Intensive Training Academies during Winterbreaks to Enhance Student Success and Transfer

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MESA Mathematics Engineering Science Achievement

COLLEGE of the DESERT

CALIFORNIA STATE UNIVERSITY SAN BERNARDINO

Student Success and Learning Outcome for Internships

1. **Can I do this (my major)?**
   - ✓Internships allow the student to explore career choices related to their major.
   - ✓Creates self-identification as a scientist
2. **What are the real world skills that I need?**
   - ✓Internships connect skills to student interests and their major (or not)
3. **How do my courses apply to the real world?**
   - ✓Internships connect the classroom to real world applications…in a real way!!
   - ✓"Thanks for showing us how to ….fill in the blank …professor"
4. **Internships outcomes are learning outcomes?**
   - ✓Student learns more as a result of motivation.
   - ✓Increased chances of entrance to programs of interest.
   - ✓Exposure to mentors at universities and in industry.
   - ✓Development and strengthening of pathways between institutions at all levels.
   - ✓Stronger better prepared workforce.
   - ✓"I did it…I built and airplane control system for NASA!!"

Overview

College of the Desert, in partnership with California State University San Bernardino, with the support of a 3-year grant through the NASA Curriculum Improvements Partnership Award for the Integration of Research (CIPAIR) developed a program for community college students, especially those from underrepresented groups, to better prepare them for summer internship opportunities at four-year schools and national laboratories. The “Winternships” provided an enhanced alternative learning environment for students pursuing degrees in the STEM fields through faculty and peer mentoring in guided undergraduate research activities.

Additionally, students received assistance in searching for summer internships in their area of interest, completing applications, and guidance on follow-up communication with the programs to which they applied. This activity has now been funded through the NSF Centers of Research Excellence in Science and Technology (CREST) Program for an additional five years in a partnership with California State University at San Bernardino.

A little bit of History

- Several years of encouraging STEM students at College of the Desert to seek Summer Internships
- Very Little Success (2 or 3 over almost 10 years)
- How do we make our STEM students at COD more successful
- Provide some research experience
- One way would be if CC was located near a four-year school
- COD's closest university more than 60 miles away
- Our choice was to try to provide a research experience at COD
- The Winter break provided us a window to try this program with the support of a NASA Grant

Note: This was during a period when number of classes were reduced and a Winter session was completely taken off the schedule leaving the students with a long break between semesters

- Our rationale was students would get research experience and the faculty mentors would be able to write letters of support for their internship applications from a better perspective.

Motivation

- One of the major goals of this project is provide research experiences for community college students.
- Community Colleges enroll a higher percentage of students from lower socioeconomic levels and the traditionally underrepresented groups (Russell, et al, 2007).
- Sixty-one percent of Latina/o STEM bachelor's degree holders attended TYC's at some point in their educational careers.
- Doctoral recipients from the underrepresented groups in science and engineering are more likely to have previously attended a two-year college.
- The undergraduate research experience fuels interest and enthusiasm in STEM majors, as well as increasing the students' anticipation of obtaining a graduate degree. This enthusiasm is a key component to early intervention and career choice (Russell,. et al, 2007).
- Mentorships should begin as early as possible so they can be maintained throughout a students' academic career. (Boyer Commission Report, 1998)
- Smooth transition to 4yr. (personal contacts, previews, skills, expectations).

Motivation (cont.)

- Another outcome is to increase the persistence and retention rate of students in the STEM fields by advancing their personal, social, cognitive, and professional skills, especially those from the traditionally underrepresented groups.

- Literature shows that the highest rate of attrition is in the freshman/sophomore years, especially in traditionally underrepresented groups (Swail, et.al, 2003, Nagda, et.al, 1998)

- An undergraduate research experience also addresses the social and academic integration of the student into the research and college environment through the establishment of a “community of learning” (Laursen, et. al, 2010).

- Students who develop these relationships have significantly higher retention and persistence rates (Nagda, et.al, 1998).

The Winternship Concept

Recruitment Fall

- Fall Announcements.
- Application Process or Registration.
- Acceptance or Enrolment.

Execution Spring

- Introduction and Skills Building.
- Internship Applications.
- Project Identification with Emphasis on Discipline Specific Skills.
- Team Organization and Development.

Summer Internship Activities

- Accept and Attend Internships at NASA centers or Similar.
- Perform On Site Internship.
- Move On to University.
- Presentations and Paper Submissions.

Returning Students and Student Mentors

- Return to Present at Institution.
- Return to Mentor Next Years Students.
- Discuss Internship with Incoming or Previously Non-participating Students.
- Pass Information Along to Transferring Institution.

Winternships

- Take place at the community college.
- Under supervision of community college faculty.
- **CC faculty guide students in selection of their project(s)**. We try to provide topics of local interest if possible.
- Opportunity for professional development for faculty.
- Duration 3-4 weeks.
- Students are paid a stipend.
- Variation - Irvine Valley College does a course. Only 2 week break. (Eng 100, both semesters).

- Complete a faculty guided research project during January that includes
    - Literature search of topic
    - Work in a team of 4-5 students
    - Prepare a poster describing their project (displayed in our science department hallways)
    - Oral presentation to faculty, students and the community at large
    - Many of our students have presented at student conference (e.g., SCCUR, AAAS)
- Complete applications for Summer Internships
    - Minimum of three applications
    - National Labs and Universities

      Note timing – summer internships open applications ~ January

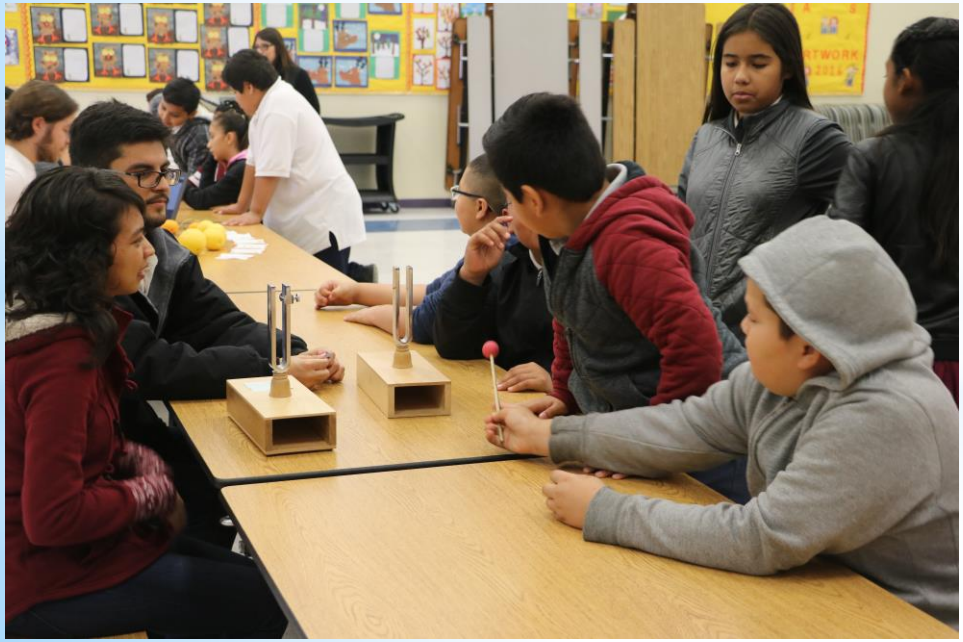
- Participate in one Elementary School Outreach Activity

Elementrary School Outreach Activity

Provides exposure to 5th and 6th grade students to science, math and engineering activities to create interest in STEM

Approximately 12-15 demonstrations are provided by the students

Impact on the participating college students (mentees become mentors and giving back to the community)




CHEMISTRY
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NSF WINTERNSHIP 2017 STUDENT PRESENTATIONS

Center for Advanced Functional Materials

Centers of Research Excellence in Science and Technology

College of the Desert Math Engineering Science Achievement Program

Can We Trust the Hydration Station's Water?

by

Richard Hernandez, Slavyana Nedelcheyva, Lucero Noriega-Garcia, Louisa Nolan, and Bryan Orozco

Water filters have positively impacted our world in several ways. The Brita company has taken the home water filter concept and spread the idea to bigger places such as college campuses. The College of the Desert uses a water filtration system known as a Hydration Station. Our group will investigate techniques for extracting and identifying organics and microbiota in the water dispensed by our Hydration Stations.

Ozone Production from Electric Vehicles

by

Alan Armendariz, Itzel Barroso, Chris Daniels, Claire Davidson-Rubin, and Patricia Mendez-Alarcon

Ozone (O_3) exists at ground level in the troposphere and higher up in the stratosphere. Ground-level ozone is harmful to humans and the environment in higher concentrations. Electric vehicles are advertised as being "environmentally friendly" but minimal research exists on whether they produce harmful chemicals. Using Arduino-based technology, we will conduct tests to measure levels of O_3 and possibly Nitrogen Dioxide (NO_2) being produced from and around the college's electric vehicles.

Detection of Hexavalent Chromium in Tapwater

by

Wilbert Garcia, Roman Montez, Jonathan Rodriguez, and Joseph Spong

Chromium is a metal that is used in myriad industries but is also found naturally in desert environments as a source of groundwater. Chromium, if in water, exists as either Chromium (III) or Chromium (VI). Chromium (VI) is measured and regulated by local water districts because it is a carcinogen. Our group collected tap water samples throughout the Coachella Valley and analyzed them for both Chromium (VI) and total chromium.

Analysis of Lead in Public Drinking Water

by

Mathew Garcia, Bailey Nixon, Adan Sanchez, and Maria Santos

Lead is a tasteless and odorless toxin and has been banned from use in pipes carrying drinking water. Lead can leach into public drinking water from deteriorating pipes and lead solder, as it did in Flint, Michigan. This study quantitatively analyzes local samples of public drinking water for lead ions by spectrophotometry to test for possible presence of lead.

Nutrient Levels in a Closed Ecosystem

by

Salvador Hernandez, Marixa Ochoa, Raul Salas, and Bradley Soares

College of the Desert features an attractive water fountain as a part of the College's landscaping. This fountain is occupied by various species of algae. We have examined the nutrient levels (phosphate and nitrate in particular) as a function of algal growth in the fountain. It is postulated that the nutrient levels, as quantified by colorimetric and ion chromatographic methods, will decrease as algae grows in the fountain water. The results from daily sampling of the fountain water will be described.

January 27, 2017 @ 3:00 PM

MESA Center / MSTC Room 250

Refreshments will be provided by the MESA Program

College of the Desert

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California State University San Bernardino


Special Gratitude to:
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MESA

Examples of Student Winternship Topics at COD

An Investigation of the Particulate Matter Emissions from the Sentinel Power Plant -The study of atmospheric chemistry and its correlation with the diminished air quality of the Coachella Valley has shown its genesis from outside sources and the desert environment. The impact of a recently opened natural gas turbine power plant on the valley air quality is investigated.

Investigative Analysis of the Air Quality in the Coachella Valley- Using emissions estimates and back trajectories via computational methods to calculate the traversal of incoming air, we conclude that most of the emissions must occur elsewhere, namely the Los Angeles basin.

NXT Robotics: Solving Daedalus' Labyrinth- Program involved the students working collaboratively in the development of Lego Mindstorm NXT robotic systems utilizing the LabVIEW programing language to navigate a maze and to create decision-making Artificial Intelligence systems.

Selenium Content of the Salton Sea- Values for the concentration of selenium in water, sediment, and biota from literature and previous studies and compared to samples of the biota, sediments, and air in the Salton Sea environment.

Other Past Winternship Topics

Detecting Hydrogen Cyanide from a Common Table Salt Additive

H_2S and H_2Se in the Salton Sea

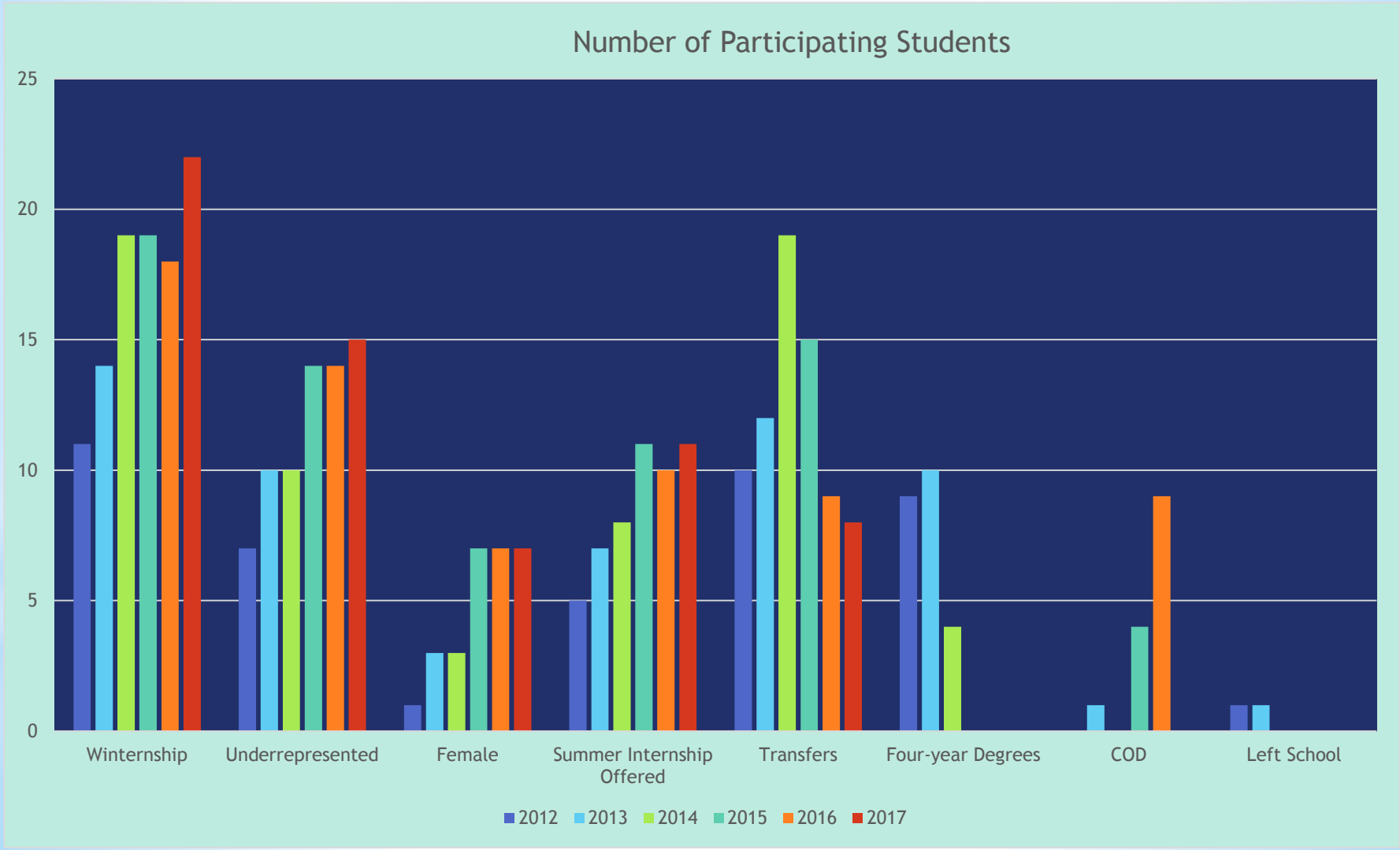
Analysis of Chemical Emissions From Asphalt

Investigation of a Possible Reaction between Alkali Metals and Cyclosiloxanes

Particle Emissions by Restaurants

An Analysis of Dietary Calcium Supplements Derived from Oyster Shells

Results at College Of the Desert



“In instructional labs, you already know what the answer will be, In research you have to find the answer yourself.”

- 2017 Winternship Participant

Winternship Implementation

- **Your already interested…so…**
- **Contact your local University**….find the right person(s).
- **Identify current efforts** at your institution.
- Start a Winternship or research course. (build it they will come).
- **Identify the needs** of local industry.
- **Finding space:** For Winternships this typically can be achieved easily as the campus is often open during the holiday but largely unoccupied. For a course Friday afternoons one can often find a free room and students.
- **Seed Grants** highlighting collaborations between 2 year and 4 year institutions allow for purchasing of equipment and essentials. Here small is good.

Development of an Undergraduate Research Experience Course

- Provides Institutionalization of activities
- Recently developed at College of the Desert as well as Irvine Valley College and CSUSB (1 hour lecture, 3 hour lab)
- Developed courses across several disciplines (Physics, Chemistry, Biology, and Math)
- Includes all components of the Winternship
  - Literature search
  - Research design
  - Applications to Internships
  - Oral and poster presentations
  - Less flexibility in topics, but can be offered across several disciplines

- Offered during Spring 2017 for first time

Acknowledgements

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