

# Addressing Diversity in STEM Education

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UNIVERSITY

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# Agenda

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## Presentations

- Co-Curricular
- Through the Classroom/SENCER
- Mentoring

## Q & A

## Discussion Questions/Sharing

# Achieving Equity In STEM- Some Strategies

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- Institutional Involvement
- Mentoring Initiatives: Peer and Faculty
- Career Options / Role Models
- Student Involvement – Planning/Younger Communities
- Undergraduate Research
- Cooperative Learning
- Classroom Practices – Knight, Mappen, Knight – civic engagement

# For Discussion

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- Ideas for building new courses or revising existing courses to enhance diversity
- Identify changes in classroom practices, the curriculum and institutional learning environments
- Provide examples of other programs

# Background: Women in STEM

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- Brief History
  - Sue Berryman, “Who Shall Do Science?” (1982)
  - Leaky Pipeline
- Programs (1980s)
  - Michigan
  - Rutgers / Douglass College- Focus
  - University of Washington

# Douglass Project

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“Hands-on” Lab Visits

Mentoring programs - peer and faculty

Peer Study Groups in math and science courses

First residence hall in U.S. for women in math  
and science

Outreach to high school students

Project SUPER – mentoring/research—first year

# Fast Forward

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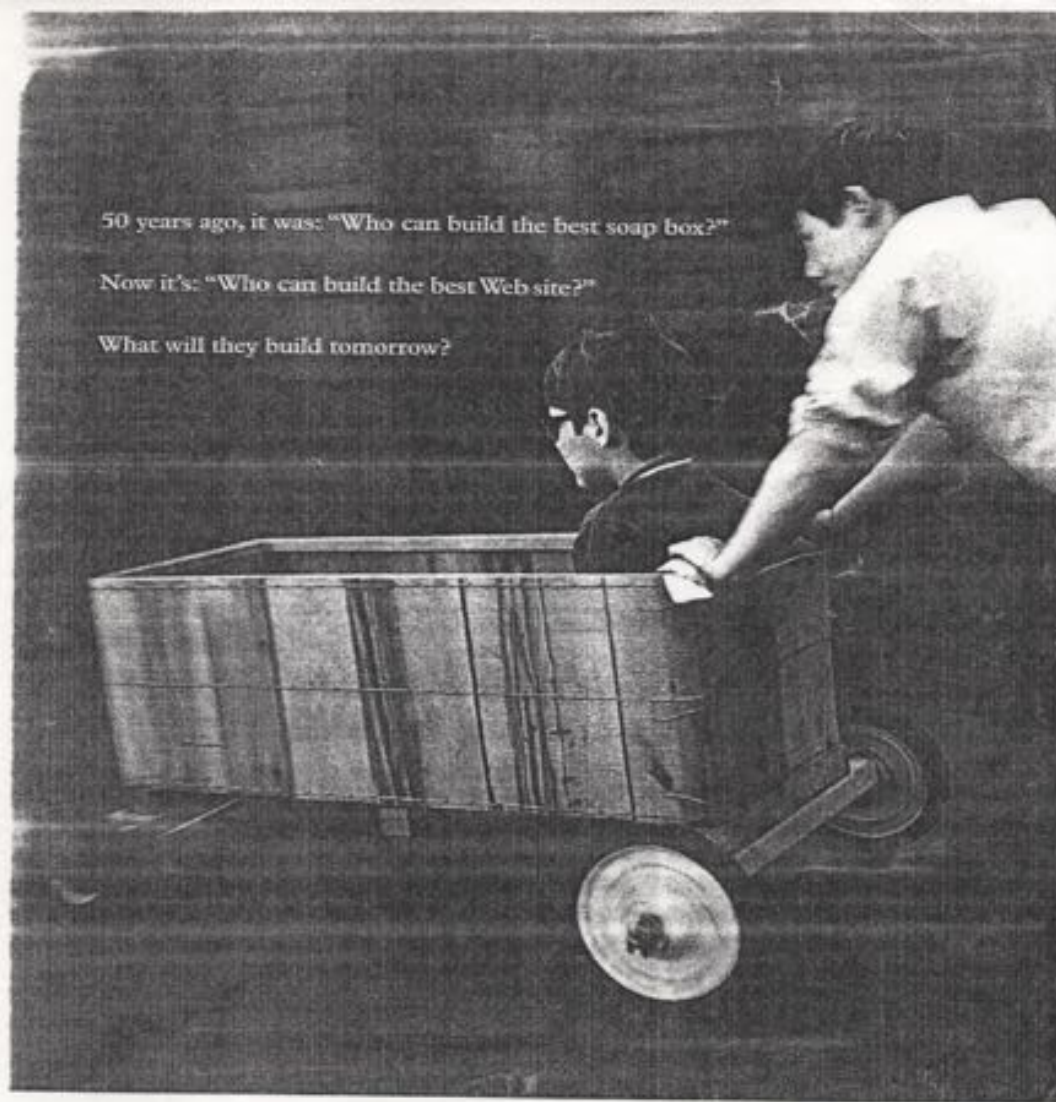
## The Douglass Project Today

- Living/Learning Communities – Bunting-Cobb/Engineering/Environmental House
- Project SUPER
- Leadership Opportunities – CS with middle school girls
- Computer Science and Engineering

50 years ago, it was: "Who can build the best soap box?"

Now it's: "Who can build the best Web site?"

What will they build tomorrow?



There's always something new to build.

**SONY**



# Douglass Project Hackathon

**RUTGERS**  
Douglass Residential College

Presented by The Douglass Project and the  
Women in Computer Science  
at Rutgers University

W:\CS> |

**HACKERS**

**HACKATHON  
FOR WOMEN**

February 7&8 | Busch Campus Center

Check-in begins at 9:00 a.m. on Saturday, Feb. 7th and the Closing Ceremony is at 10:00 a.m. on Sunday, Feb. 8th.  
Bring a laptop, extension cord and sleeping bag. Food will be provided throughout the event as well as free swag!

For more information, schedule and to register, visit: [HACKERS.ME](http://HACKERS.ME)



# Quest for Success @ MTSU

## MTSU ADVANCE

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JUDITH IRIARTE-GROSS

WOMEN IN STEM CENTER & DEPARTMENT OF CHEMISTRY

COLLEGE OF BASIC AND APPLIED SCIENCES

**I have a  
window!**



# Quest for Student Success

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# Tennessee Promise

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- Two years tuition at any Tennessee community college or technical school
  - Complete FAFAS
  - TN Promise is a “Last-Dollar” scholarship
  - Attend 2 mandatory meetings with **mentor**
  - Complete 8 hours community service each semester
  - Maintain 2.0 GPA
  - What does this mean for 4 year institutions?



# Role Models and Mentors Matter

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Girls Raised in Tennessee Science  
(GRITS)  
Collaborative Project

**10,000 PLEDGES!**

# Quest for Student Success

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- Four strategies
  - Enhanced advising\*\*\*
  - Communication
  - Course redesign\*\*\*
  - Tutoring



# Advising

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- Use of “Big Data” to identify when students are at risk and do not ask for help
- @MTSU 20% students left in second year
- More directed advising with weekly reports; targeted counseling; tutoring
  - Post attendance and midterm grades for ALL students
- Keep students on track



# Course Redesign

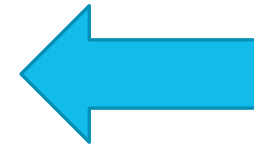
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- Enhance learning across the curriculum
  - Use of “hands-on” learning
  - Mentored undergraduate research
  - Use of technology
  - EXL (Experiential Learning)
- Faculty learning communities
  - Professional development
- \*\*\*[SENCER@MTSU](mailto:SENCER@MTSU)\*\*\*

Going Green:  
Climate Change



RayD8:  
Ozone Depletion





Contemporary Issues In Science students discuss EXL projects with Ellen and Monica

<http://www.mtsunews.com/?s=SENCER>





# MTSU ADVANCE

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# MTSU ADVANCE to date

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- ADVANCE Kick-Off
- Campus climate survey
  - 69% response rate
  - 45 to 60 minutes
  - Survey found at <http://www.mtsu.edu/wistem/ADVANCE/index.php>

# ADVANCE Preliminary Results

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- Leadership Development
  - Informal networks
  - Opportunities
- Promotion Policies
  - Gap at Rank of Full Professor across campus and particularly in STEM
- Resource Allocations



# DIVERSITY IN STEM AT STONY BROOK UNIVERSITY

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DAVID L. FERGUSON

DEPARTMENT OF TECHNOLOGY AND SOCIETY

COLLEGE OF ENGINEERING AND APPLIED SCIENCES

# Community Building: Cognitive and Social Support for Underrepresented Groups

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**Challenge:** Entering students interested in STEM majors often lack confidence or are ill-prepared to succeed in introductory courses.

# Community Building: Cognitive and Social Support for Underrepresented Groups

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**Action:** Expand and enhance summer bridge programs and academic-year support that optimize learning and productivity through interactive problem-solving and communication.

# Student Support: Engaging Students with Online Discussion Boards

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**Challenge:** Students in large introductory courses often become disengaged or focus only on detail, failing to understand the content or its applications in a larger context.

# Student Support: Engaging Students with Online Discussion Boards

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**Action:** Implement actively facilitated on-line discussion boards to maintain engagement and move from memorization towards understanding. These methods, developed and now used by Biology, will be expanded into courses in Chemistry and Physics.

# Course Development: Connect Mathematics and Chemistry to Real World Contexts

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**Challenge:** Students who struggle in introductory mathematics and general chemistry often have difficulty connecting the development of their quantitative skills to their interests and career plans.

# Course Development: Connect Mathematics and Chemistry to Real World Contexts

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**Action:** Develop course materials to improve quantitative reasoning and problem-solving skills in connection with applications to STEM disciplines that will be used to mount large-capacity, small-group courses, linked to introductory calculus and chemistry.

# Instructor Development: Build “Communicating Science” Skills of Graduate Instructors

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**Challenge:** Many graduate student instructors are knowledgeable, but unskilled in direct communication and lack the confidence and ability to engage students.



# Instructor Development: Build “Communicating Science” Skills of Graduate Instructors

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**Action:** Expand a successful and innovative program that engages graduate instructors in performance and interaction skills to engage students more effectively.

# Instructor Development: Cultivate a Culture of Scientific Teaching at Stony Brook

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**Challenge:** A broad transformation of the campus teaching culture is needed.

# Instructor Development: Cultivate a Culture of Scientific Teaching at Stony Brook

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**Action:** Develop in-house Summer Institutes on Undergraduate STEM Education, modeled on the National Academies Summer Institute on Undergraduate Education in Biology, to engage faculty across all STEM Departments

# Capstone: Sustain the Institutional Commitment to Transforming STEM Education

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**Challenge:** Support STEM education initiatives.

# Capstone: Sustain the Institutional Commitment to Transforming STEM Education

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**Action:** Establish an umbrella organization, the *Institute for STEM Education*, as a locus for joint departmental/ Center for Science and Mathematics Education (CESAME) faculty appointments and a resource for research on STEM education.

# Policy Changes

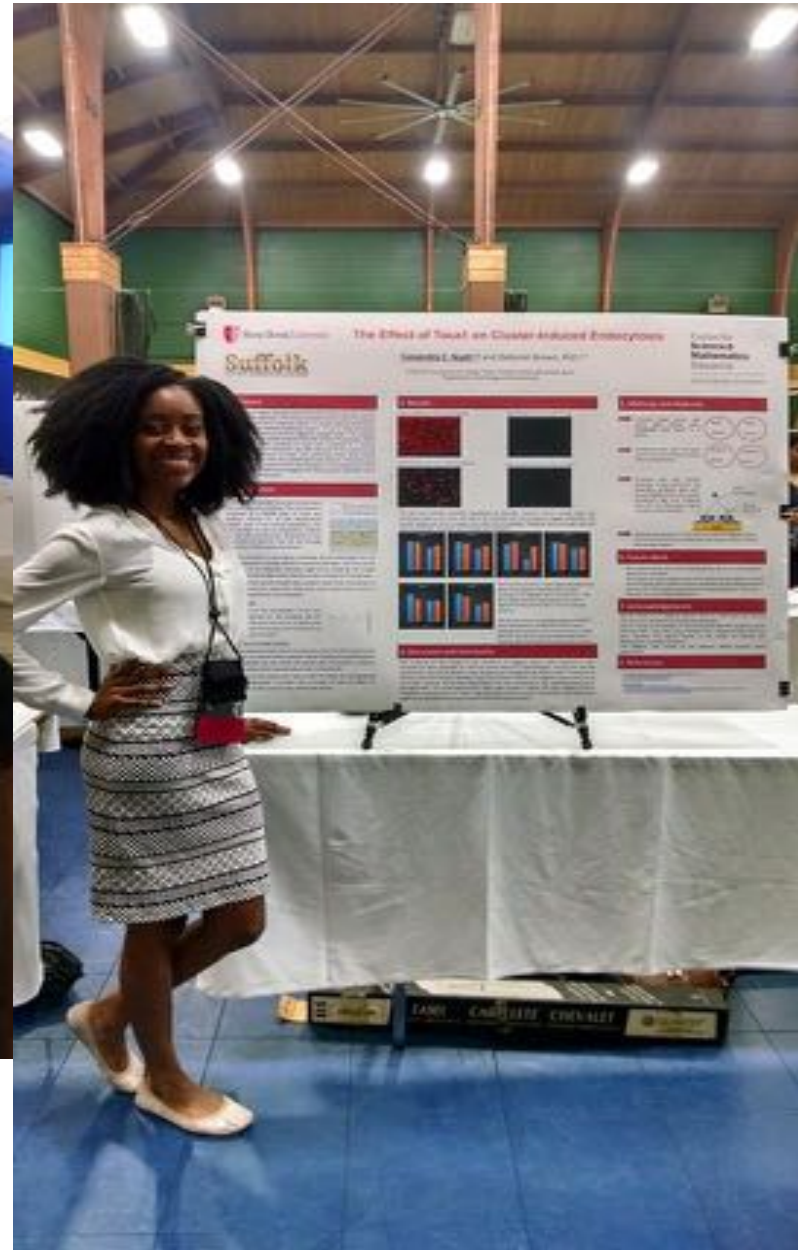
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**Challenge:** Make diversity a cross cutting and pervasive dimension of all institutional planning.

# Policy Changes

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**Action:** Integrate diversity into strategic plans at all levels of the institution.







# Resources

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- Google Embeds Engineers as Professors
  - <http://nyti.ms/1HOwVQ3>
- How to Attract Female Engineers
  - <http://nyti.ms/1OXrwow>
- What It's Like as a "Girl" in the Lab
  - <http://nyti.ms/1MNwi7Y>
- Give Women an Even Chance
  - <http://www.sciencemag.org/content/348/6235/611.full.pdf>
- Association for Women In Science
  - <http://www.awis.org/?WhatWeDo>
- Hill, C., Corbett, C., St. Rose, A, Why So Few? Women in Science, Technology, Engineering and Mathematics. AAUW, 2010.
  - <http://www.aauw.org/research/why-so-few/>.
- Institute for Women's Policy Research
  - <http://www.iwpr.org>

- Knight, D.B., Mappen, E. F., Knight, S.L. A Review of the Literature on Increasing the Representation of Women Undergraduates in STEM Disciplines through Civic Engagement Pedagogies. *Science Education and Civic Engagement*. 2011: 3:1 Winter 2011.
  - <http://d32ogoqmya1dw8.cloudfront.net/files/seceij/winter10/knight.v3.pdf>
- Mendoza-Denton R, Downey G, Purdie V, Davis A, Pietrzak J. Sensitivity to status-based rejection: Implications for African-American students' college experiences. *Journal of Personality and Social Psychology*. 2002: 83:896-918.
- Mullen, A.L. Gender, Social Background, and the Choice of College Major in a Liberal Arts Context. *Gender & Society* 2014: 28 No.2: 289-312. Originally published online at: <http://gas.sagepub.com/content/28/2/289>, December 17 2013.
- National Research Council. Committee on Women in Science and Engineering. 2006. *To Recruit and Advance: Women Students and Faculty in Science and Engineering*. Washington, D.C.: National Academy Press.
- National Science Foundation. ADVANCE: ADVANCE web portal found at: <http://www.portal.advance.vt.edu/>

- National Science Foundation. Women, Minorities and Persons with Disabilities
  - <http://www.nsf.gov/statistics/wmpd/2013/start.cfm>
- Phinney J.S., Torres Campos C.M., Padilla Kallemeyn D.M., Kim C. Processes and outcomes of a mentoring program for Latino college freshmen. *Journal of Social Issues*. 2011: 67-599-621.
- Rosenthal L, London B, Levy SR, Lobel M. The roles of perceived identity compatibility and social support for women in single-sex STEM program at a co-education university. *Sex Roles*. 2011a: 65-725-736.
- SciGirls Seven: How to engage girls in STEM
  - <http://scigirlsconnect.org/page/scigirls-seven>
- The Boston Consulting Group and the L’Oreal Foundation. 2014. Overview of Women’s Status in Science.
  - [file:///Users/EllenMappen/Downloads/bcg\\_fwis%20\(1\).pdf](file:///Users/EllenMappen/Downloads/bcg_fwis%20(1).pdf).
- The White House Council on Women and Girls
  - <http://www.whitehouse.gov/administration/eop/cwg/>

- Science in the Moment (SciMo). SciMo is a research study funded by the National Science Foundation. Its purpose is to provide a description account of what a variety of high school science contexts feel like from the perspective of female and male students.
  - <http://cedu.niu.edu/scienceinthemoment/>. See also an article at [http://www.huffingtonpost.com/2014/04/29/sexist-high-school-science\\_n\\_5234915.html?utm\\_hp\\_ref=email\\_share](http://www.huffingtonpost.com/2014/04/29/sexist-high-school-science_n_5234915.html?utm_hp_ref=email_share).