Diversity, Technology and the Modern Research University

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We have heard the assertion that cognitive diversity provides non-additive collective improvements in performance, prediction, and problem solving, as much as or more so than individual ability, given certain and often challenging conditions are met such as relevance, identity validation, effective communication, expectations of benefits, overcoming stereotypes and negative group dynamics [1]. In the modern research University setting, clearly diversity has educational and scholarly benefits for the aggregate population, it is a facilitator of paradigm shifts in the scientific community [2], a key component of interdisciplinary research and a critical determinant of the mission to generate and advance knowledge that will best serve the nation and the world in the 21st century. Yet, challenges and questions still remain as to what mechanisms should be used and how new technological tools should be deployed to unlock the great potential of diversity and to catalyze learning, creativity, discovery and innovation. I would like to consider two necessary components; 1) equitable access to higher education and 2) an inclusive university climate.

Regarding the first component, equitable access to higher education, in the context of selective Universities like MIT, what I refer to is that to remain competitive we must educate students from the widest array and broadest pools of talent by tapping into all segments of our population; this is one of the founding principles of MIT [3]. Hence, diversity efforts should take into consideration national population demographics and under-representation and should address barriers which prevent certain groups from ever reaching the selection pool. Diversity is not solely a social justice issue and it is not in tension “with producing top research” and “productivity” [1]. Under-represented constituencies do not only bring diverse perspectives, but also serve as an untapped pool of
talent, aptitude and intelligence and it is this combination of diversity and excellence that will push forward research quality and productivity at the individual, disciplinary and aggregate University level. At MIT, over the last two decades, we have had significant gains in domestic diversity in the student population including racial/ethnic minorities and women at both the undergraduate and graduate levels [4] and our students are, both as individuals and as an aggregate cohort, ever more outstanding; intellectually, academically, and personally.

Nationally, however, participation by under-represented groups in the Science, Technology, Engineering and Math (STEM) fields has exhibited minimal growth over the last decade [5]. There is also great heterogeneity across disciplines. At MIT, at the undergraduate level we have maintained aggressive and consistent increases in financial aid [6] and at the graduate level, targeted recruitment programs, outreach to Minority Serving Institutions and fellowship support [7] have been successful in beginning to address the decrease in enrollment of under-represented minorities from the baccalaureate to the graduate level. The latter efforts focus on reducing barriers specific to under-represented constituencies such as; informational (e.g. lack of understanding of admissions requirements and processes), financial (e.g. dispelling myths, justification of the cost of education when supporting family and/or extended family), personal and cultural (e.g. isolation and separation from family, lack of understanding by family, the “imposter syndrome”), and institutional climate, both in perception and reality. I myself am a product of pipeline programs and targeted fellowships which opened the door to graduate school and to academia, I am 100% certain I would not be where I am today without them.

Today, revolutionary technological advances in communication, information and computation yield great potential for Universities to energize, expand and explore new mechanisms to broaden participation by under-represented populations in the STEM fields. Online media holds opportunities for use as a platform to inspire, to inform, to prepare, to recruit, to enhance the residential educational, to improve retention and potentially to expand access and educate large segments of society at massive scales. At MIT, OpenCourseWare (OCW), a permanent web-based publication of virtually all MIT course content that is free, open and available anytime to anyone in the world has fostered curiosity in millions of individual self-learners, as well as provided educational institutions
worldwide a platform to increase the quality of their instruction. For example, Cambridge College in Cambridge, MA, one of the top institutions conferring Master’s degrees to minority students, has used OCW for curriculum design, benchmarking and as a “motivating touchstone” for learning [8]. Other mechanisms can generate excitement in STEM fields at the K-12 level, such as publicly available, video libraries of inspirational, idea-generating and topic-based short and engaging presentations which have attracted global audiences of learners in the millions [9]. Social media [10], online discussion forums [11], and 3D interactive virtual campuses [12] all may become viable opportunities to recruit from larger pools of talent, as their quality increases. Virtual communities and online education also present possibilities to enhance interactions, create networks to strengthen pipelines between Minority-Serving Institutions and major Research Universities.

An inclusive University climate is the second component to releasing the great potential of diversity. To truly fulfill our mission, it is essential that all members of our community – those of all races, genders, culture, sexual orientation, disability, socioeconomic background, age, religion and language – are welcomed, valued, intellectually and socially engaged, interacting and connected to resources, information, to each other, to the University, to the nation and, ultimately, to the world. A nurturing and supportive climate does not mean we have to sacrifice academic rigor or scientific productivity and, in fact, conversely it is expected to enhance the quality of the education and research enterprise, promote the retention and academic success of our students. To create an inclusive University climate, structural, cultural and pedagogical aspects must be considered at multiple levels that support the academic, personal, and professional development of all students [13], in the context of a system of residential graduate education that today is increasingly supported and enhanced by virtual interactions [14].

A hierarchical climate strategy for graduate education can be envisioned at the individual, cohort, program and Institute levels. For individual graduate students, stable and long-term financial support, as well as ensuring equitable access to resources and opportunities are highly beneficial. Cohort and community building activities (for example, support of student groups and clubs) can serve to combat isolation, facilitate networking and professional development skills, encourage work-life balance, provide a motivating
support structure, and enhance information exchange, when carried out in a thoughtful manner. At MIT, community-building events among the female graduate population are enormously popular with over 1,000 women graduate students participating in such activities sponsored by the University each year [15].

At the next level up, “bridging activities” which academically, intellectually and socially connect students to peers, academic programs, faculty, and alumni, are highly advantageous. In-depth orientation programs which acclimatize new graduate students to the culture of doctoral education and research are desirable [13]. The MIT Sloan School of Management, for example, additionally provides an orientation agenda that introduces a set of “core values” such as integrity, respect, collaboration, innovation, and positive impact and re-emphasizes those values throughout the academic year, for example with interactive installations [16]. At the program level, academic support [17] and transparency and clarity of policies and procedures, in particular financial support, is crucial. Supporting student groups which promote sharing of their cultures with the broader community and cross-cutting events between groups of different ethnic, cultural, and national backgrounds is also beneficial. Mechanisms which facilitate the creation of a network of mentors, including peer, post-doc, faculty, and alumni, are advantageous, as well as compiling and disseminating best practices for mentoring of a diverse cohort [18]. Establish recognition and rewards for students and mentors as they progress over the academic hurdles [13]. In addition to known methods which facilitate inclusive classroom environments [19], new technologies such as analytics, web-based collaborative annotation tools [20], classroom response systems (“clickers”) [21], and social media can be employed to accommodate different learning styles and, thus, to potentially improve learning outcomes and self-confidence of diverse student cohorts. Building up vibrant and interactive virtual communities and cross-cutting intellectual networks to facilitate inclusivity and bridge communities that might not otherwise engage with each other also has potential to enhance the on-campus, residential climate.

At the University-level, as well as the program level, actions can be taken to reinforce the values, principles and policies which foster diversity and inclusion by publicizing, acknowledging and celebrating the accomplishments of students from a range of
backgrounds, by emphasizing the positive correlation between diversity and excellence, by articulating the value of diversity and by providing resources to enhance diversity.

Lastly, I would like to provide a cautionary note related to technology that may provide challenges to creating an inclusive climate, as virtual platforms and electronic communications continue to evolve and grow in graduate education. We must be cognizant of reduced accountability, online harassment and cyberbullying, the increased possibility of miscommunications, the impact of 24/7 availability expectations on work-life balance and mental health, issues of student privacy, the potential for isolation and disconnection, erosion of faculty-student contact hours, and more opportunities for violation of academic integrity and other ethical standards.

As I have outlined the opportunities and challenges associated with the use of technology in broadening participation and creating an inclusive climate, I believe we can strategize and implement plans to create an University environment where a diverse cohort of students find their path and passion, develop self-confidence, unlock their imagination and creativity, realize their potential, become life-long learners and achieve all of their academic, personal and professional objectives. I hope all of us can take on the challenge to create an educational experience which truly celebrates our differences and empowers all of our students and the next generation to achieve their goals and dreams.

Bibliography


4. Between 1991-2011, at the undergraduate level, MIT exhibited an increase from 16.5% to 26% under-represented minorities (URM) as a percentage of the domestic population and at the graduate level an increase from 4.4% to 11.6% URM as a percentage of the domestic population. Between 1991-2011, for female students, at the undergraduate level, MIT exhibited an increase from 32.8% to 45.3% and at the graduate level an increase from 21.8% to 31.2% (MIT Institutional Research, Office of the Provost).
5. In 2010, under-represented minorities were 18.3%, 17.7%, and 13.6% of the domestic population for Bachelors, Masters and PhD degrees, respectively and women composed 57.2%, 60.1%, and 49.3% of the total student population for Bachelors, Masters and PhD degrees, respectively (Integrated Postsecondary Education Data Systems or IPEDS data, compiled by MIT Institutional Research, Office of the Provost).


8. Unlocking Knowledge, Empowering Minds: A collection of case studies about MIT OpenCourseWare, November 2011, Massachusetts Institute of Technology: Cambridge, MA.


12. Virginia Tech Graduate Life Center (http://openlife01.cc.vt.edu:9500/wifi/).

14. The use of technology is pervasive and can serve to enhance residential graduate education. For example, graduates students employ online media for literature searches and review, on-line disciplinary discussion groups, peer review of scientific manuscripts, to facilitate research collaboration, interaction with faculty advisors and, hence, advising and mentoring, identification of fellowship and resource information, remote laboratory experimentation, in-classroom educational technology for teaching assistantships, OpenCourseWare (46% of MIT students use OCW as an advising and course selection tool), etc.

15. Community building events for women graduate students at MIT include a “Path of Professorship” workshop (http://odge.mit.edu/development/pop/), the popular and over-subscribed Graduate Women at MIT (GWAMIT) leadership and empowerment conferences (https://sites.google.com/site/gwamitweb/), extensive mentoring and advising activities, the Graduate Women’s Reading Group, the Graduate Women’s Luncheons and the “Graduate Women of Excellence” celebration (http://odge.mit.edu/community/women/celebratewomen/).


17. Academic support examples include; forums which provide guidance and information on choosing a research topic and advisor, funding mechanisms, fellowship application support and feedback, mock oral examinations, and graduate student work-in-progress seminars.

18. Weiss, J.A., How to mentor graduate students: A guide for faculty at a diverse university; For example, self-assessment, constructive and honest feedback, navigation of administration, development of transferable skills, career facilitation, and psychosocial aspects such as building self-confidence. University of Michigan, The Rackham School of Graduate Studies., 2006.

