Broadening Participation of Underrepresented Minorities in STEM

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Orientation and Professional Development Workshop/Webinar for Faculty and Staff at QEM/INCLUDES
Research Experiences for Undergraduate (REU) Sites

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Effective Practices for Broadening Participation of URMs in STEM

• Research Experiences
• Summer Bridge Programs
• Academic Support and Social Integration (mentoring, tutoring, peer-peer support)
• Early exposure to STEM fields in K-12
• Networking/Collaborative Activities (professional development, conferences)
Effective Practices for Broadening Participation of URM in STEM Cont.....

• Financial Support
• Curriculum Reforms: Redesigning first-year STEM courses to promote active learning and collaboration
• Culturally relevant pedagogy and science relevancy
• Partnerships with local schools
• Family support
• Teacher Preparation: Ensure adequate academic preparation in high school for college-level work in STEM
Literature: Early Undergraduate Years

• First two years of college are most critical to the retention and recruitment of STEM majors
  (Science and Engineering Indicators, 2016)

• Minority students are as likely as white and Asian students to show interest in STEM fields when they enter college, but they are more likely to either switch out of the disciplines or drop out before earning a degree
  (National Academy of Sciences, National Academy of Engineering, & Institute of Medicine, 2011)
How do we address this issue?

- Institutions should adopt strategies that improve the recruitment and retention of STEM majors during the first two years of college.

The 2012 President’s Council of Advisors on Science and Technology (PCAST) Report
QEM/D&DLP REU Focus

• Early undergraduates (Freshmen/Sophomores)

• Underrepresented Minorities (African-Americans; Native Americans)
Study 1: Introducing Freshmen to Investigative Research

- 1-month research-based course
- Course offered 6 times to 47 students (34 Freshmen)
- Benefits
  - 54% became research assistants
  - Only 2 of 47 changed majors
  - 8 of 47 continued research and presented at national conferences

Chaplin S, Manske J, Cruise J. Introducing freshmen to investigative research: A course for biology majors at Minnesota’s University of St. Thomas.
Study 2: *The Role of Undergraduate Research in Student Retention*

- The Undergraduate Research Opportunity Program (UROP) at University of Michigan (first and second year students)
- Developed in 1998; pilot 14 to >1,000
- Key benefits:
  - Retention rates for African American and sophomores increased (81% vs. 65%)
  - Matriculation for African American males was 75% compared to 56% for non-UROP students
  - Across all racial & gender groups students who participated in undergraduate research were more likely to go to graduate school

*Gregerman, R. The Role of Undergraduate Research in Student Retention, Academic Engagement, and the Pursuit of Graduate Education*
Study 3. *Preparing Minority Scientists and Engineers*

- University of Maryland Baltimore County
- Scholarships to African Americans; Research experiences
- From 1989-2006 program supported ~800 students

- Benefits
  - 86% graduated with science or engineering degree
  - Compared to control group, students in the UMBC freshmen/sophomore research program were:
    - Twice as likely to graduate
    - Five times more likely to go to graduate school

*Summers M, & Hrabowski F. Preparing minority scientists and engineers.*
Study 4: Undergraduate Student-faculty Research Partnerships

- Evaluation of UROP Study (2873 applicants)
- 1,280 freshmen & Sophomores (613 UROP participants; 667 control)
- Benefits
  - Students in the study had lower attrition rate that those not involved
  - African Americans with lower entry scored received most benefit
  - Greater impact reported for sophomores than freshmen

Nagda B, Gregerman S, Jonides J, von Hippel W, Lerner JS. Undergraduate student-faculty research partnerships affect student retention.
Benefits of Early Research Exposure (Freshmen & Sophomores)  

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Mentoring Defined

• Mentoring is a term generally used to describe a relationship between a less experienced individual, called a mentee or protégé, and a more experienced individual known as a mentor

• A mentor is:
  – An individual with expertise who can help develop the career of a mentee (APA, 2006)
  – A person who takes an interest in, and helps to advance, another person’s career and professional development through both an interpersonal and professional relationship with that person (Savage HE, Karp RS, & Logue R. 2004)
Types of Mentoring Models

- **Site-based/Place-based**: Mentors and mentees are restricted to on-site meetings. Sessions provide more structured activities.
- **E-mentoring/I-mentoring**: Mentoring exchanges take place electronically.
- **One-on-One Mentoring**: One mentor is matched with one mentee.
- **Group mentoring**: Group of mentors working with a group of mentees.
- **Peer mentoring**: Older students provide advice and support and serve as role models for younger students who need help.
- **Community-based**: Meet wherever the mentor or mentees chooses and they choose activities together. Less structured.
Effective Mentoring Strategies

• Understand the needs and responsibilities of mentees
• Establish clear expectations of the roles of mentors
• Be available: set meeting time in advance and be consistent
• Be attentive and provide ongoing feedback
• Be aware of cultural and gender issues
Effective Mentoring Strategies Cont..

• Use personal testimonies to connect/relate to students
• Observe professional boundaries
• Balance support and challenge
• Address and resolve issues as soon as they arise
References

- Committee on Underrepresented Groups and the Expansion of the Science and Engineering Workforce Pipeline; Committee on Science, Engineering, and Public Policy; Policy and Global Affairs; National Academy of Sciences; National Academy of Engineering; Institute of Medicine. Expanding Underrepresented Minority Participation (2011)
References

• President’s Council of Advisors on Science and Technology (2012). Engage to excel: Producing one million additional college graduates with degrees in science, technology, engineering, and mathematics. Washington, DC: Executive Office of the President, President’s Council of Advisors on Science and Technology.


• Toldson, I., & Esters, L (2012). The Quest for Excellence: Supporting the Academic Success of Minority Males in Science, Technology, Engineering, and Mathematics (STEM) Disciplines,” a report by the Association of Public and Land-grant Universities.