Arizona Universities working together to Increase Diversity in STEM at all levels

October 7, 2022

Drs. Gabriel A. Montaño & Inès Montaño
Celedonio Rodriguez, Anna Tanguma-Gallegos, Jessica Hauer, and Brianna Moreno
Agenda:

- Disruptive Collaboration
- Nano
- CBP-STEM
- CQN
- MIRA!
- SparCQS
- Activities
- Q & A
Seizing The Future

The greatest intellectual commodity the U.S. and Arizona have is Diversity!
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Seizing The Future

AZ POPULATION 2050

<table>
<thead>
<tr>
<th>Race/Group</th>
<th>2010</th>
<th>2021</th>
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<tbody>
<tr>
<td>White</td>
<td>57.9%</td>
<td>53.2%</td>
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<tr>
<td>Hispanic/Latino</td>
<td>28.7%</td>
<td>32.3%</td>
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<tr>
<td>Asian (non-Hispanic)</td>
<td>3%</td>
<td>4.5%</td>
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<tr>
<td>American Indian/Alaska Native</td>
<td>0%</td>
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<tr>
<td>Multiracial (non-Hispanic)</td>
<td>0%</td>
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<tr>
<td>Black (non-Hispanic)</td>
<td>5%</td>
<td>4.7%</td>
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<tr>
<td>Native Hawaiian and Other Pacific Islander (non-Hispanic)</td>
<td>0%</td>
<td>0.5%</td>
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<td>Asian</td>
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American Indian/Alaska Native (non-Hispanic)
Asian (non-Hispanic)
Black (non-Hispanic)
Hispanic/Latino
Multiracial (non-Hispanic)
Native Hawaiian and Other Pacific Islander (non-Hispanic)
White (non-Hispanic)
Seizing The Future

The Future in STEM in BRIGHT!

Median earnings in Arizona STEM jobs are:

$36.62/hour

Median earnings in Arizona all other jobs are:

$17.64/hour

Seizing The Future

The Future in STEM in BRIGHT!

STEM and non-STEM Unemployment rate, 2011-2014

- Arizona: 2.5% STEM, 8% non-STEM
- United States: 3.1% STEM, 7.4% non-STEM

Source: U.S. Census Department, 2011-2014
Seizing The Future

But are we Seizing the Future?

US Population 2021

- White: 59%
- Black: 12.5%
- Asian: 6%
- Hispanic: 19%
- Native American: 0.7%

STEM Degrees/Certificates 2016

- White: 64%
- Black: 8.6%
- Hispanic: 12%
- Native American: 0.6%
- Asian: 12%
Seizing The Future

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STEM Degrees/Certificates Continue to be disproportionately low for URM. This translates to all levels of STEM Education and Workforce.
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Numbers reflect a Resistance to Change in STEM Education and Workforce
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The CULTURE of STEM Education and STEM Careers Present Significant Barriers that limit participation
What Are We Doing About it?

**Disruptive Collaboration:** Alliances of institutions, programs, and people to create new Opportunities by:
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- Reducing Barriers that stifle URM STEM Students from persisting
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• Reducing Barriers that stifle URM STEM Students from persisting

• Increasing Access to STEM education and careers at the Community Level

• Changing what the Face of STEM Looks like: Students, families and communities need to see themselves reflected to truly make it possible!
The NCI-Southwest encompasses six collaborative research facilities:

ASU NanoFab, Eyring Materials Center, ¡MIRA! Center at NAU, Advanced Electronics and Photonics Core Facility, Center for the Life Cycle of Nanomaterials, & User Facility for the Social and Ethical Implications of Nanotechnology.

Follow NCI-Southwest:
http://ncisouthwest.org
Twitter: @NCISouthWest
LinkedIn: nci-southwest

What is nano?
https://nncci.net/what-nano

Signup to receive our newsletter:

Acknowledgement: This material is based upon work primarily supported by the National Science Foundation under award No. ECCS-2025490.
How do we support education?

K-14 & Community education

Community College, Undergraduate & Teacher education

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In honor of National Nanotechnology Day, October 9th, we host Plenty of Beauty at the Bottom image contest. Referencing Richard Feynman’s 1959 lecture, "There’s Plenty of Room at the Bottom," this image contest celebrates the beauty of the micro and nanoscale.

Plenty of Beauty at the Bottom
Center for Broadening Participation in STEM at Arizona State University

Arizona Universities working together to Increase Diversity in STEM at all levels

October 7, 2022

@CenterForBPSTEM

Funding for this project was awarded by National Science Foundation to the Center for Broadening Participation in STEM at Arizona State University (NSF#2120021, NSF#2142734, NSF#2055362, NSF#1953763, NSF#1902599, NSF#1940949)
The Center for Broadening Participation in STEM at Arizona State University is

- A research organization specializing in developing and implementing inclusive and equitable educational strategies specifically for underrepresented students in STEM.
- Provides diversity, equity, and inclusion (DEI) in STEM educational opportunities and in experiential learning services and training,
- Studies the impact of this work on outcomes for STEM faculty, staff and students.
**STEM-ESS Assessment**
A self-assessment tool based on the STEM-ESS Model that rates institutional leadership’s intentionality to accelerate Latino student success in undergraduate STEM Education. A comprehensive presentation and analysis of the institution’s STEM-ESS Assessment data and visualizations that also takes into account the college Strategic Plan and existing STEM initiatives (See Example Current Situation Assessment (CSA) Report).

**Professional Development**
Comprehensive workshops that offer training for culturally responsive instruction and practices to faculty, staff, and administrators. Embedding cultural responsiveness in Nano Technology and other technology programs.

**Experiential Learning**
A hands-on active learning approach that encourages faculty to provide a dynamic learning environment to engage students. Experiential learning forms include work-based experiences related to industry projects and undergraduate research experiences offered in classrooms or labs.

**Dissemination of Research**
CBP-STEM Staff are experts in their field and practice rigor in research and its dissemination. CBP-STEM research has been published in ASEE, IEEE, ATE, ITS, and multiple HSI Conferences.

**Management of Alliances**
Managed relationships with partners have enhanced collective project management skills and produced mutually beneficial outcomes that also increase long-term revenue.

**Outreach**
Collaborate and connect with community, higher education, and K12 partners to intentionally serve the needs of students who have historically been underrepresented in STEM.
The Center for Quantum Networks will play a pivotal role in developing the quantum Internet similar to that of ARPANET for today’s Internet.

CQN’s research will lay the foundations for a socially responsible quantum Internet that will spur new technology industries and a competitive marketplace of quantum service providers and application developers.
Directed by Prof. Saikat Guha, University of Arizona

Spans 11 Institutions

+ 18 Industry Partnerships

Four Foundational Components
Our EWD strategy aims to set the foundation for a strong, diverse, quantum-educated workforce through the following targeted efforts aiming to impact all levels of the quantum engineering lifecycle:

- Pre-college and community activities
- CQN REU program
- MS QISE program
- Short course program

At the core of CQN’s vision is the belief that the much-needed progress in diversifying STEM can not be accomplished if the work environment is not one of inclusivity, openness and dedication to progress.
How do we accomplish these goals?

Convergence of our foundational components and integration throughout every aspect of CQN

Highlighted Associated Project: NSF Collaborative HSI IUSE: ¿Quantum Qué?: Institutional Supports for Transfer Students’ Success in Quantum, Information Science and Engineering
¡MIRA!
NORTHERN ARIZONA UNIVERSITY
Center for Materials Interfaces in Research and Applications

DIVERSITY, DISCOVERY and INNOVATION through a revolutionary scientific center
Diversity is in our DNA... LITERALLY!!

What makes ¡MIRA! unique?
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What makes ¡MIRA! unique?

1. It’s not just a logo
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![MIRA](image)

2. The mission – materials science research & diversity center
Diversity is in our DNA… LITERALLY!!

What makes ¡MIRA! unique?

1. It’s not just a logo

2. The mission – materials science research & diversity center

3. The people ->

- 50% of our faculty are URM/Women – unprecedented in the US in Materials Science
- Our students, faculty, staff reflect our mission
That’s the Science, but ¡MIRA! is about the PEOPLE!

"As a woman of color, it’s nice to feel like I’m not the odd one out because they have this emphasis on hiring other people of color. It was really nice being able to see other people succeeding in the sciences who look like me.” – Victoria Girgis, Spring 2021 MIRA Scholar

Bringing R1 Networks to Community Colleges
The ¡MIRA! Effect

• The Impact of ¡MIRA! extends beyond the numbers, it’s the people!

• ¡MIRA! is designed to empower students, faculty, and communities to not only persist but excel by being WHO THEY ARE!

• Ultimately, it’s about changing a culture

Find your place in Science and Make a Difference Doing it!
Facilitating meaningful outreach by bringing quantum science to any community, specifically rural and remote communities!

Contact: ines.montano@nau.edu
Traditional outreach initiatives:

- Largely rely on participants coming to providers
- Often limited to urban populations
- Often do not manage to engage BROAD audiences

Goal: To facilitate meaningful outreach that **actually reaches OUT!**
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Reach out to:

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Reach out to:
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• Groups traditionally underrepresented in STEM
• People where they are
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Develop ‘Hands on’ quantum experiences that we **WE BRING** to the schools and communities.
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Mobile Lab
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Mobile Lab

This won’t work for us!
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SPARQS Mobile Lab

Changing what the face of STEM looks like!

Designed to be fun, engaging, welcoming, and inclusive.

**Students need** to see themselves reflected! Representation matters!
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SpaRQS Stickers

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**SparQs ID badges**

Personal ID badges like those worn by National Lab Scientists and Engineers

Providing students with constant reminder of ability to become scientists and engineers themselves!
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**SPARQS Events: SPARQS @ camps & STEM events**

Reducing barriers by showing diverse representation and making science fun!
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**SPARQS Events: SPARQS @ non-STEM events**

**DESCRIPTION**

Join the Greater Flagstaff Chamber of Commerce and the Flagstaff community in celebrating our country's Independence Day. More than 20,000 spectators will watch 100 floats, livestock, dancers, marching bands parade down the streets of downtown Flagstaff, 9-11 am. Free. Downtown Flagstaff. 928-774-4506 or flagstaffchamber.com.

**4th of July Parade**

Changing what the face of STEM looks like!
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SparQS Events: SparQS @ non-STEM events

Mall of America announces large-scale SCIENCE, TECHNOLOGY, ENGINEERING, ARTS, AND MATHEMATICS (STEAM) event August 10 - 14

As part of Mall of America’s 30th Birthday celebration, the mall-wide event aims to inspire youth showcasing a variety of STEAM careers in action

BLOOMINGTON, MN — June 16, 2022

The U.S. Bureau of Labor Statistics projects more than 1 million STEAM (Science, Technology, Engineering, Arts, Mathematics) jobs will have been added by the year 2030, meanwhile in 2022, the national shortfall of highly-skilled technical workers hit 3.4 million.

In an effort to increase awareness and provide opportunities, including educational and career pathways, to K-12 youth and their families, the National Center for Autonomous Technologies (NCAT) along with the National Science Foundation (NSF) and Minnesota State Colleges and Universities (MinnState) will host EXPERIENCE STEAM at Mall of America August 10 – 14, 2022.

Utilizing nearly every inch of common area space inside and outside the 5.6 million square foot retail and entertainment destination, the week-long event will feature a spectrum of STEAM opportunities for attendees, regardless of age, academic background or social constraints, including experiential learning activity booths, professional development workshops, student camps, robotic competitions, advanced skills training and more. All aspects of the event will be free and open to the public.

MoA:
• 5 million sq ft
• 500 stores
• 40 million visitors/year
Goal: To facilitate meaningful outreach that actually reaches OUT!

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SPARQS Events: SPARQS @ non-STEM events

Increasing access to STEM while changing what the face of STEM looks like!

- 75% women/URM
- 16 of 17 team members are faculty, graduate/undergraduate students
- Everyone works in related area
- From
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Over 800 ID badges

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