Leveraging Student Research Experiences to Bridge the Gap for Underrepresented Minorities in STEM Careers

Irene O. Aninye, Ph.D.
RCP Senior Program Associate
American Association for the Advancement of Science

Emerging Researchers National Conference 2019

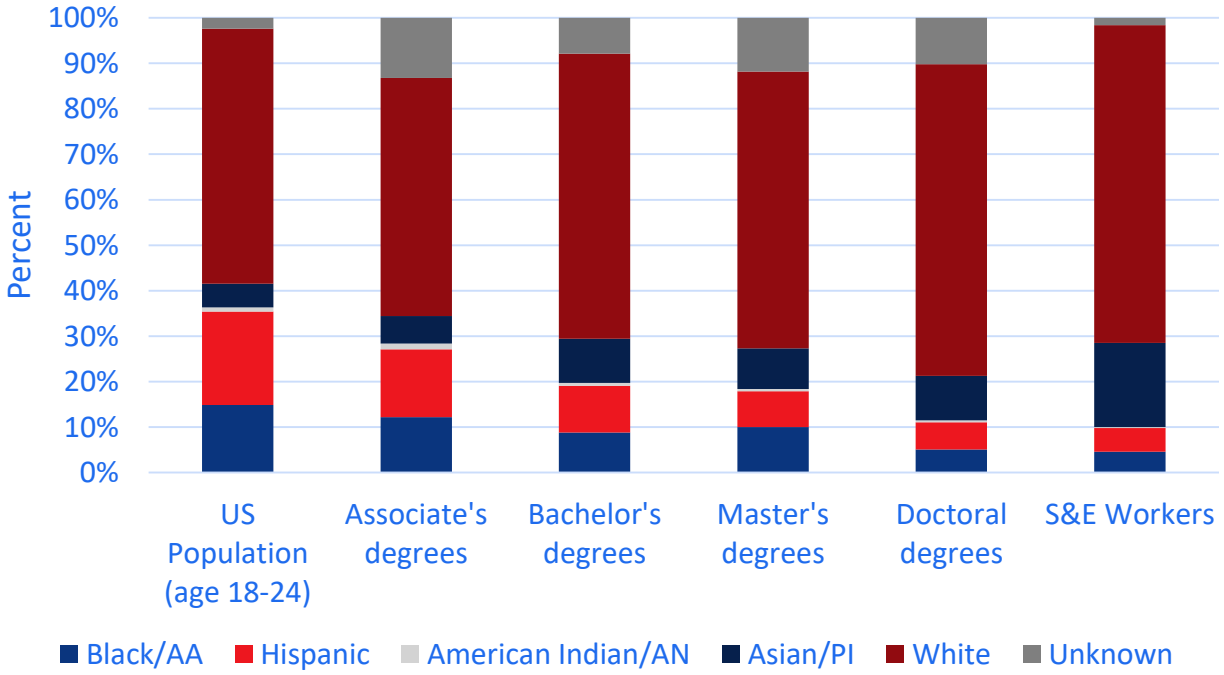
February 23, 2019
Washington, DC

Session Overview

- Introductions
- Review of National Data on Underrepresented Minority (URM) participation and persistence in STEM
- AAAS Research Competitiveness Program STEM Program Assessment Findings
- SWOT Assessment
- Discuss tools and approaches to engage URMs in STEM undergraduate research

Racial/Ethnic Distribution of S&E Degree Recipients, 2012

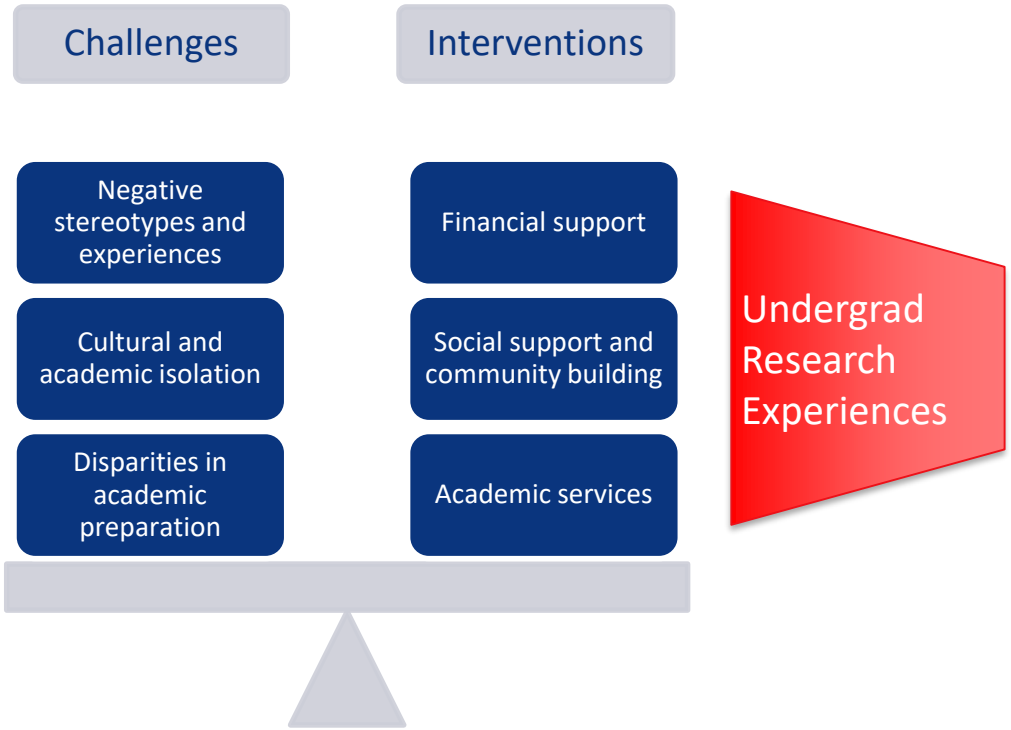
(U.S. Citizens and Permanent Residents)



National Science Board, STEM Education Data and Trends, 2014

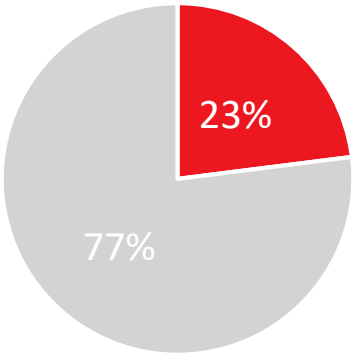
Factors that Effect URM Persistence in STEM

Factors that Effect URM Persistence in STEM

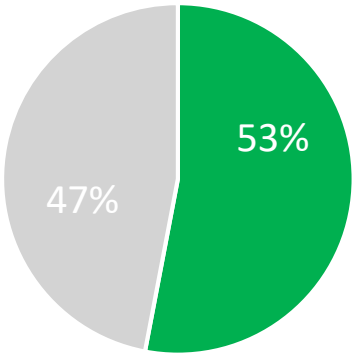


Benefits of Undergraduate Research (UGR) Experiences

- Builds confidence in research and professional skills
- Increases preparation for and commitment to pursue graduate program in STEM
- Clarifies future career pathways in STEM



ALL Student participation in UGR
(NSSE, 2017)

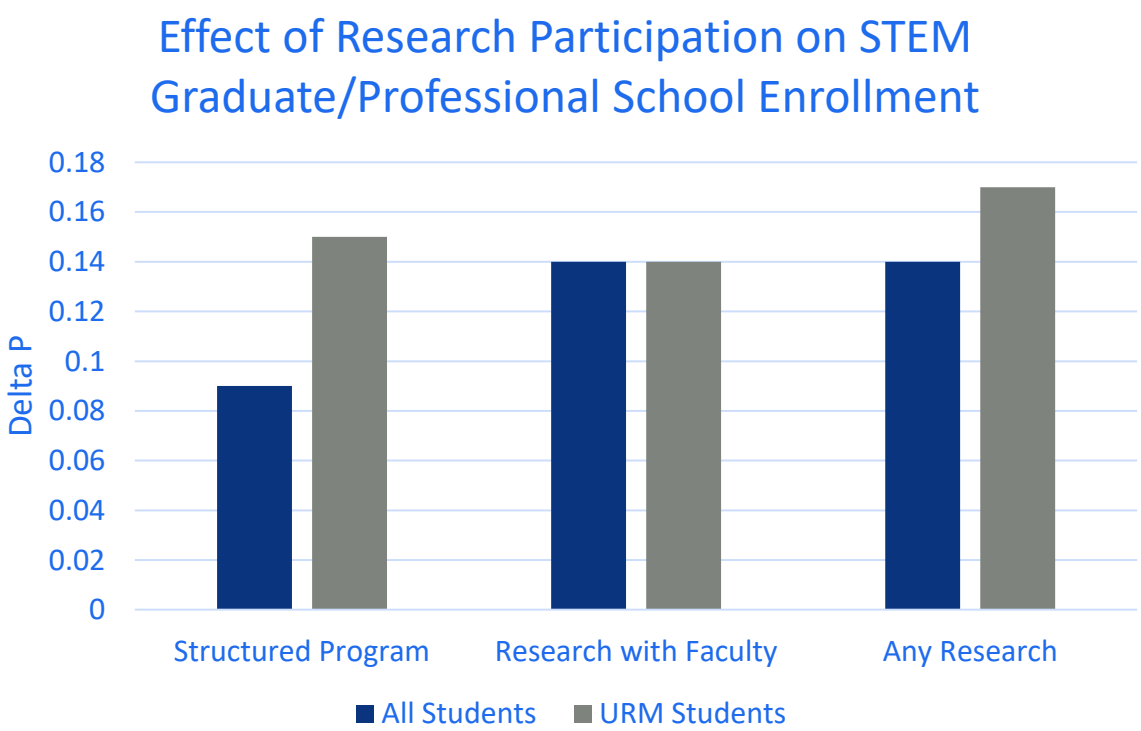


STEM Student participation in UGR
(Russell, 2006)

16.27%

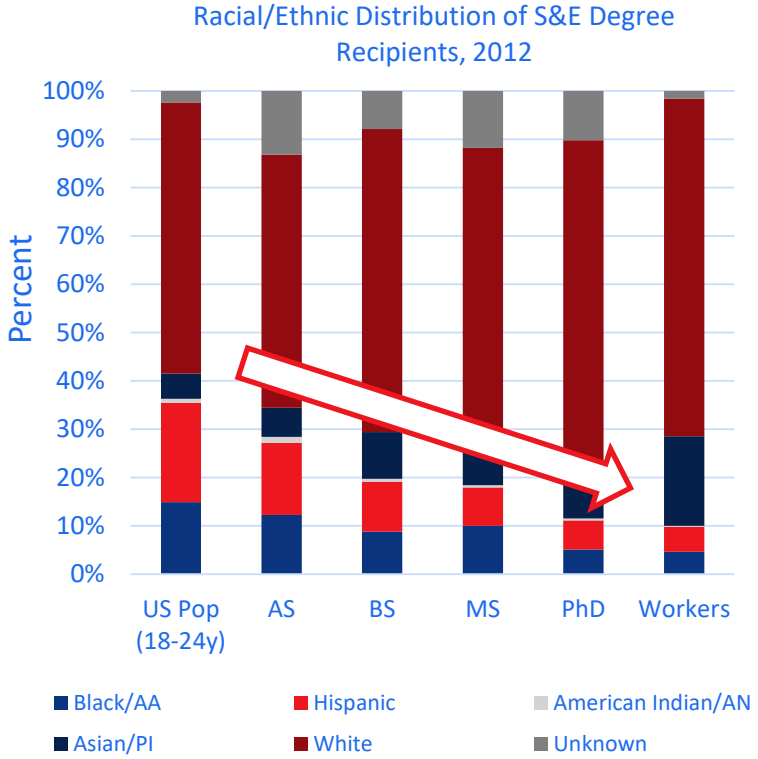
Black student participation in UGR compared to White students (Delta-P)
(Figueroa, 2013)

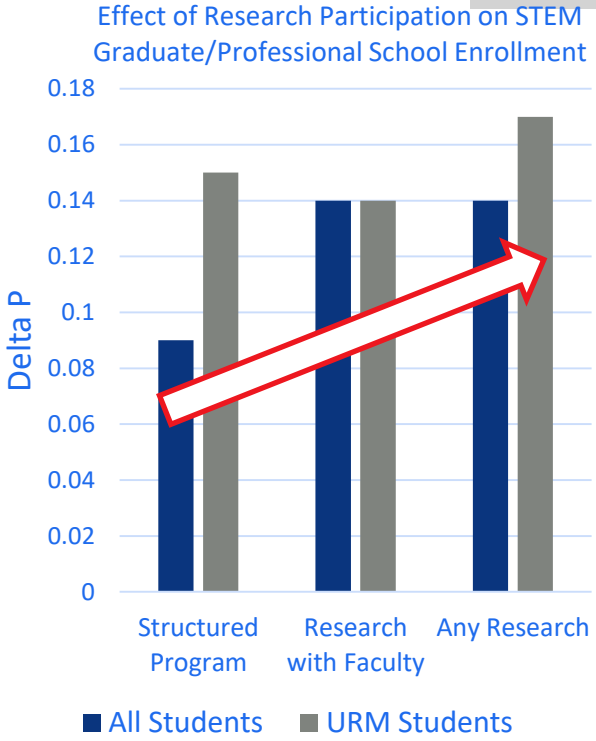
URM students who participated in UGR experiences were **17.4% more likely** to persist in STEM than those who did not. *(Chang et al., 2014)*



Hurtado, 2014

Bridging the STEM Gap for URMs through UGR





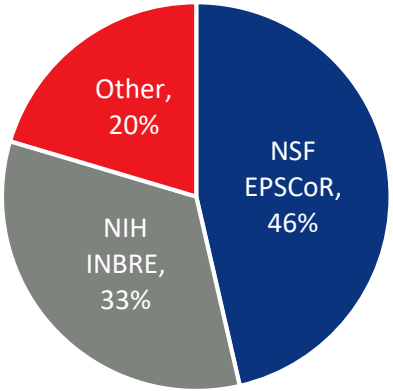
AAAS Research Competitiveness Program

- Provides support to individual researchers, academic institutions, funding agencies, and governments in four program areas:
  - Peer Review of Research Proposals
  - STEM Program Assessments
  - Innovation and Entrepreneurship programs
  - Capacity-building and Competitiveness short courses

AAAS STEM Program Assessments

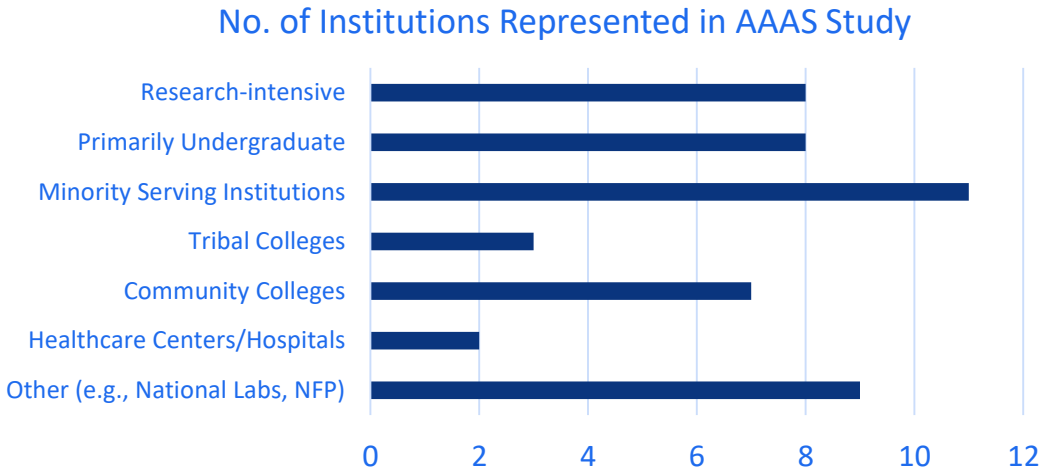
- 250+ strategic assessments (>$1 billion in programs)
  - Independent, external assessment to institutions and awardees
  - Large-scale multi-institutional initiatives
    - Established Program to Stimulate Competitive Research (EPSCoR – NSF, NASA, DoE)
    - IDeA Network for Biomedical Research Excellence (NIH INBRE)
  - Expert panel provides scientific and administrative assessment and guidance
    - Research infrastructure
    - Program design and leadership development
    - Student training and research
  - Summary report of panel's findings and recommendations

RCP Assessment Portfolio

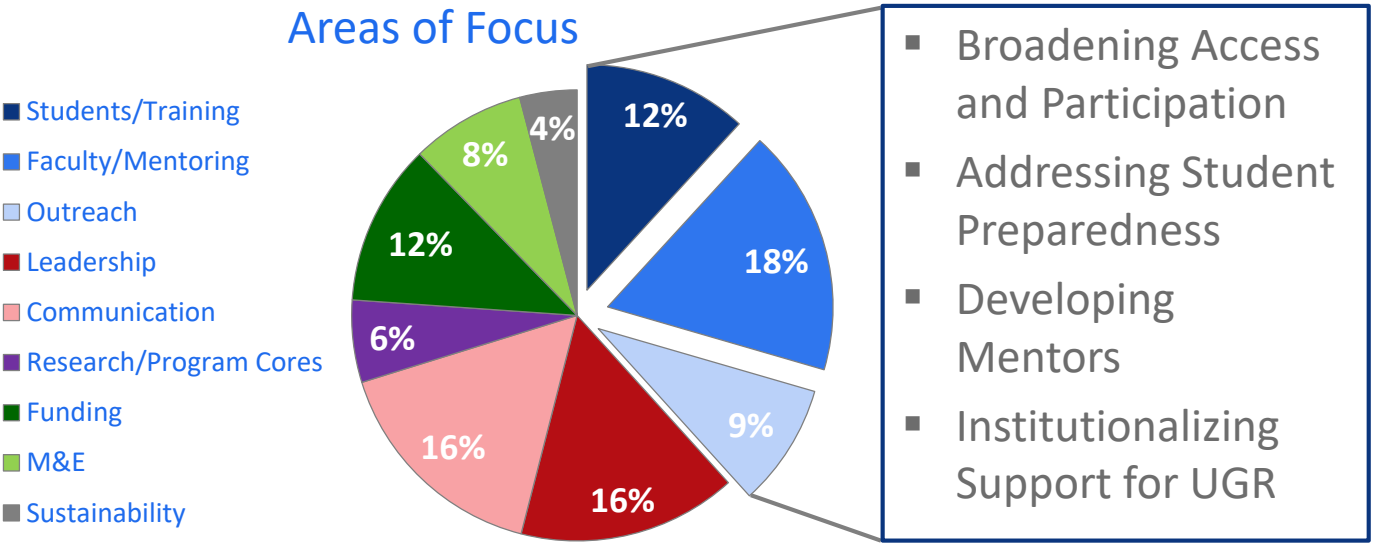


AAAS STEM Program Assessments: A Retrospective Analysis

- RCP assessments from 2010 to 2017
  - Reports on programs assessed at least 3 times over 5 years
  - 15 reports, including 48 institutions



Retrospective Analysis: Approaches to Engage URMs in UGR



Approaches to Broaden Access and Participation

- Offer challenging projects that students can take ownership of
- Ensure research opportunity is accessible to students (travel and lodging), summer and academic year UGR
- Engage students after the summer program; utilize alumni networks
- Highlight non-PhD career options in STEM

- ***Community-based participatory research and service learning opportunities***
  - *Potential public health or clinical research focus*
  - *Partnered with community organizations, clinics, centers*
  - *Engaged and serviced students' local or home community*

Approaches to Address Student Preparedness

- Expose students to sophisticated equipment/methodology
- Utilize small group discussions and working groups

- ***Intensive boot camp orientation (1-2 weeks) at the beginning of the summer***
  - *Provided training in basic lab techniques, research ethics, and field methods*
  - *Offered specialty training and certifications (e.g., cultural competency, CPR, phlebotomy)*
  - *Assessed knowledge acquisition with pre- and post- testing*

Approaches to Develop Mentors

- Require mentor training/orientation
- Incorporate teaching and mentoring opportunities for post-docs and graduate students

- ***Active matching process to place students with a faculty mentor***
  - *Promoted direct faculty engagement with student during program*
  - *Exposed students to a diverse pool of mentors*

Strong faculty-student relationships is a strong predictor of choosing STEM graduate study *(Hurtado, 2014)*

Approaches to Institutionalize Support for UGR

- Enable course credit for UGR throughout the year
- Provide gap funds when grant cycle is misaligned to internship schedule
- Incentivize and recognize faculty for participation in UGR
- Sponsor internal competition for students to continue summer research during the academic year (awards <$10,000)

- ***Multi-program symposia and seminars***
  - *Allowed students to communicate science and exposed them to the larger scientific community*
  - *Maximized individual program resources*
  - *Incentivized the institutions to provide additional support to event*
  - *Attracted attention of the surrounding non-STEM community*

References and Resources

- Chang MJ, et al. (2014). What matters in college for retaining aspiring scientists and engineers from underrepresented racial groups. Journal of Research in Science Teaching, 51(5), 555-580.
- Figueroa T. (2013). Supporting future scientists: Predicting minority student participation in the STEM opportunity structure in higher education. Paper presented at the National Association for Research in Science Teaching, Rio Grande, PR.
- Hurtado S, et al. (Apr 2014). Reversing Underrepresentation: The Impact of Undergraduate Research Programs on Enrollment in STEM Graduate Programs. Los Angeles: Higher Education Research Institute, UCLA
- Maton, et al. (2016). Outcomes and Processes in the Meyerhoff Scholars Program: STEM PhD Completion, Sense of Community, Perceived Program Benefit, Science Identity, and Research Self-Efficacy. CBE Life Sci Educ, 15(3). pii:ar48.
- Russell SH. (2006). Evaluation of NSF support for undergraduate research opportunities: Follow-up survey of undergraduate NSF program participants: Draft final report (pp. vi, 6, 54, 15 p.). Arlington, VA: National Science Foundation.
- National Science Board's STEM Education Data: https://www.nsf.gov/nsb/sei/edTool/
- National Survey of Student Engagement: http://nsse.indiana.edu/

	Helpful to achieving the objective	Harmful to achieving the objective
Internal Origin (attributes of the organization)	**STRENGTHS** - internal, positive attributes of your group/program/ institution. These are things that are within your control. •*Successful processes implemented* •*Assets of your team/environment (e.g., network, staff, equipment, funding, skills, reputation)* •*Competitive advantages*	**WEAKNESSES** - negative factors that detract from your strengths. These are things that you might need to improve on to be more effective. •*Things needed to be more competitive* •*Processes needing improvement* •*Tangible assets needed (e.g., money or equipment)* •*Gaps in team, program, or institution* •*Location fit*
External Origin (attributes of the environment)	**OPPORTUNITIES** - external factors in your environment that are likely to contribute to your success, but have not been incorporated or utilized. •*Trends in research attractive to students* •*Upcoming events to promote/grow program* •*Policy and funding developments* •*Reputation*	**THREATS** - external factors that you have no control over. Consider identifying contingency plans for dealing them if they occur. •*Sustainability of supplies, funds, and resources* •*Maintaining pace with advances in technology* •*Research, funding, or career trends that challenge your goals*

Discussion

- Broadening access and URM participation in UGR
- Addressing student preparedness
- Engagement of faculty and program alumni
- Institutionalizing support

STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
Internal, positive attributes of your group/program/ institution. These are things that are within your control. • What processes have shown success implementing your goals? • What assets do you have in your team/environment (e.g., staff, network, skills, reputation, equipment, technology, funding, facilities)? • What competitive advantages does your group/program/institution have?	Negative factors that detract from your strengths. These are things that you might need to improve on to be more effective. • What things would make your group/ program/institution more competitive? • What processes need improvement? • Are there tangible assets that you need (e.g., money, equipment)? • Are there gaps on your team or within your program/institution? • Is your location ideal for your success?	External factors in your environment that are likely to contribute to your success, but have yet not been utilized/maximized. • What trends in your research area will attract student participation? • What coming events could you utilize to promote/grow your program? • Are there upcoming policy or funding changes that might impact your program positively? • Do students, colleagues, or external entities think highly of you?	External factors that you have no control over. Consider identifying contingency plans for dealing them if they occur. • Which other groups draw from your current pool of resources (e.g., facilities, funds, audience)? • What supplies/funds will be available long term to support your needs? • How might technology advances change how you do your work? • Are there research/funding trends that could become a threat to your goals?
S	W	O	T