INCREASING THE STEM PIPELINE: A COMMUNITY COLLEGE/CSUN PARTNERSHIP

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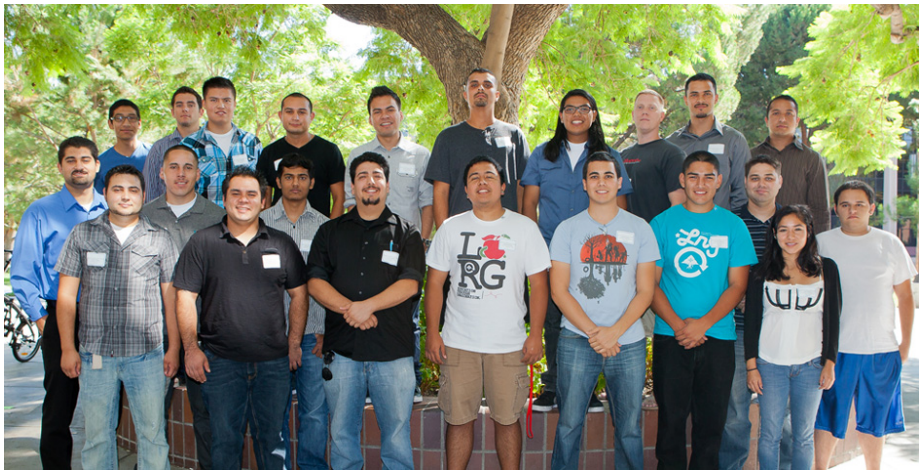
6th Annual HSI/Title V Best Practices Conference
March 18, 2014

Attract, Inspire, Mentor, and Support Students (AIMS^2)

California State University Northridge

- Faculty Mentors, Chairs, and Dean



- 2012-2013 Cohort 2

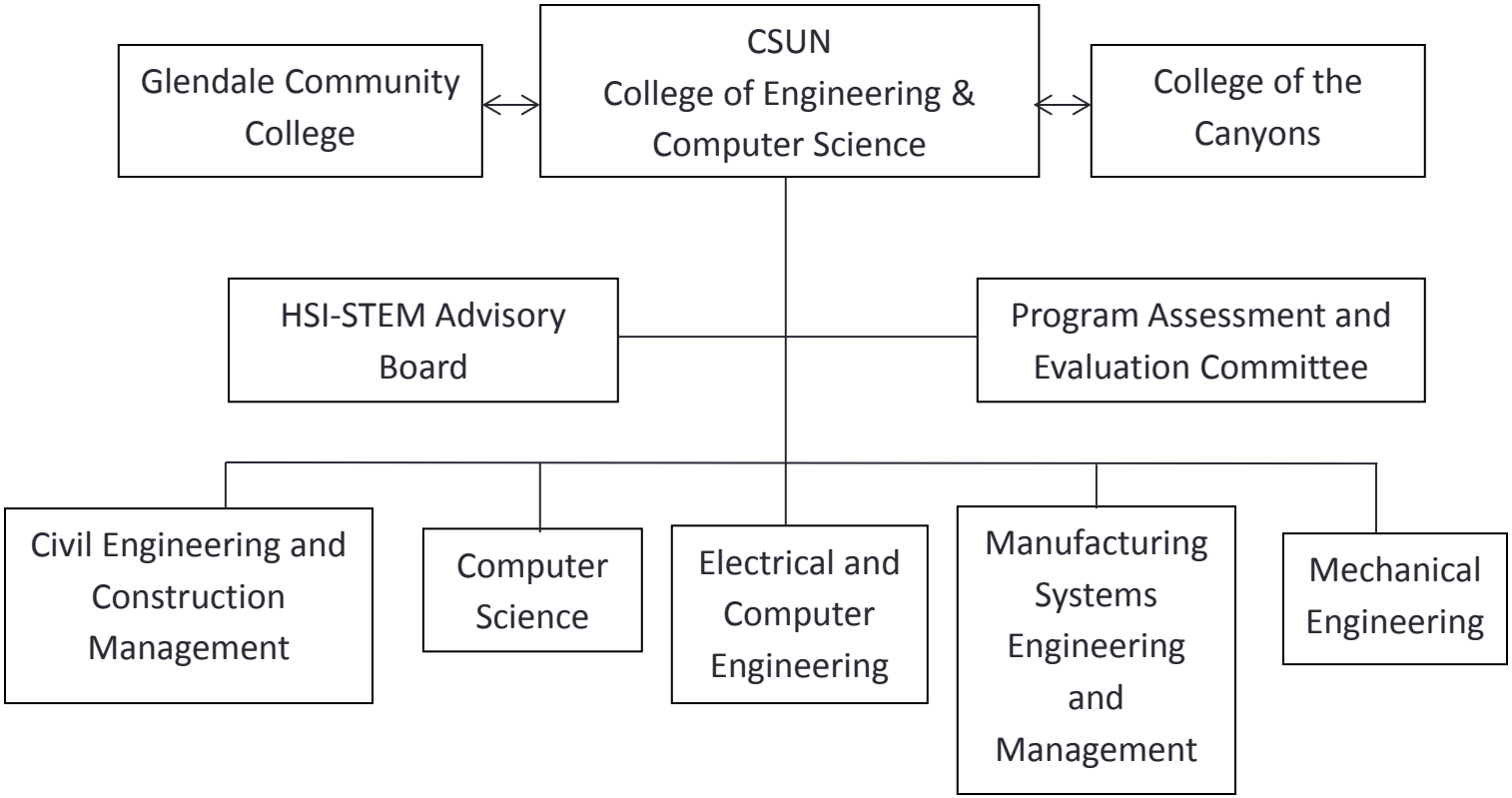
Program Goals

- To increase the number of Hispanic and low-income students who transfer from the community college partner institutions to pursue STEM degrees at CSU Northridge
- To assist these students to successfully graduate with a STEM degree in a timely manner
- To streamline the transfer process between the community college partners to our institution by expanding existing articulation agreements

Program Structure

- Funded by $5.5 Million HSI-STEM Grant from the Department of Education
- PI is S.K. Ramesh, Dean of the College of Engineering & Computer Science at CSUN
- Co-PI's include additional academic personnel from CSUN, Glendale Community College, and College of the Canyons
- Monthly meetings are held at CSUN to discuss program activities, articulation agreements, program assessment, etc.

Program Structure



Advisory Board

- Mr. Rich Alvidrez, JPL
  - Community College Initiatives
  - NASA/JPL Education Office
- Dr. Vaughn Cable, JPL
  - Spacecraft Antenna Research Group
  - Caltech-JPL
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  - Northrop Grumman Corporation Electronic Systems
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  - Managing Director,
  - Avery James, Inc.
- Prof. Miguel Macias,
  - Emeritus faculty, Civil Engineering and Applied Mechanics
  - CSUN
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  - CMT Program Alumnus
  - Analyst
  - Consulting and Claims Services
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- Mr. David Naiditch
  - Senior Engineering Specialist
  - The Aerospace Corporation
  - El Segundo, CA
- Dr. Rick Ratcliffe
  - Dean Emeritus, College of Engineering and Computer Science
  - CSUN

Student Recruitment

- Program began in AY 11-12
- Students must be an individual who has faced or faces social, cultural, educational, or economic barriers to a career in a STEM field (U.S. Citizen or Permanent Resident)
- Each year the target is to have a cohort of 30 students at CSUN, and 15 each at CoC and GCC
- CSUN students receive a stipend of $2400 per year, CoC and GCC students receive $1200 per year

Student Benefits and Expectations

- Must successfully complete 24 units per year
- Access to faculty mentors, student mentors, and tutors
- Free iPad
- Opportunities for program engagement (e.g. volunteer on senior design projects, involvement in professional societies, attendance at conferences)
- Opportunities for summer employment as research assistants working with faculty mentors

Summer 13 Research Projects

- Professor Bob Ryan:
  "Wind Tunnel Testing Summer Research"
  "Human Powered Vehicle (HPV) project with 5 CSUN students and 2 GCC students

- Professor Behzad Bavarian:
  “Alternative Battery-BioTech Project” with 6 CSUN students, 1 GCC student, 1 COC student

- Professor Bruno Osorno and Professor Kourosh Sedghisigarchi:
  "SMART GRID project” with 2 CSUN students, 1 GCC student, 1 COC, and 1 Mission Community College student

- Professor Gloria Melara:
  “Collaborating and Modeling Android computer game Summer Project” with 2 students from CSUN students and 4 GCC students

Sample of Student Accomplishments

- Yassamah Tarazkar, “Mechanical Engineering Design Experience for Hispanic and Low Income Students”, paper presented at 2013 ASEE Annual Conference

- Travis Van Leeuwen and Mr. Kevin Miranda,
  “Rechargeable Metal-Ion Batteries for Energy Storage”, presentation at November 2013 meeting of the SFV ASM/SAMPE chapter

- Melissa Flores, Alliance of HSI Educators Scholarship (Tier # 1: conference travel, registration and iPad)

- Stephanie Medina, Noe Hernandez, Juan Zepeda, attended the HACU 27th Annual Conference in October, 2013

GLENDALE COMMUNITY COLLEGE
ASPIRE, INITIATE, AND MASTER (AIM) PROGRAM

AIM Program Profile

- Three Cohorts of 13-15 participants (n= 44)

Majors:

2 Aerospace Engineering, 2 Architecture, 1 Biotechnical Engineering, 6 Civil Engineering, 3 Computer Engineering, 2 Computer Information Technology, 12 Computer Science, 5 Electrical Engineering, 3 Engineering (undecided on option), 7 Mechanical Engineering, & 1 Physics

Academic Performance (GCC)

	Spring 2012		Fall 2012		Spring 2013	
	n	mean	n	mean	n	mean
Cohort 1	13	2.81	12	3.05	10	2.95
Cohort 2			14	2.7	14	2.7
Cohort 3					7	3.1
Comparison (Cohort 1)	14,823	2.58	14,962	2.57	15,036	2.59
Comparison (Cohort 2)			14,962	2.57	15,036	2.59
Comparison (Cohort 3)					15,036	2.59

Transfer Trends

- Cohort 1: A total of 6 transferred to CSUN & 1 to Cal Poly Pomona for Fall 2013.
- Cohort 2: A total of 2 transferred to CSUN & 1 to CSULA for Fall 2013. The majority have applied for Fall 2014.
- Cohort 3: The majority will apply for Spring 2015 (if CSUN is open).

Program Benefits

- Personalized Academic & Career Counseling
- Individualized Tutoring
- GCC Faculty Mentoring
- CSUN Summer Research Internship Opportunities
- $1200 Annual Scholarships
- STEM-related Co-curricular Activities
- K-12 Outreach Opportunities
- Bi-monthly workshops
- FREE iPAD & training

Enhance GCC/CSUN Articulation Agreements

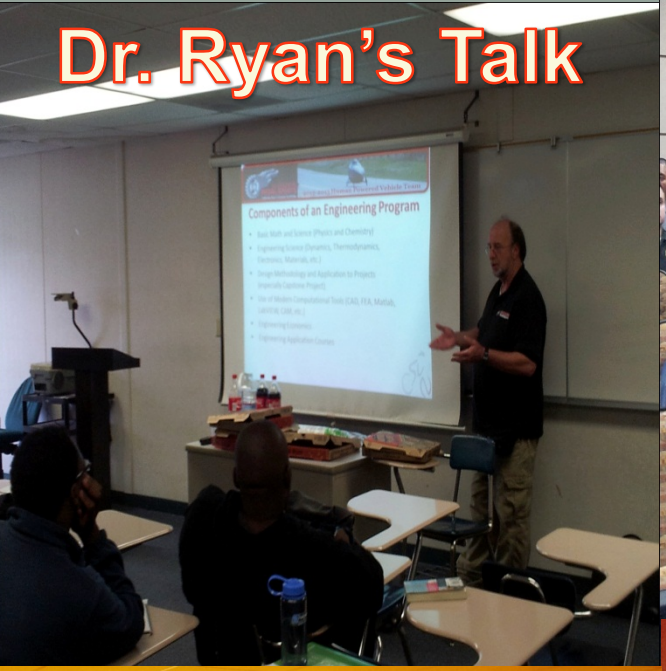
- Upon grant submission, 15 lower division Engineering and Computer Science major courses lacked course to course articulation agreements
- As of March 2014, GCC and CSUN have successfully articulated 6 & 2 course currently in the pipeline

GCC – New Course Articulations

CSUN Course Name/#	Course Title	GCC Course Name/#	Course Title
CIT 101/L	CIT Fundamentals w/lab	CS/IS 101	Intro to Computer Info Systems
CIT 160/L	Internet Technologies w/lab	CS/IS 260	Intro to Website Development
COMP 108	Orientation to Computer Science	CS/IS 112	Intro to Programming using JAVA
COMP 122/L	Computer Architecture & Assembly Language	CS/IS 165	Computer Architecture & Assembly Language
ME 186/L	Computer-Aided Design w/lab	ENGR 111	Solid Works Applications
CE 240/L	Engineering Statics	ENGR 152	Engineering Mechanics-Statics
ECE 240/L	Electrical Engineering Fundamentals	ENGR 140	Electrical Engineering Fundamentals (pending)
MSE 227/L	Engineering Materials w/lab	ENGR 146	Engineering Materials (pending)

AIM Counseling/Workshops

- Over 50 counseling sessions made since the start of the Fall 2013 (n=27)
- On average, 23 participants attended our bi-monthly AIM meetings/workshops
- On average, 15 participants receive peer tutoring services (over 66 hours of tutoring last Fall)


Dr. Ryan's Talk
Components of an Engineering Program


CSUN Social


Brewery Visit


iPad Training


Speed Mentoring
SPEED
MENT
WIN A GIFT CARD!
INDUSTRY PRO
October 2
4:00-6:0

Professional Development

Exposing more students, counselors, and instructors to professional engineering conferences

Co-Curricular Activites

- Jet Propulsion Laboratory (JPL)
- JBL/Harman
- North Island Naval Base (San Diego)
- Burbank Water and Power
- California State University, Northridge
- Speed Mentoring (WISE)
- California Science Center
- Golden Road Brewery
- HEENAC 2013 Conference (New Orleans)
- SHPE 2013 Conference (Indianapolis)
- VivaTech events (GMIS)


Burbank Water/Power

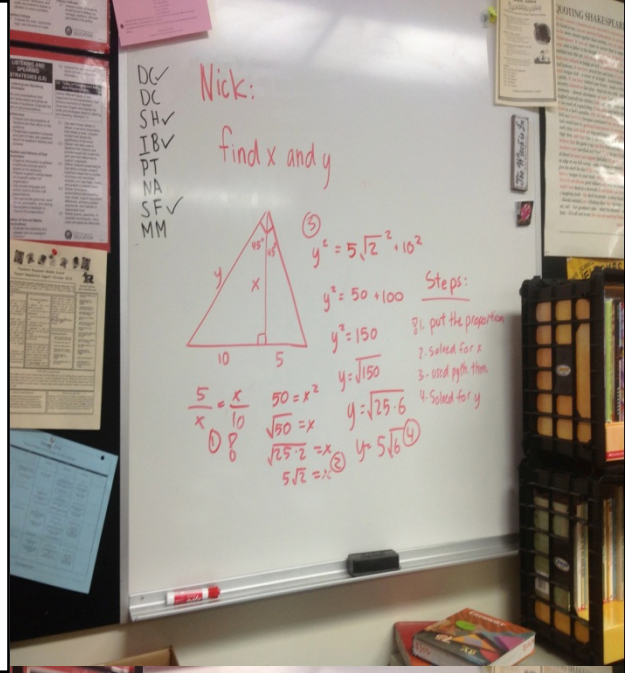

Naval Base Tour

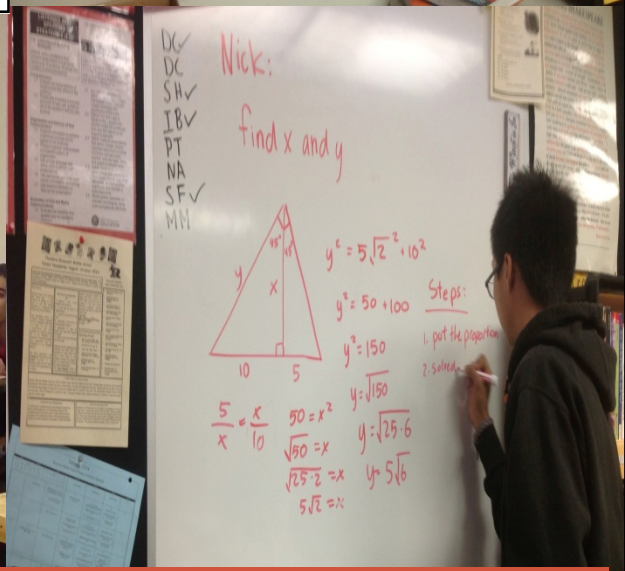

JPL


JBL/Harman
JBL

AIM Outreach/Mentoring

- AIM participants/mentors pay weekly visits to Roosevelt Middle School (Glendale)
- Mentors serve as co-facilitators, tutors, and robotics coaches
- Mentors are paid for their trainings and visits





AIM Mentoring in Action

Challenges

- Finding committed GCC faculty mentors
- Student psychosocial issues (e.g., low self-esteem/self-efficacy, lack of assertiveness)
- Minimal counseling training in STEM-related work
- Financial aid bureaucracy
- Not having a centralized location

Exploring Project Performance

- Evaluation framework
- Research design and procedures
- Overall findings and patterns
- Next steps

Evaluation Framework

- Project objectives guided the evaluation as an embedded mixed methods case study design
  - Merriam (2009) and Stake (1995): cross case comparison, use of diverse procedures
  - Unique needs across sites: CSUN, GCC, COC
    - Student and faculty/staff needs and project objectives at each campus direct approaches

Diverse Data Sources

- Diverse data sources
  - Cohort participants (students), mentors (faculty), staff, and institutional data
- Mixed sampling/recruitment
  - Criterion sampling and email invitations to for questionnaire, journals, interviews
    - Miles and Huberman (1994): stratified purposeful sampling strategy

A Collection of Procedures

- Questionnaires
  - Entry (baseline) and annual (assessment) instruments for students tied to measures at GCC
  - Entry (baseline) instrument: CSUN applicant interview
- Structured journaling
  - Monthly journal guides for students to record participation in project activities
- Personal and group interviews
  - Annual student interviews (GCC and CSUN)

A Mix of Analytical Approaches

- Descriptive statistical analysis
  - Frequency analysis with institutional data (COC/CSUN), questionnaire (GCC)/journal (CSUN) data
- Thematic data analysis
  - Segmenting, coding, clustering, and thematizing textual data from personal (CSUN) and group (GCC) interviews

Measuring Project Performance

- 12 objectives shape 35 performance measures
  - 35 performance measures guide assessment tasks
    - 28 quantitative, 7 qualitative measures shape data
      - Quantitative measures: transfer, completion, articulation, advisors, advising, courses/labs, tutoring, mentoring
      - Qualitative measures: student-faculty, peer-peer, research
  - Types: project (4), non-cohort (3), cohort (28)

Challenges of a Cohort Model

- A cohort model required a unique approach
  - With the formation of the second cohort, we needed to assess cohort measures by cohort
    - Baseline data and actual performance data collected by cohort, analyzed by cohort
  - This approach applied the 28 cohort measures to each cohort for the performance period

Success: Transfer and Completion

- Transfer achievement exceeded target
  - 44 new CSUN transfer students entered in 2012-13 from COC/GCC in a field housed in CECS
    - 122% increase over the project target (n=36) and 210% increase over baseline figure (n=21) from 2010-11
- Program completion exceeded target
  - 40% (25/63) completed a degree program for the most recent period vs. 31% (21/68) project target

Strengths in Cohort Measures

- GCC/COC counselor STEM PD
- COC academic advising frequency, quality of GCC student-faculty interaction improved
- Student-faculty interaction campuses dramatically increased during the period
  - CSUN academic advising/workshops, supplemental labs, faculty research increased

Interpreting Quantitative Measures

- Faculty work with cohort participants—advising, mentoring, supervising research
- Project faculty/staff efforts with academic workshops, events, activities pays off
- Lower peer tutoring/mentoring rates = greater percentage ➔ senior standing

Faculty Research: Student Learning

- Faculty research presented students with typical problems in the field, concepts in class
  - “I was learning techniques used in the field.”
  - “Working on the [redacted] helps me to learn concepts.”
  - “After participating in the research projects, I felt better about my classes; I understood material.”
  - “Attending a national conference gave me confidence. I felt better about myself.”

Research: Career Preparation

- Research participation builds career capital, skills
  - “The [redacted] competition was really exciting. I met people in the industry…good for me and my future.”
  - “I was presenting my research to other people across the country [and] accomplished something really big.”
  - “Research experience helps with career and my individual work presentations.”
  - “[Redacted] has made me look differently at my self, what I can do and where I can go.”
  - “Being able to work in a group teaches me skills for later on, like work plans…[as] part of a group.”

Student-Faculty Interaction

- Overall, students reported meaningful, fulfilling interactions with supportive faculty
  - “My faculty mentor is very helpful…willing to listen” and “is friendly…we just talk”
  - “My faculty mentor is very helpful and is always willing to listen.”
  - “[I] find the instructors very approachable” and “friendly,” including times “when I have a question, they answer them and help me.”

Faculty Interaction as Advising

- “The face-to-face meetings with my faculty mentor has been great. I get my questions answered.”
- “The interaction with the professors help me to augment what I am learning in class. They have been great to me.”
- “My interactions with faculty mentors help me to learn a lot of new stuff [and have] given me some ideas towards a career and also helped me in classes.”
- “My interactions with faculty mentors help me to learn a lot of new stuff and they just help a lot.”

Peer Effects: Transitions/Learning

- “My peer mentor helped me to navigate things”
- “I still see my friends from GCC and we have some classes together.”
- “I like working with the same students in my [redacted] group and research group.”
- “They helped me to study for this one class I was having problems with.”
- “The peer tutors are good, they know the subject matter and help me especially before tests.”
- “I meet with my peer tutor and mentor [for] tips on the program, classes.”

Interpreting Qualitative Measures

- What appears to affect student learning and career development is consistent, frequent interaction with faculty mentors
  - The activities that facilitate interaction matter if meaningfully connected to coursework and career
- Peer tutors/mentors tend to enhance student academic/social experiences, support learning

Recap

- In general, advising, workshops, labs, and faculty research are project strengths
- Overall, student-faculty interaction have the strongest effects on student development
- Finally, peer interaction via peer mentoring and tutoring appear to have strong, positive effects on student transitions, learning

Next Steps

- Update program monitoring tools
- Inferential statistical analyses to examine program participation and outcomes at CSUN
- Exploratory studies on effects of faculty contact with transfer students of color, focusing on gender and race/ethnicity

QUESTIONS?

http://www.ecs.csun.edu/aims2/