Broadening Participation in STEM

April 3, 2018

Boston University Office of the Vice President and Associate Provost for Research

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Technology Innovation Scholars Program

Stacey Freeman
Assistant Dean of Outreach and Inclusion
ENG

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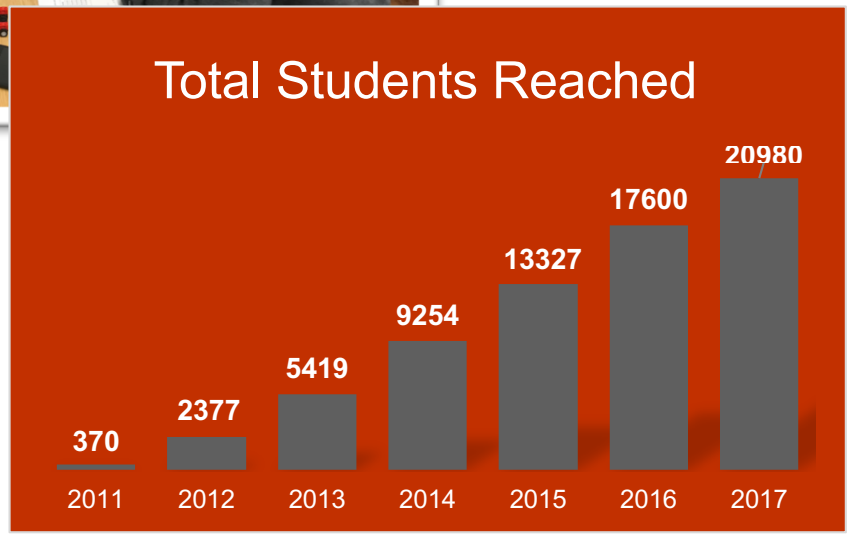
Technology Innovation Scholars Program (TISP)

- What is TISP?
- Why TISP?
- Who Participates?
- What We Do
  - Home Visits
  - FIRST Robotics
  - Boston-Area School Visits
  - Campus Visits/Events
- What We Teach
  - Innovations in a Box
  - Electrical Engineering
  - Biomedical Engineering
  - Computer Engineering
  - Mechanical Engineering
  - Broad Application of Engineering
- Our Impact Since 2011
  - ***Reached over 20,000 students across 27 states and 9 countries***



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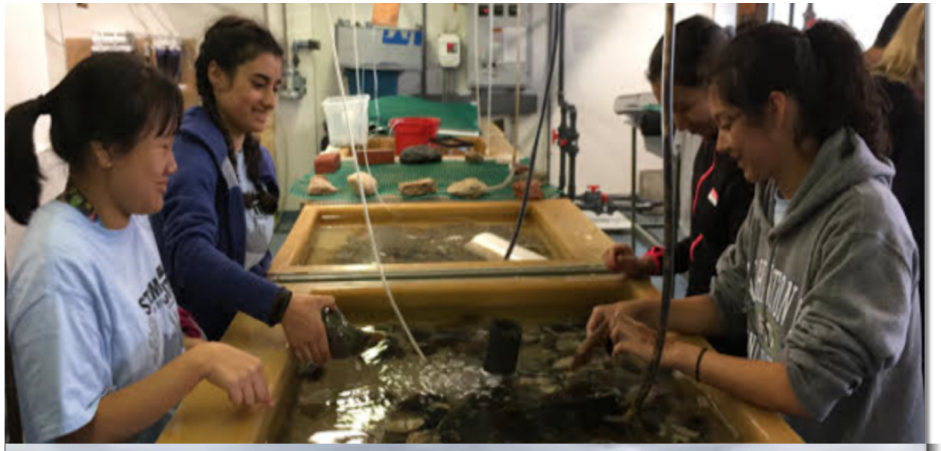
Ellen E. Faszewski

Professor
Biology, Integrated Liberal Arts
Wheelock College
WCEHD Clinical Faculty Member

Broadening Participation in STEM:
STEM in the City Summer Program

- Two week summer day program, started 2015
- Target Audience: Rising 8th and 9th graders
- Environmental & Health Sciences / Marine & Space Sciences
- Classroom activities, field trips, college readiness
  - 47% white
  - 20% Hispanic
  - 18% Asian
  - 13% black
  - 33% scholarships
  - 26 cities/towns
  - ELL learners

STEM in the CITY



Ziba Cranmer

Director
BU Spark!

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ALTERNATIVE PATHWAYS
DEMISTIFIED THROUGH PROXIMITY
MOTIVATED BY APPLICATIONS
RETAINED THROUGH CO-CURRICULARS
SPARK!

CULTURE CHANGE THROUGH STUDENT CLUBS

SOCIAL NORMING

PROFESSIONAL DEVELOPMENT

COMMUNITY BUILDING

Kim McCall

Professor and Chair
Biology, CAS

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Diversifying the pipeline

BOSTON UNIVERSITY LERNet

- High school students
  - BioBugs
  - Summer Pathways
  - GROW
  - Lernet Director, Cynthia Brossman

GROW Greater Boston Area Research Opportunities For Young Women

- Undergraduate students
  - SURF NSF REU
  - 150 students since 2001
  - 67% have gone to MD or PhD programs
  - 800 applications/year for 10 slots
  - PI, Thomas Gilmore

NIH opportunities to promote diversity

"Fostering diversity by addressing underrepresentation in the scientific research workforce is a key component of the NIH strategy to identify, develop, support and maintain the quality of our scientific human capital."

- Research Supplements to Promote Diversity in Health-Related Research
  - PA-18-586
  - Funds to recruit and support students, postdoctorates, and eligible investigators from groups that have been shown to be underrepresented in health-related research
  - High school to faculty level, $5000 to $100,000
  - For "certain new research objectives, as long as the research objectives are within the original scope of the peer reviewed and approved project"

- Ruth L. Kirschstein National Research Service Award (NRSA) to Promote Diversity in Health-Related Research
  - PA-18-666 (F31)
  - Individual 2-5 year fellowships to support graduate students
  - Individuals from underrepresented racial/ethnic groups or disabilities
  - Stipend, partial tuition + supplies
  - Mentor role is very important

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Boston UniverCity: Training Graduate Students in Biogeoscience and Environmental Health to Tackle Urban Environmental Challenges

Pamela Templer

Professor
Biology, CAS

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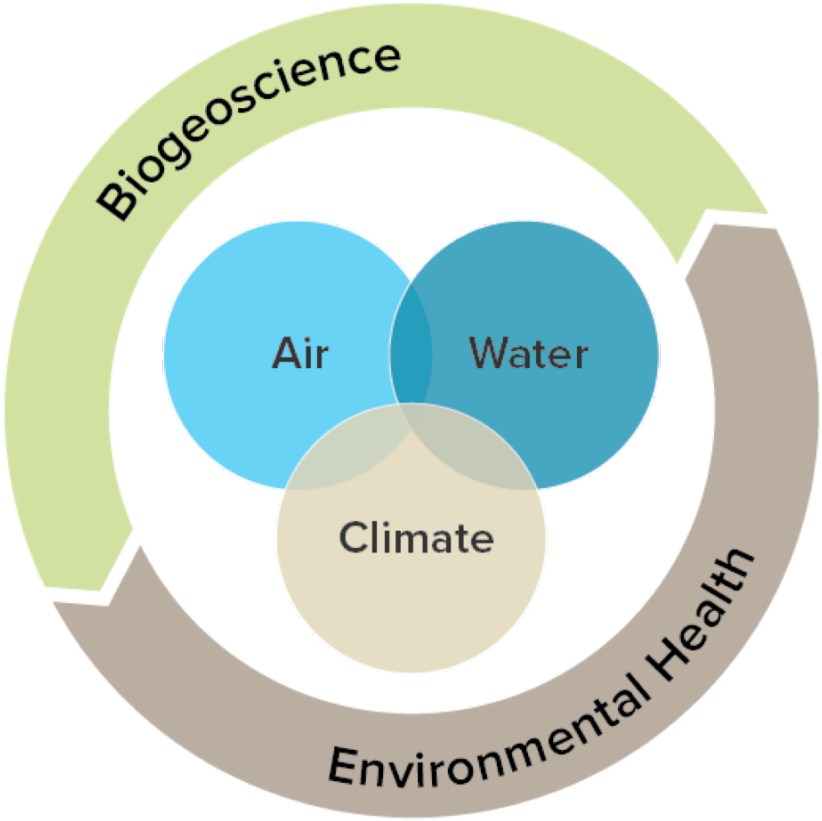
URBAN Boston University Program in Biogeoscience & Environmental Health

NSF Research Traineeship (NRT) Program: Five Year $3M Grants to Broaden STEM Participation



Program Goals

- Train 60 Ph.D. students in Biogeoscience, Environmental Health, Statistics
- Develop collaborative research projects among students, faculty, policy-makers, private sector
- Communicate research to policy-makers and the public
- Disseminate new training model to universities around U.S.

Thomas Bifano

Professor
Mechanical Engineering and
Materials Science & Engineering, ENG
Director, Photonics Center

Xin Zhang

Professor
Mechanical Engineering, Electrical & Computer Engineering, and
Materials Science & Engineering, ENG

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Photonics Center, broadening participation through NSF Programs

NSF Research Experiences for Undergrads (**REU**)

NSF Research Experiences for Teachers (**RET**)

NSF Doctoral Research Training in Neurophotonics (**NRT**)

NSF Eng'g Rsch Ctr on Tissue Engineering (**CELL-MET**)

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All four programs have a specific aim of broadening STEM participation, but each emphasizes a different approach.

REU – Participants are mainly junior undergrads from URGs**.** Our approach: Tight knit cohorts, hands-on organizer (Fawcett), intensive, inclusive summer experience in BU labs. We recruit the best into our grad programs the following year.

RET – Participants are teachers in URM-serving High Schools. Our approach: Get teachers professional development points (PDPs), Use teachers as professional mentors for REUs, recruit BU faculty for HS science judging.

NRT – The grant supports 2nd & 3rd year doctoral URMs and women (5/yr), and also has substantial funding for creating a larger inclusive community of other trainees (20/yr). Our approach: Collaborate w/ grad coordinators in six cognate Depts at BU, extensive training and community building for trainees.

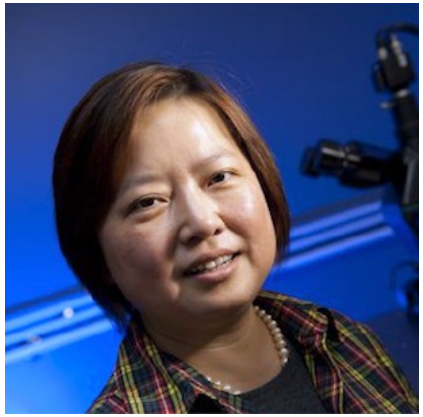
ERC – Major multi-university research initiative. Our approach: Partnership with a URM serving institution (FIU), emphasize diversity at all levels.

Reflections on our experiences:

1) Departmental graduate admissions committees ought to have more consistent and more strategic long term plans for recruiting and retaining doctoral students from URGs. BU goals and metrics need to be more explicit.

2) Centers and Institutes can and should carry substantial university load for winning and overseeing training and research grants that highlight broad participation. They should share resources for doing so.

3) An energetic, determined program coordinator is the key to success in creating and sustaining a diverse and inclusive training program. It is easy to underestimate the time and effort required.



Increasing Diversity in the Biomedical Workforce

Isabel Dominguez
Assistant Dean for Diversity & Multicultural Affairs
Director, STaRS Program, Graduate Medical Sciences
Assistant Professor, Medicine, MED

starsdir@bu.edu

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	18-24 y.o. US citizens (31 million, 2014)	Undergrad Student	Biological Sciences Graduate Student	PhDs in Academia
URMs*	37%	32.5%	12.1%	4-6%

Long-term goal: increasing diversity in the biomedical workforce

Graduate Medical Sciences (GMS) Division

BAHEC — BEST-BET — BU PREP

Middle / High School → College → Bachelor's

STaRS

**URM (NSF): groups underrepresented in Biomedicine (Data from US census, NIH, NSF and AAMC)*

Pipeline Program: Summer Training as Research Scholars (**STaRS**)

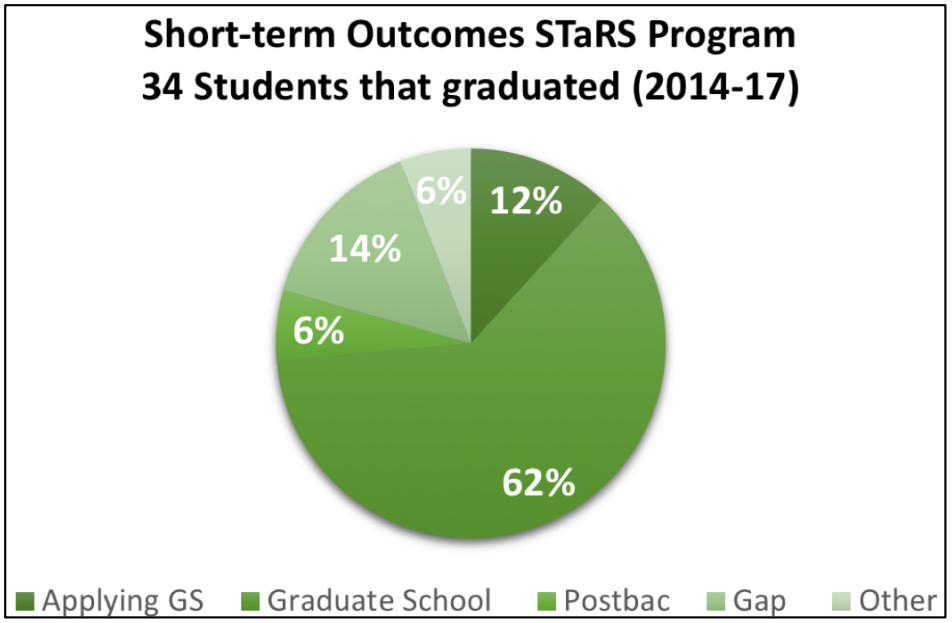
- Since 2010 -- R25 NHLBI (2014-18)

- For Undergraduate students and BU Medical Students (EMSSP)

- Goal: enhance the skills and motivation of students for successful application, matriculation and completion of a graduate level program in the biomedical sciences

- Components:
  1) Faculty-mentored research projects
  2) Scientific skill workshops and seminars
  3) Career planning and advising
  4) Research Symposium
  5) Post-program follow-up support

89% participants reported that STaRS influenced positively their decision to pursue an advanced degree or continue their careers in biomedical research



Retention: programs for URM trainees at GMS

Joyce Y. Wong

ARROWS: Advancing Women in STEM @ BU

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MOU: Why important to solve problem?

- Define ARROWS not as equality or fairness, **but** to **retain talent** to ensure **long-term competitiveness** of University

⇒ Makes objective universally important to **all stakeholders**

⇒ Answers the question "Why is it important to solve this problem today? **What is the cost of doing nothing?**"

ARROWS Abridged Faculty Hiring Guide

Prepared Spring 2017 with Jen Sheridan (Univ Wisconsin)

Rolled out Fall 2017 hiring cycle: Associate Provost Faculty Actions orientation for faculty search committee members

Unconscious Bias Training

ECE Fall 2015 hosted Cornell Theater Troupe

Physics and CAS Spring 2017 Cornell Theater Troupe

ARROWS Faculty Recruitment Meetings

Program first introduced by BU WISE:

At least 1 female STEM faculty member outside of hiring dept meets informally with faculty candidate

ARROWS Resurrected program Spring 2016 and has continued, but not all STEM departments took advantage of program

AY 18 Expanded to other STEM departments: *testimonials* and *metrics*

MOU: Project objectives

Implement processes and policies to …

- Assure Boston University's long-term quality by attracting best talent to BU, regardless of gender, age, race, and other differentiating characteristics
- Increase number of BU STEM women faculty to levels that at least **match the pool** at all ranks
- Increase number of BU STEM women in leadership positions
- Increase numbers to have highest women STEM faculty ratios among our peer institutions

Metrics

- Increase female faculty candidate pool and hires to match nationwide statistics at all ranks
- **Compare data**: time for promotion to full professor before and after policy implementation

Rank	AY 2018		AY 2016	
	Male	Female	Male	Female
Full	30	3	31	3
Assoc	3	1	2	0
Asst	5	3	3	1
NSF pool	1544	378	1544	358

EXPANSIVE MEANINGS AND MAKINGS IN ARTSCIENCE

Beth Warren

Associate Professor
Literacy and Language
Associate Dean for Research
SED

A Collaborative Design Research Project: Boston Arts Academy; The Broad Institute; TERC; local independent artists

Funded by the National Science Foundation
ECR-1348494

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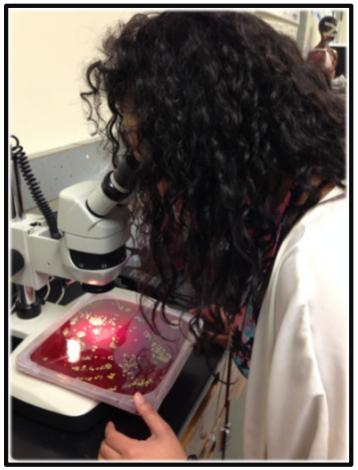
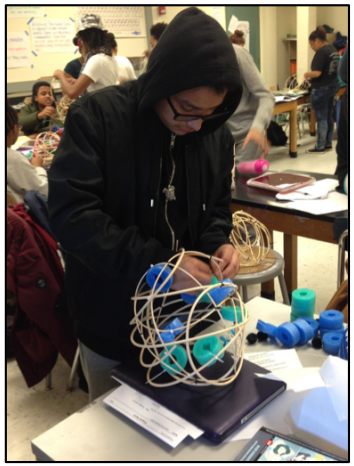
ARTSCIENCE is…



knowing, analyzing, experiencing and feeling simultaneously.



We're not individuals, we're colonies of creatures.

I want people to understand the drastic difference there is between what they think and what actually is…I looked at my plates and saw how amazing and beautiful my microbiome really is…

Eve Manz

Rethinking Elementary Investigations to Support Meaningful Engagement in Science Practices

Assistant Professor
SED

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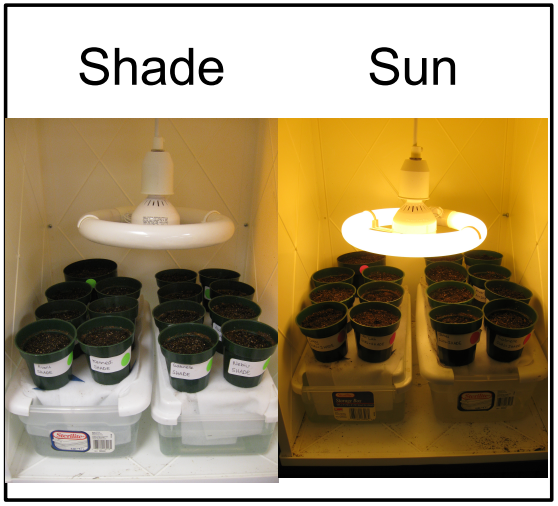
Experiment



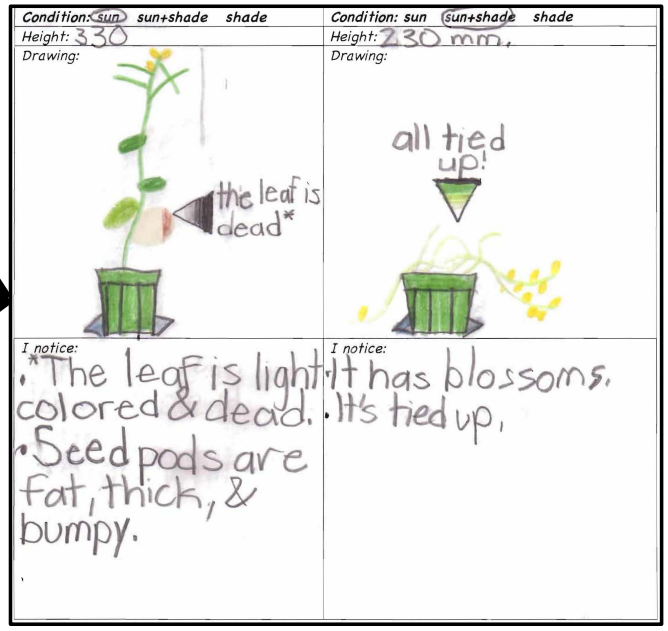
How can we represent shade?

World

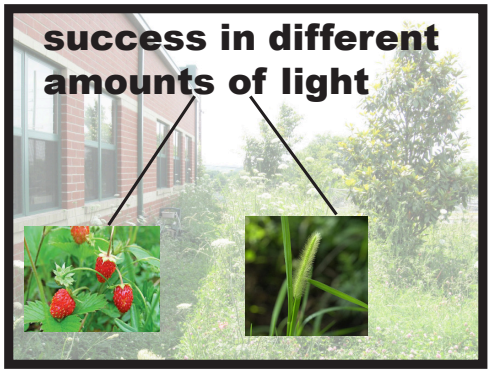
Experiment

Shade Sun

Data/Evidence



Explanation



How do we see success?

Why are there plants in the shady area outside?

Lynsey Gibbons

Broadening Participation through Focusing on Teacher Learning

Mathematics Education, School of Education

Boston University
Andrea Bien, Eve Manz, Cathy O'Connor, Beth Warren

Chèche Konnen Center, TERC
Ann Rosebery, Eli Tucker-Raymond

Southern Methodist University
Annie Wilhelm

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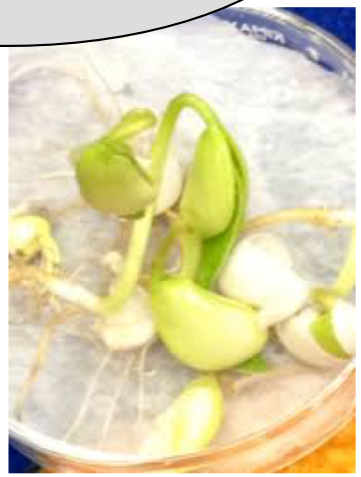
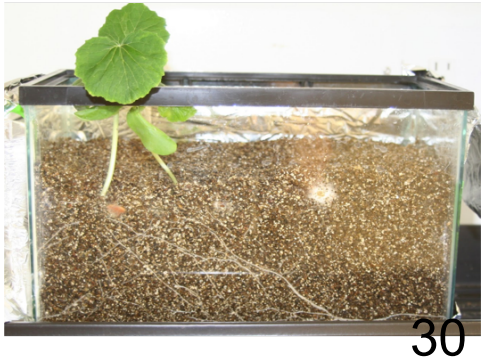
A student voices an unexpected idea:





Initially appears off task
Holds an important idea about soil in plant growth

Teacher listens, probes, and co-constructs disciplinary substance and intellectually responsive relationship with student

Warren, B. & Rosebery, A.S. (2011). Journal of African American Males in Education, 2(1), 98-115.

Joyce Y. Wong

Professor
Biomedical Engineering and Materials Science & Engineering, ENG

AAAS

SEA CHANGE

Supporting institutional transformation for equity, diversity, and inclusion

Regional working meeting, UMass Lowell
Beth Ruedi, AAAS

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What is SEA Change?

- Awards (e.g. LEED certification) based on:
  - acceptance of SEA Change Guiding Principles
  - self-assessment and identification of challenges related to equity, diversity and inclusion
  - development of a specific, measurable, achievable, realistic, and time-oriented (SMART) action plan to address challenges (Bronze award = 5 year plan)
  - active work overcoming challenges and enhancing diversity and inclusion, with evidence of improvement

It Takes a Village…

Participants to-date from BU in SEA Change events

- Provost Jean Morrison
- Associate Dean (CAS) Stan Sclaroff
- Associate Dean (CAS) Michael Sorenson
- Chair (Chemistry) Larry Ziegler
- Chair (Biology) Kim McCall
- Former Chair (Physics) Karl Ludwig
- Asst VP (Institutional Research) Melanie Madaio-O'Brien
- Assoc Dir (Institutional Research) Nancy Insley
- Asst Dean of Diversity and Outreach (ENG) Stacey Freeman
- Faculty (Physics) Kevin Black

Next steps: Engage broader BU STEM community by targeting key leadership

- Current buy-in from President, Provost, Associate Provosts, VP of Research, CAS and ENG deans, some Chairs, some faculty, graduate students, staff

Graduate Infrastructure

gwise@BU
graduate women in science + engineering

NE GWiSE
New England
Graduate Women in Science & Engineering

School Representation

NE GWiSE is a consortium of nine institutions with GWiSE chapters or other women in science groups across New England. Current members are Boston College, Boston University, Brandeis University, Brown University, Dartmouth College, Harvard University, including Harvard Medical School, Massachusetts Institute of Technology (MIT), Northeastern University, and Tufts University, including Tufts University School of Medicine.

Boston partners…

WOMEN OF COLOR IN THE ACADEMY

Building Strategies for Career Advancement–The Time is Now

February 10, 2017

NORTHEASTERN UNIVERSITY
LVX VERITAS VIRTVS
FOUNDED AD 1898
BOSTON, MASSACHUSETTS

Diane Thompson

Assistant Professor
Earth & Environment
CAS

Nathan Phillips, Professor, Earth & Environment
Hussein Sayani, Postdoctoral Fellow, Earth & Environment

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BU-AGREED

Allies for Gender/Sexuality, Racial and Ethnic Equality & Diversity

1	2	3	4
unconscious bias	gender sexuality	race ethnicity	bystander intervention

COMING FALL 2018

@BU_AGREED

thompsod@bu.edu

http://sites.bu.edu/thompsonlab/outreach/diversity-inclusion/

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