The webinar will begin at 1 PM Eastern time.

Hosted by: ATECENTRAL
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ATE Central acts as an information Hub for the National Science Foundation ATE Grantee Community

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Introductions

Mike Lesiecki

Robert Ehrmann
Managing Director, NACK Network

Trevor Thornton
Professor, Director NCI-SW
Presenters

Jared Ashcroft, Pasadena City College
Rick Vaughn, Rio Salado College
James Schifley, CA BOCES
Poll: How is it going?

A. Our Nano and STEM programs are full up, no worries
B. It is a constant challenge to recruit students into our programs
C. I know of a program that closed recently because of lack of enrollments
Using Undergraduate Research And Community Partnerships to Increase Student Recruitment in Nanotechnology

Jared Ashcroft
Design of Undergraduate Research Program: a tiered approach

YEAR ONE
TIER I
Research methods/skill development

YEAR TWO
TIER II
Hypothesis-driven Research

YEAR THREE
TIER III
Internships: REUs, industry/university collaborations

SKILLS (become more sophisticated)

RESEARCH (becomes more complex and independent)

OUTREACH
Research in Class
Objective: Gain a sense of scale.

Quantum Lab

Objective: Identify an unknown mineral.

Geology Lab

Objective: Design Mars Habitat

Oxygen Lab

“Cultivating Mars: A Problem-Based Learning Lab Designing an Oxygen-Rich Environment on the Red Planet.” Journal of Laboratory Chemical Education. 6, 1, 4-11, 2018.


**RAIN Nano Labs**

**Gold NP Lab**

Objective: Synthesize and Characterize Nanoparticles


**Nanowire Labs**

Objective: Understanding of Electrodeposition


**Nano Solar Cell**

Objective: Understanding of Solar Cells

Research Project 1 – Algae Biofuels for Renewable Energy

**Year 2: Join Research Group**

**Principle Investigator:**
Dr. Jillian Blatti, PCC, eCURe advisor

Dr. J and Jennifer Portillo extracting synthesized algae biodiesel

**TRANSESTERIFICATION OF ALGAL LIPIDS TO SYNTHESIZE BIODIESEL**
Year 2: Join Research Group

Research Project 2 – Solar Energy Activity Lab with CalTech

Principle Investigator:
Dr. Veronica Jaramillo, PCC, eCURe advisor

CCI Solar Fuels Annual Meeting 2016

SEAL Conference May 2015

Jennifer Portillo and Vincent Aguirre Jr. present the results of their research at Cal Tech SEAL Conference May 2014.
Year 2: Join Research Group

Research Project 3 – nanotechnology: applications and environmental impact

Collaborators:
UCLA, UC Riverside,
Cal State Long Beach

Principle Investigator:
Dr. Jared Ashcroft, PCC, eCURE advisor

Scanning Electron Microscope at PCC
Students analyze an unknown algae sample collected from Long Beach (left)

SEM images taken at PCC (below)
Augmented Reality in Chemistry
Coming Soon: John Muir High School MNTech Center

https://youtu.be/Mv_W-sWWz6o  https://www.youtube.com/watch?v=0bkpyqtyFBs
Nano-bio Conjugates
Project in Collaboration with Oak Crest Institute of Science and
UC Riverside and CSU Northridge
Participate in Outreach

Principles
- Student-driven
- Engaging
- Hands-on
- Experimental
- Safe
- Live model organisms

Scientist
- Access to tools
- Provide practical research methods
- Scientific knowledge
- Identify workforce skills

Educator
- Curriculum goals
- Build lesson plans
- Classroom management
- Communicate science
- Scaffold for age and learning levels

Outreach Program

Outreach team/Teacher
- Review curriculum and identify needs
- Align experiment to standards
- Discuss available resources
- Formalize lessons and assessments
- Create a teacher training
- Discuss limitations and obstacles
- Pilot ideas

Outreach team/School districts/University
- Create a funding plan
- Align with policy, regulations, and goals
- Develop plan for self-sustaining teachers
- Create opportunities to build teacher network
Outreach to K-12 Classrooms
Year 3: Internships
Finding Organizations to Work With

NASA Education
Dr. Brandon Rodriguez
Outcomes since 2015

1. Five peer reviewed publications (two more in review and three more in preparation) with 12 PCC student authors.

2. 21 student presentations at conferences

3. 15 faculty presentations at conferences

4. 12 student summer internships
   (9 Purdue, Nebraska, HMRI, Oak Crest)

5. 90% success and retention rate, no achievement gap
   80% transfer rate
Rio Salado - Where Nano Knows No Limits

Rick Vaughn, Ph.D.
Rio Salado College
MICRO NANO TECHNOLOGY WITHOUT WALLS

MISSION
- The College Within Everyone’s Reach
- Founded in 1978 to challenge the limits of tradition
- Customized, High Quality Learning Design
- Core Practices: Learning, Innovating, Partnering

CURRICULUM
- Two-year STEM Core: Calculus, Physics, Chemistry
- Redesign entry level Engineering and Physics
- ECE112 Principles of Nanotechnology
- ECE106 Survey of Nanotechnology

WHO WE ARE
- One of the Maricopa Community Colleges
- FY10-11 Total Unduplicated Headcount: 69,819 with 40,760 distance students
- Geographically diverse student population
- Fastest Growing online Community College

COMMUNITY NETWORKS
- Arizona NanoCluster
- Arizona STEM Network
- Arizona Science Center
- Science Foundation Arizona

COMING TO MICRO & NANO TECHNOLOGY
- Multidisciplinary
- Academic and Workforce Training

OUTCOMES
- Increase STEM completers
- Meet demand for high tech workforce
- Generate interest in STEM careers among K-12 students
Where Nano Leads to Big Things!
Certificate & Degree in Nanotechnology
Nanotechnology has the potential to create many new jobs across a variety of sectors. While some jobs, will require an advanced degree, a 2014 study funded by the National Science Foundation points out that 2-yr and 4-yr training with access to continuing and technical education will be sufficient for many of the future positions in nanotechnology, nanomanufacturing, and beyond.

Previous estimates stated that 6 million nanotechnology jobs will be needed by 2020, with 2 million of those jobs in the United States (Roco, Mirkin, and Hersam 2010). According to the U.S. News/Raytheon analysis, the number of STEM jobs increased 20 percent between 2000 and 2014. Looking ahead, the U.S. Bureau of Labor Statistics (BLS) projects that between 2012 and 2022, employment in occupations that NSF classifies as science and engineering (S&E) will increase 15 percent. To find out about nanotechnology programs at college and graduate levels, see College and Graduate Programs. If you are interested in 2-year degrees or training programs, see Associate Degrees, Certificates, & Job Info.
And its not just potential

Manufacturing Technician (all shifts - Arizona)
Intel 3,154 reviews -

Job Description
Intel's state-of-the-art processes and products give you the opportunity to learn a variety of technical and manufacturing skills from operations to equipment repair and troubleshooting in a demanding and challenging production environment.

Qualifications
Any one of the following will be considered:
Associate of Science degree or Certification in a STEM program (i.e Microelectronics, Electronic Engineering Technology, or Computer Electronic Engineering Technology, avionics repair), or a Bachelor of Science degree in Engineering, Chemistry, Physics, or Biology.
Candidates with 2 or more years of military electronic/avionic technician training …
**Manufacturing Technician Careers at Intel**

Intel is currently hiring hundreds of Manufacturing Technicians and Specialists in Hillsboro OR, Rio Rancho NM, and Ocotillo AZ.

Manufacturing technicians and specialists are at the heart of Intel's mission to build the world's best processors. They work at our high-tech fabrication facilities worldwide using the most advanced manufacturing processes and tools. If you want to work with the latest technology in a rewarding, fast-paced environment, a career in manufacturing at Intel may be for you.

**What You'll Do**

Intel's state-of-the-art processes and products give you the opportunity to learn a variety of technical and manufacturing skills, from operations to equipment repair and troubleshooting in a demanding and challenging production environment. As a manufacturing technician or specialist you will operate, maintain, and repair specialized processing equipment in a clean room environment to keep output high without compromising safety or quality.

**What we’re looking for**

Our manufacturing technicians require certificates, a two-year or four-year technical degrees in STEM related fields like electronic engineering, manufacturing, computer, mechanical, semiconductor, equipment and control, or facilities technology, or military training and experience.
A Day in the Life ... 

https://www.youtube.com/watch?v=xM4lee7ghxs
At Rio Salado College

NANO KNOWS NO LIMITS.

See how far Nanotechnology can take your career.

www.riosalado.edu/nano
Enrollment

- 2016: 0
- 2017: 18

This is a $\frac{18-0}{0}$ percent growth.
Now since we can’t divide by zero, we instead use a little Calculus $\lim_{n \to 0} \frac{18}{n}$
Which of course is …
Enrollment Update

∞ % Growth Rate

In other words …

NANO KNOWS NO LIMITS
Enrollment Update – Post Marketing

- 2017: 18
- 2018 (to date): 71

And 3 Graduates!
Questions?

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Learning About Nanotechnology

James Schifley
Cattaraugus-Allegany BOCES (Board of Cooperative Educational Services) Overview:
Number of component districts - 22
Geographic area - 2,159 square miles
Component district enrollment – 17,000*
BOCES Career/Technical Education enrollment - 1,140*

Upstate New York

Not New York City
Challenges with starting a program:

Awareness – What is nanotechnology???

Teacher evaluation system and emphasis on testing/student pass rate

Less time/incentive to integrate new technologies
Challenges with starting a program (continued)

Cost – Research grade equipment is very expensive – Preventative maintenance contract cost on equipment is costly as well.

Personnel – Hiring experts to operate and instruct with the equipment at public school teacher wages

Contractual obligations – Teachers work from 8:15 am - 3:15 pm – 185 days a year
Strategies and Activities

Infrastructure and Professional Development:

• Integrated into all Career and Technical Education programs

• Affiliation with RAIN, MNTeSIG, HI-TEC, local colleges.

• Teacher focus group – find champions in districts

• F.A.S.T. – Future of Advanced Science and Technology committee

• Teacher workshops
Strategies and Activities

Outreach:

Webpage to host work

Work with local businesses

Booth at Regional Science Fair
Don’t Do What We Did

Early on we sent out a flyer to all science teachers about a workshop with no follow up or personal contact.
Don’t Do What We Did

Early on we sent out a flyer to all science teachers about a workshop with no follow up or personal contact.

Had one teacher show up out of 75-100.
Positives:
Students driving their own Science learning after exposure to equipment

Partnerships with businesses and student interns – Reduced price of using equipment if business provides an internship or guest speaker/lesson.
More Positives:

Gaining momentum – Asked to showcase our efforts at the NYS capital in March

Requests to work with component schools are increasing

Changing the perception of CTE students
One thing to share with others starting out:

Don’t try to do it alone

Omni Nano provided content for the first online nanotechnology offering
Final Questions
Join Us! www.mntesig.net

Apply for a fellowship to attend our Special Interest Group meeting at HI-TEC, July 23, 2019 in St. Louis
Webinar, Join Us: March 29, 2019: 1 PM Eastern

Capturing Movies of Molecules Using Ultrafast X-rays

Dr. William Graves
Arizona State University