IMPROVING ACCESSIBILITY AND INCLUSION IN STEM GRADUATE EDUCATION

Susan Cozzens, PhD
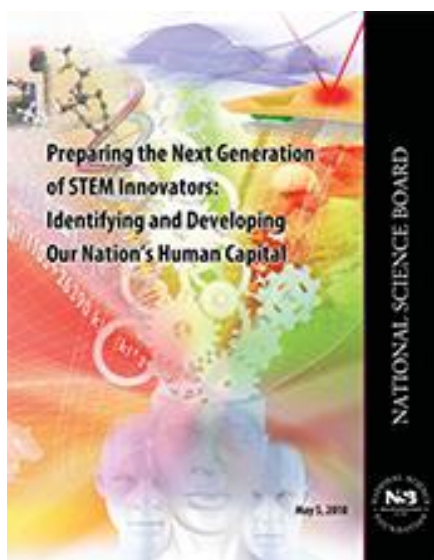Vice Provost, Graduate Education and Faculty Affairs

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Broadening Participation in STEM

"The nation's economic prosperity, security, and quality of life depends on the identification and development of our next generation of STEM innovators."

"Every student in America should be given the opportunity to reach his or her full potential."

- National Science Board, 2010

Disability Statistics

11% of Postsecondary Students Have a Disability

Disability Type	Distribution
Specific Learning Disabilities	31%
ADD or ADHD	18%
Mental Illness or Psychological/Psychiatric Condition	15%
Health Impairment/(Chronic) Condition	11%
Mobility Limitation/Orthopedic Impairment	7%
Difficulty Hearing	4%
Difficulty Seeing	3%

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Disability Statistics (continued)

Disability Type	Distribution
Cognitive Difficulties or Intellectual Disability	3%
Autism Spectrum Disorders	2%
Traumatic Brain Injury	2%
Difficulty Speaking or Language Impairment	1%
Other	3%

SOURCES: U.S. Department of Education, National Center for Education Statistics. (2012). Digest of Education Statistics, 2011; Raue, K., and Lewis, L. (2011). Students With Disabilities at Degree-Granting Postsecondary Institutions (NCES 2011–018). U.S. Department of Education, National Center for Education Statistics. Washington, DC: U.S. Government Printing Office.

Opportunities and Barriers in STEM

- Opportunities in STEM continue to grow…
  - **STEM jobs projected to increase by 17%** between 2008-2018, vs. 10% for non-STEM jobs.
  - U.S. to need **1 million more** graduates in STEM than currently produced.

- …But barriers persist for Americans with disabilities:
  - 19% of the U.S. population, but **less than 10% of its employed scientists and engineers.**
  - Students with disabilities represent only 10% of undergraduate, **7% of graduate, and 1% of doctoral-level STEM majors**.
  - Challenge of **persistence** in STEM; Issues of **inaccessible pedagogy** and **negative attitudes.**

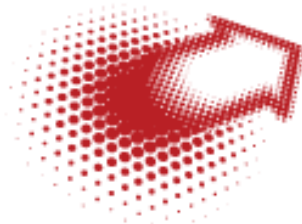# RESEARCH AND DEMONSTRATION PROJECTS AT GEORGIA TECH

Student-Oriented: Improving Persistence in STEM Through E-Mentoring

Faculty-Oriented: Supporting Accessibility and Inclusion in STEM Instruction

BreakThru: Georgia STEM Accessibility Alliance (GSAA)

http://www.georgiabreakthru.org

NSF's Research in Disabilities Education (RDE) Alliances Program
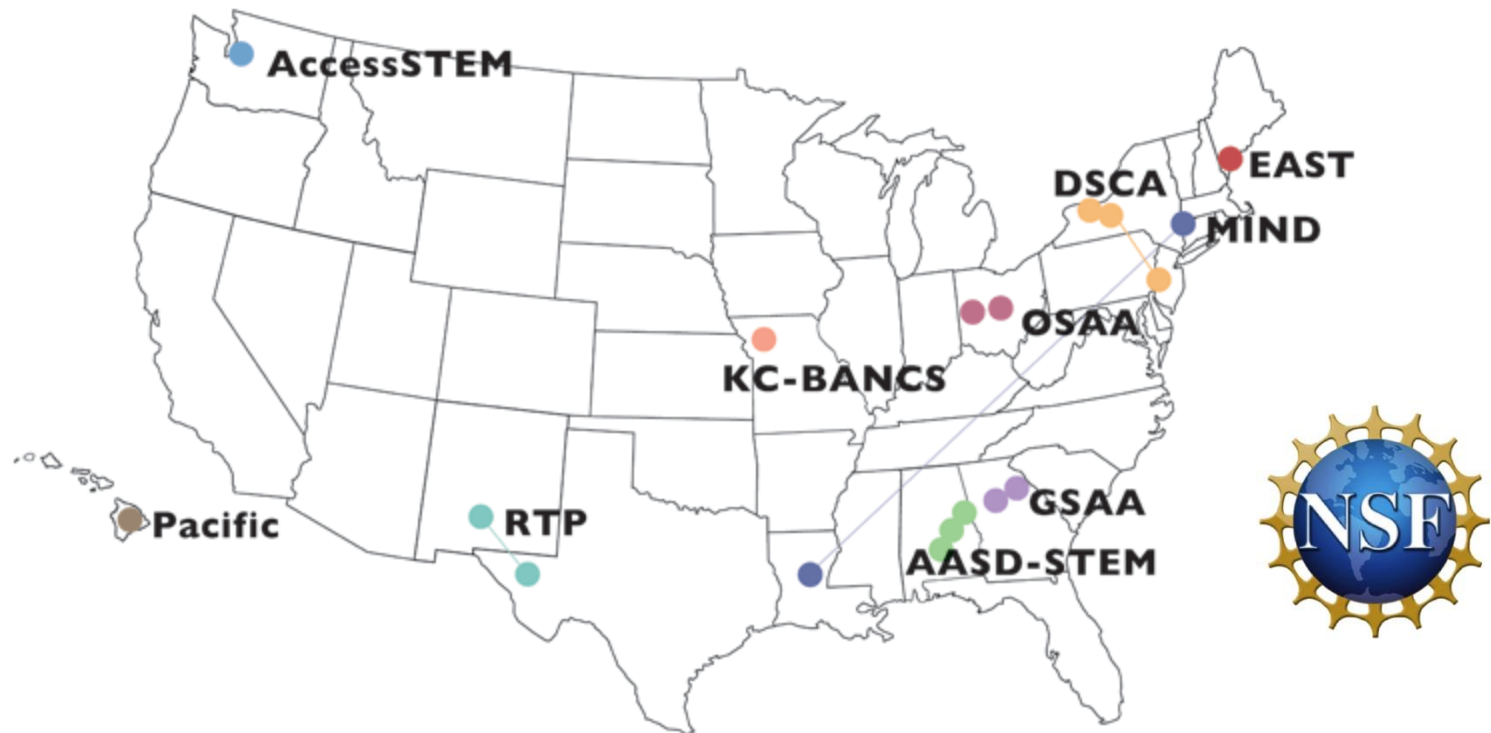
Goals of GSAA and BreakThru

1. Increase the **number** of secondary students with disabilities enrolling in STEM postsecondary classes and majors.

2. Increase the **retention** and **graduation** of postsecondary students with disabilities in STEM majors.

3. Increase the **successful entry** of postsecondary students with disabilities into STEM graduate programs or the STEM workforce.

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Virtual Worlds and Social Media

Why Virtual Worlds?

BreakThru has been created to provide broad impact through:

- Applicability to students and faculty who are separated geographically,
- Gathering a national/international network of STEM stakeholders
- Creating immersive environments for students who may have difficulty with face-to-face interactions (autism, LD, and ADHD)
- Offering control over identity and representation for students with disabilities
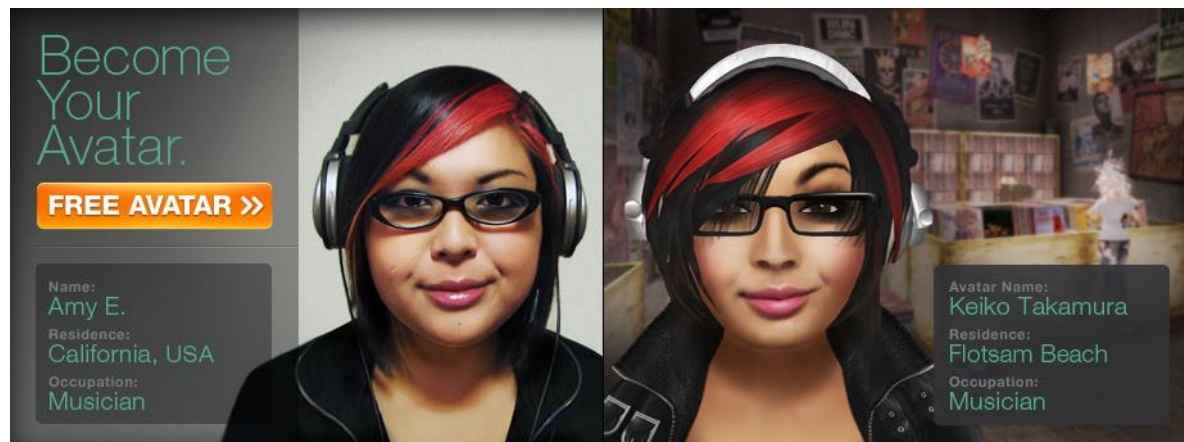
Electronic Mentoring

- 25 Learning Modules
  - 4 Critical Modules: Introduction to STEM, Self-Determination, Classroom Accommodations, Time Management
  - Other Key Modules: Math/Science/Test Anxiety, Forming Study Groups, Taking Notes, STEM Study Skills

- E-Mentoring Sessions
  - Meetings at Least Monthly
  - Surveys of Mentors/Mentees

- Emphasis on Student Support for Persistence

SciTrain University (SciTrainU)

- Demonstration Project funded by U.S. Department of Education

- Intended for **College and University Faculty, Administrators**

- Emphasis on Universal Design for
  Learning (UDL) – Design For All

http://www.catea.gatech.edu/scitrainU

SciTrain U — Georgia Tech | College of Architecture

CENTER FOR ASSISTIVE TECHNOLOGY AND ENVIRONMENTAL ACCESS

Navigation

SciTrain U Home

Available Courses

Accessible STEM Teaching 101

Improved Teaching for Large Lecture Classes

Improving Online STEM Learning Environments

Improving STEM Labs

Additional Resources

UDI Online: Applying Universal Design for Instruction to Online and Blended Courses

SciTrain U: For College Instructors who Teach Students with Disabilities

SciTrain U is an informational site geared toward university level instructors in science, technology, engineering, and mathematics. Tools and techniques are tailored for the types of students you teach.

Two Ways to Learn: Once you choose a course (at left) you can explore topics of interest individually in any order, or you can work through the material as a self-paced online courses, complete with tests and instructions for getting continuing education credit. The content is the same either way.

Interested in an extended analysis of universal teaching design and student accommodations in your classroom? Sign up to join our longitudinal study.

Start with our general course: Accessible STEM Teaching 101 ➡

SciTrainU Overview

- Four Modules Available
  - Accessible STEM Teaching 101
  - Improved Teaching for Large Lectures
  - Improving Online STEM Learning
       Environments
  - Improving STEM Labs

- Particular Emphasis on Learning Disabilities

- Emphasis on Accessibility and Inclusion, Not Accommodations

- Strategies for Classroom, Laboratory, and Fieldwork Instruction, as well as Group Assignments and Testing

THINKING ABOUT ACCESSIBILITY AND INCLUSION IN STEM EDUCATION

Accommodations Approaches and Universal Design for Learning (UDL) Approaches in STEM Education

Laws and Responsibilities

|	High School	Post-Secondary Institutions
Law	Individuals with Disabilities Act (IDEA)	Section 504 of Rehabilitation Act and Americans with Disabilities Act (ADA)
Responsibility	"Free and Appropriate Public Education" (FAPE)	Accessibility and Reasonable Accommodations
Implementation	Individualized Education Plans (IEP)	Student Responsibility to Reveal/Provide Documentation of Disability
Services	Individualized Instruction, Modifications, Accommodations	Reasonable Accommodations for Equal Access and Participation
Support	Program Support for Personnel	No Formal Program Support

Common Accommodations in STEM

- Alternate Exam Formats or Additional Exam Time (88%)

- Tutors to Assist with Ongoing Coursework (77%)

- Readers, Classroom Notetakers, or Scribes (69%)

- Registration Assistance or Priority Registration (62%)

- Adaptive Equipment or Technology (58%)

- Textbooks in Audio Format (55%)

- Sign Language Interpreters (45%)

- Course Substitutions or Waivers (42%)

Beyond Accommodations: Universal Design for Learning

- Developing instruction and pedagogy that work for everyone, not a single "one size fits all" approach to learning.

- Successful and well-designed adaptations may make coursework and labs more approachable and effective for all students, not only those with disabilities.

- 3 key principles:
  - Multiple Means of Representation
  - Multiple Means of Expression
  - Multiple Means of Engagement
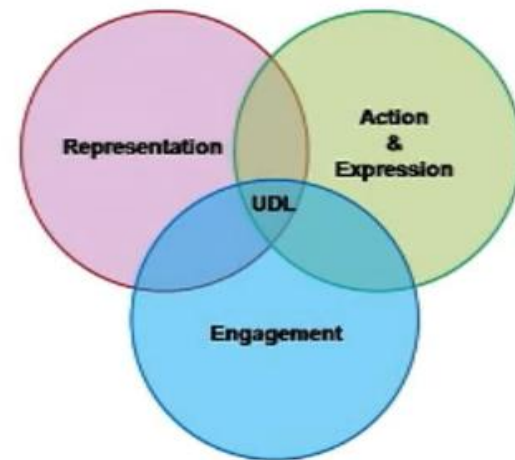
Common UDL Approaches in STEM

- **Class Climate**: Syllabi Statements of Diversity/Inclusiveness

- **Interaction**: Group Work Requiring Learners to Support Each Other with Value on Different Skills and Roles

- **Physical Environments and Products**: Safety Procedures for All Students, Including Those Who Are Blind, Deaf, or Wheelchair Users

- **Delivery Methods**: Multiple Modes to Deliver Content

- **Information Resources**: Ensure Usability of Web Content

- **Feedback**: Permit Feedback Opportunities for Large Projects

- **Assessment**: Group Performance, In Addition to Individual Effort

- **Accommodation**: Address Needs Not Met by UDL

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Considerations for Graduate Education

- Importance of Faculty Attitudes
  - Mentorship and advisement play a greater role in graduate education; keys to persistence and completion of graduate education

- Accessibility of Laboratories and Fieldwork
  - Need to consider creative solutions to accessibility challenges; not always a high-tech solution
  - Furnishings, manipulation, and visualization of materials/supplies present barriers that are solvable
  - Process barriers: There are presently no supports in place to make customized equipment accessible – need to consider accessibility and usability at outset

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Faculty Attitudes toward Success

Resources at Georgia Tech

 http://www.georgiabreakthru.org/

 http://www.catea.gatech.edu/scitrainU/

 http://www.catea.gatech.edu/scitrain/

(for secondary education)

Resources at Georgia Tech

http://www.amacusg.org/

Accessible instructional materials for postsecondary education

http://www.catea.gatech.edu/scitrain/accommodating.pdf
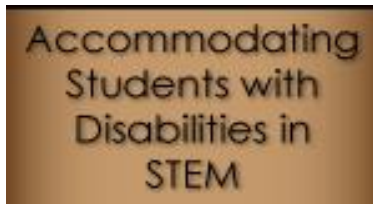
Free e-book on classroom and lab accommodations in STEM

Additional Resources

Introduction to Universal Design

- Theory of UDL
- Implementing Multiple Means of Representation/Expression/Engagement
- **http://www.udlcenter.org/**

- Theory of UDI
- Implementing the Seven Principles of Universal Design in Instruction
- **http://www.washington.edu/doit/Brochures/Academics/instruction.html**

Thank You!

- For questions or a copy of this presentation, please e-mail: **nathan.moon@cacp.gatech.edu**

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