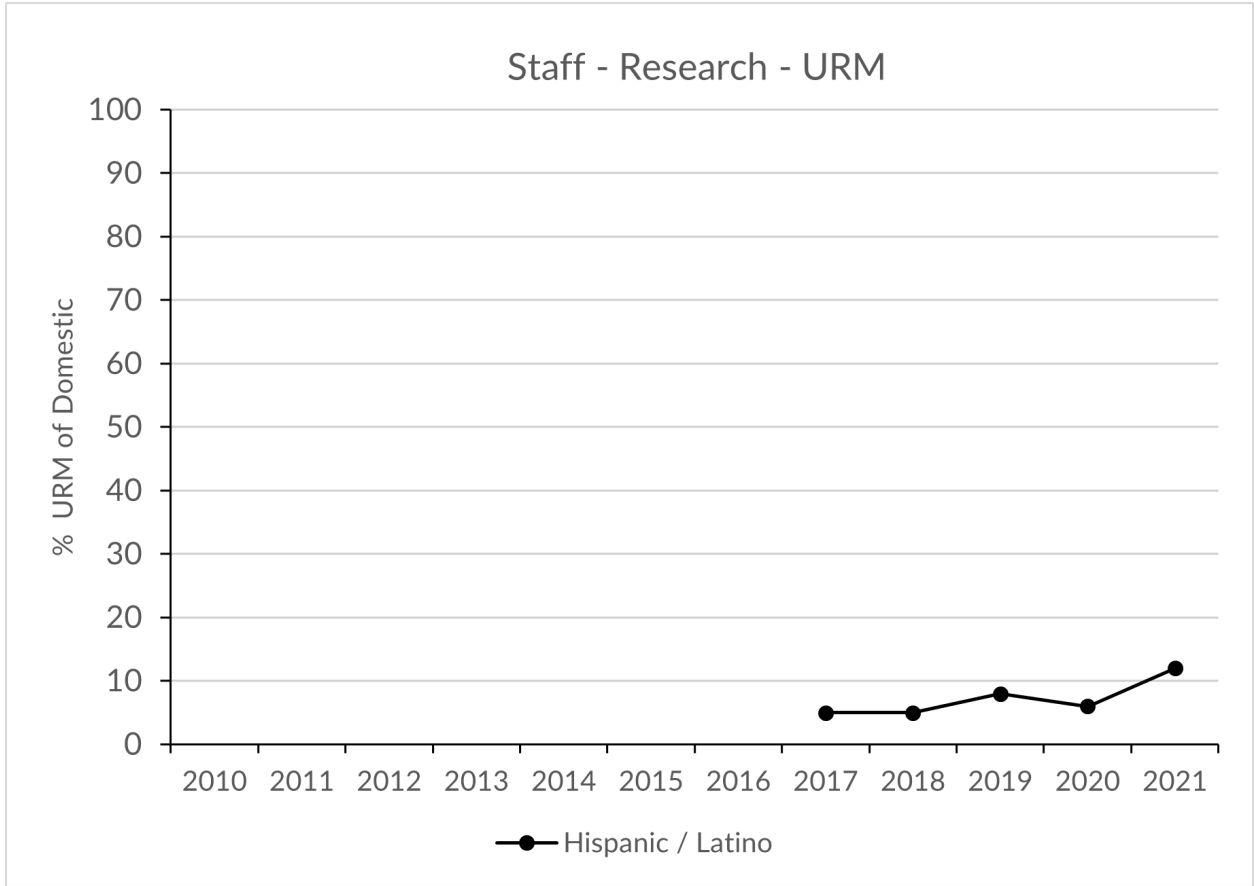


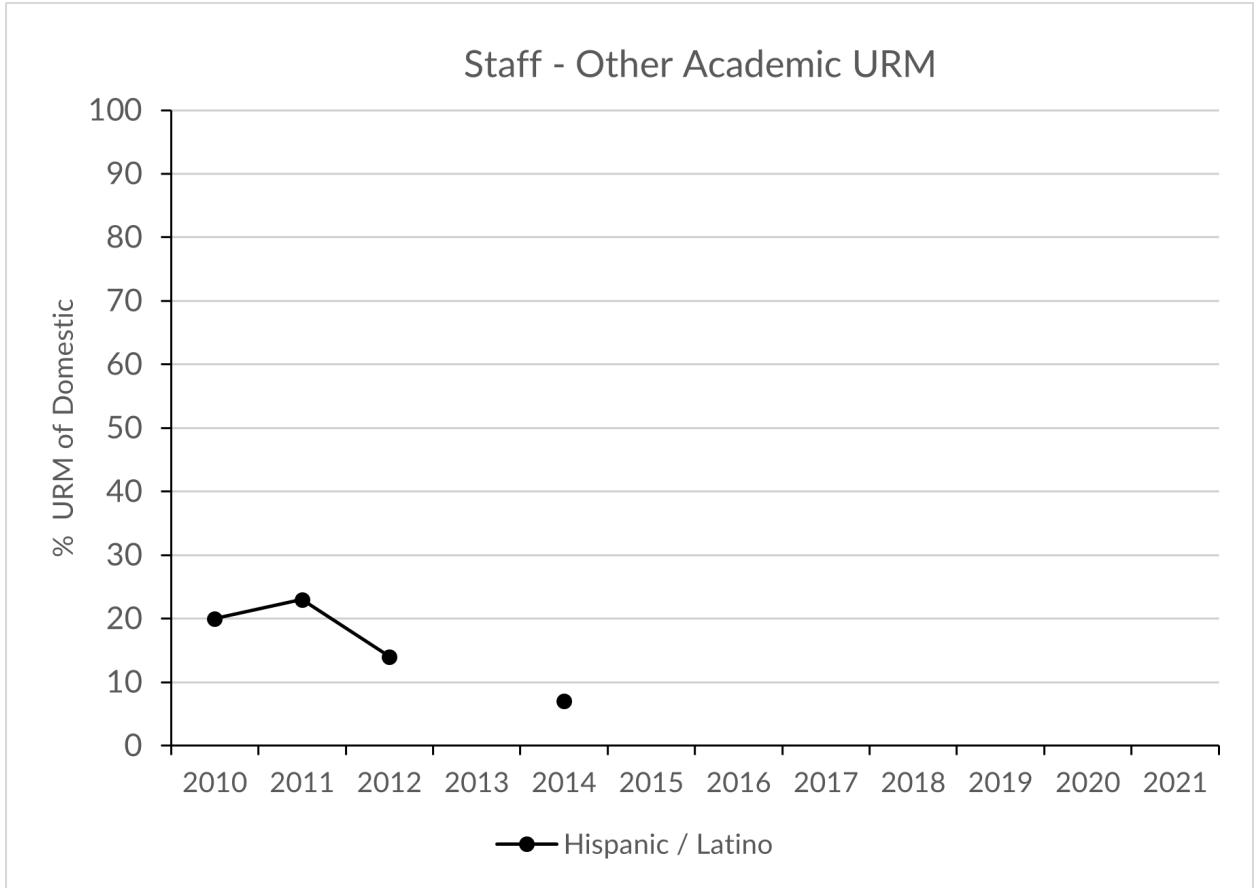
### Staff - Support - URM

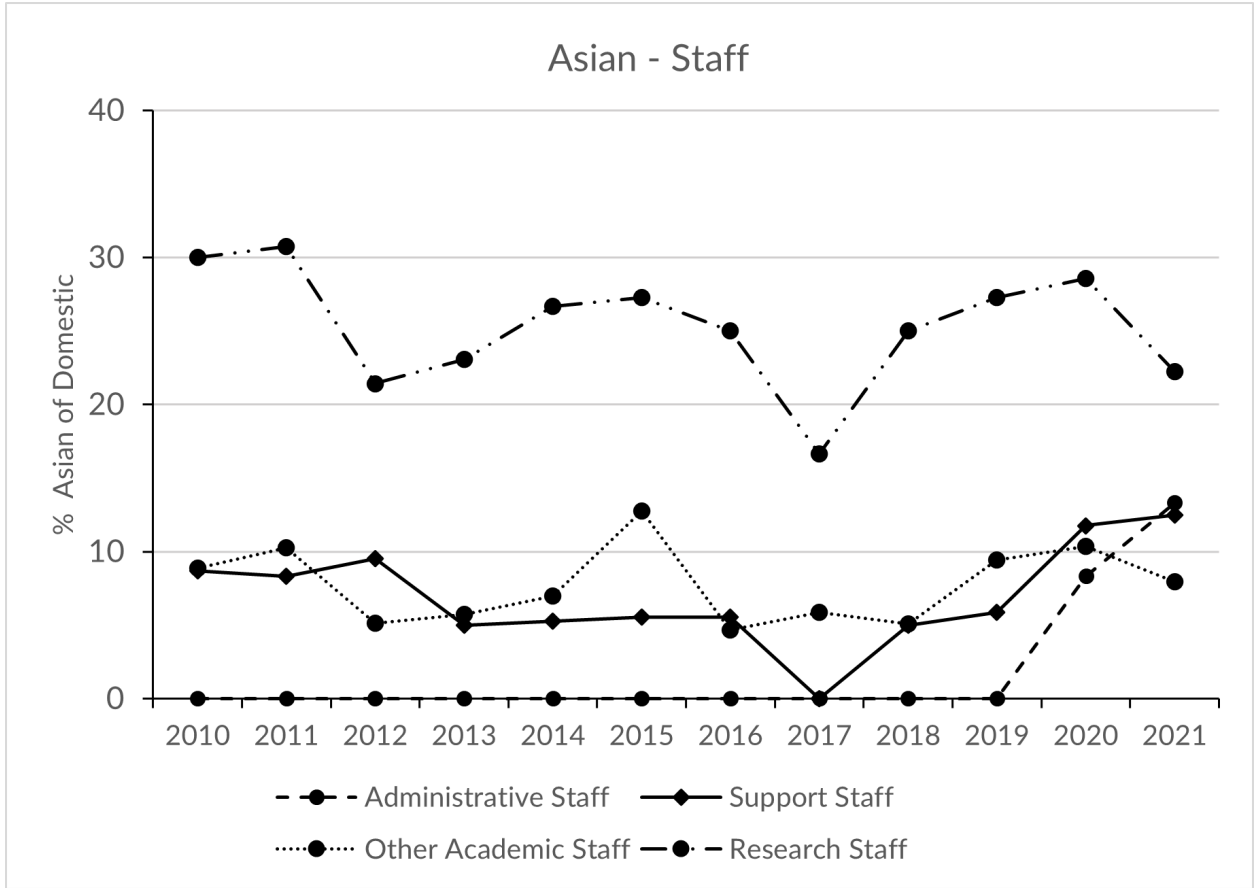












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