

THE CALIFORNIA STATE UNIVERSITY  
**STEM**  
COLLABORATIVES

California State Polytechnic University Pomona, April 7<sup>th</sup>-8<sup>th</sup> 2015

Dear Attendee,

Welcome to California State Polytechnic University Pomona and the California State University Science, Technology, Engineering, and Mathematics (STEM) Collaboratives Summit.

The first day of the event is dedicated for discussions between the eight CSU campuses funded through the Leona M. and Harry B. Helmsley Charitable Trust award. The second day will be a general meeting involving representatives from all 23 CSU campuses. We anticipate that the general meeting on April 8th will be first of a number of meetings to be held to discuss strategic initiatives to improve STEM student degree attainment, particularly among Hispanic and other low-income students, who tend to be highly underrepresented in the discipline.

A report last week from Georgetown University's Center on Education and the Workforce indicated that STEM occupations grew by 15 percent nationally last year, the largest growth rate among occupational clusters. This growth is expected to continue and it is anticipated that by then end of the decade approximately one out of every three jobs requiring a baccalaureate degree will be in the STEM and health-related sciences.

Rising concerns about the ability of the United States to compete in the global economy have led to concerted national efforts to increase the number and diversity of students pursuing degrees and careers in STEM fields. The urgency of the need was emphasized in a policy report by the President's Council of Advisors on Science and Technology (PCAST 2012) that urged post-secondary education institutions to produce more STEM graduates announcing that, if the United States was to retain its competitive global advantage in science and technology, an additional 1 million more STEM professionals would be needed over the next decade.

In the Fall of 2014, 93,247 CSU undergraduates were enrolled in the STEM and Health-Related Disciplines, representing just over 23% of the total of student enrollment 403,997. Cohort-based analytics from first time freshman declaring majors in STEM predict that probably less than 30% of these students will actually graduate with a degree in the discipline. While just estimates, these predications are in keeping with the recent California State University Report: State Performance Measures for 2013/14 Academic Year that documented a total of 17,061 STEM and 6,223 baccalaureate degrees being conferred in the Health-Related Sciences. The CSU awarded an additional 3817 Masters STEM Degrees and 1,967 Masters Degrees in the Health-Related Sciences

The sheer number of students participating in the STEM-related programs places the CSU in a position to be a national leader in advancing STEM degree attainment. This summit recognizes the pivotal importance of the CSU system in meeting national expectations as a leader in promoting STEM graduation success, particularly in Hispanic and other underserved student populations, to meet national workforce needs in the next decade and beyond.

Preliminary surveys indicate that, system wide, there are approximately 400 externally funded projects garnering in the region of \$0.3 Billion, involving over 2000 faculty, aimed at strengthening the STEM pipeline. The aim of this inaugural meeting is to provide a focused forum for STEM education leaders to share longitudinal information on the successful outcomes of interventions applied through these various sponsored programs on the different campuses. These discussions will enable us to distill some of the best evidence-based practices for advancing STEM degree attainment. Ultimately, by the end of the summit, we hope that we will be able to identify the rate limiting steps and processes for student success to inform which programmatic barriers matter most for improving STEM degree attainment. We anticipate that the results from this and successive summits will help inform a strategic plan for the implementation of sustainable, cost effective practices that are scalable across the CSU system.

Welcome to Cal Poly Pomona.

Zed Mason  
Interim Assistant Vice Chancellor for Research Relationships and Partnerships

Dawn M. Digrius  
Senior Project Manager, STEM Collaboratives

Ken O' Donnell  
Senior Director, Student Engagement and Academic Initiatives and Partnerships

## CSU STEM COLLABORATIVE SUMMIT: MEETING AGENDA: APRIL 7th

Time	Topic	Activity
9:00am-10:00am	BREAKFAST	
10:00am-10:15am	WELCOME	<b>Dawn M. Digrius</b> , Senior Project Manager, CSU STEM Collaboratives <b>Claudia Pinter-Lucke</b> , Associate Provost, Academic Programs and Professor of Mathematics, Cal Poly Pomona
10:15am-11:15am	Project Updates	<b>Demonstration Sites Updates:</b> (5mins each campus) How will your summer experience connect to fall? Who is your evaluator and what is their biggest concern?
11:15am-11:20am	Where We Are	<b>Ken O'Donnell</b> Observations on launch of cohort one
11:20am-12:00pm		<b>Charrette 1 (Teams Shuffled):</b> How will the student experience be different for those in STEM Collaboratives versus comparison groups?
12:00pm-1:00pm	LUNCH	
1:00pm-1:15pm	Undergraduate Research and Student Success	<b>Alexander Rudolph</b> , Professor of Physics and Astronomy, CAL Bridge and CAMPARE, Cal Poly Pomona
1:15pm-1:30pm	Pathways in STEM	<b>Stephanie Couch</b> , Bayer Executive Director, Institute for STEM Education Director, Gateways East Bay STEM Network
1:30pm-2:30pm		<b>Charrette 2 (Project Sort):</b> Are you ready to integrate? How will you know it worked?
2:30pm-2:45pm	BREAK	
2:45pm-3:00pm		<b>Highlight:</b> RISE, Cal State Channel Islands, Phil Hampton
3:00pm-3:15pm		<b>Highlight:</b> FUSE, Cal State Dominguez Hills, Matthew Jones
3:15PM-4:15pm		<b>Charrette 3 (Campus Sort):</b> Are you ready to integrate? How will you know it worked?
4:15pm-4:45pm		<b>Report of Charrette Sessions</b> , deliverables sent to <a href="https://docs.google.com/forms/d/1plwQS0MMz0QfAH_XhsUVT4-C5qrmF4CFHNP446YHXw4/viewform?usp=send_form">https://docs.google.com/forms/d/1plwQS0MMz0QfAH_XhsUVT4-C5qrmF4CFHNP446YHXw4/viewform?usp=send_form</a>
4:45pm-5:00pm	Wrap up	<b>Dawn Digrius</b> , Senior Project Manager, STEM Collaboratives
5:00pm-6:00pm	Poster Session	Progress of the CSU STEM Collaboratives Project
6:00pm-7:30pm	DINNER	
7:30pm-8:30pm	Game Night	Collaboration is Key

## CSU STEM COLLABORATIVE SUMMIT: MEETING AGENDA: APRIL 8th

TIME	TOPIC	SPEAKER
8:30am-9:00am	<b>Continental Breakfast</b>	
9:00am-9:15am	Welcome and Introductory Remarks	<b>Soraya M. Coley</b> , President, California State Polytechnic University, Pomona; <b>Zed Mason</b> , Interim Assistant Vice Chancellor, Research Initiatives & Partnerships, CSU Chancellor's Office
9:15am-10:15am	<b>Panel Discussion:</b> National Strategies in STEM Education and the Potential of the CSU System to Fill the State and Nation's Needs in STEM	<b>Geraldine Contreras</b> , LA Chamber of Commerce, Regional STEM Hub Manager <b>Stephanie Couch</b> , Bayer Executive Director, Institute for STEM Education Director, Gateways East Bay STEM Network <b>Ryan Kelsey</b> , Program Officer, Helmsley Charitable Trust <b>Lee Ann Kline</b> , President and Founder, STEM Advantage <b>Dr. James T. Minor</b> , Deputy Assistant Secretary, Higher Education Programs, U.S. Dept. Education
10.15am-10:30am	BREAK	
10:30am-12:00PM	<b>Charette:</b> <b>Small Group Discussions:</b>	<b>Topic:</b> Strategies and Investments needed to Improve STEM Outcomes: Campus based and System-wide
12:00pm-12:30pm	<b>Charette Report-OUT</b>	<b>Facilitators</b>
12:30pm-1:30pm	<b>LUNCH</b>	Buffet Lunch: Upper Level Dining Rooms
	<b>Afternoon Introductions</b>	<b>Susan Elrod</b> , Interim Provost, California State University, Chico.
1:30pm-2:00pm	The Enrollment Solution Bottleneck Initiative: Solving the D/F/W Problem	<b>JP Bayard</b> , Associate Director, System-wide Learning Design and Technologies, CSU Chancellor's Office <b>Kathy Fernandes</b> , Director Academic Technologies, CSU Chancellor's Office <b>Mariappan "Jawa" Jawaharlal</b> , Professor of Mechanical Engineering at Cal Poly Pomona
2:00pm-2:15pm	The CSU Student Success Data Dashboard: What it Tells Us About What and How We are Doing?	<b>Jeff Gold</b> , Senior Director, Academic Technology Services, CSU Chancellor's Office; <b>Audrey Hovannesian</b> , Associate Director of Assessment, CSU Chancellor's Office
2:15pm-2:30pm	CSU STEM VISTA	<b>Kristina Barger</b> , STEM VISTA Program Manager
2:30pm-2:45pm	<b>BREAK</b>	
2:45pm-3:45pm	Campus Break Out Sessions	Deliverables to be sent to a Google Docs site.
3:45pm-4:00pm	Wrap Up and Next Steps	<b>Dawn M. Digrius</b> , Senior Project Manager, CSU STEM Collaboratives, Chancellor's Office; <b>Ken O' Donnell</b> , Senior Director, Student Engagement and Academic Initiatives and Partnerships, CSU Chancellor's Office
4:00pm-6:00pm	Wine and Cheese Reception	Poster Session: Mountain Vista

## POSTER PRESENTATIONS.

Click [HERE](#) to view Posters.

- 1 First-Year Undergraduate Student Experience (FUSE). Matthew Jones, Angel Pu, Dr. Mohsen Behesti, Paz Oliverez, Sharon Lanaghan, Sheila Wood, Chris Torres. California State University, Dominguez Hills
- 2 Strengthening the Foundation for STEM Student Success. Claudia Pinter-Lucke. California State Polytechnic University, Pomona
- 3 Placed-based Learning Communities for Freshmen in STEM. Matt Johnson, Amy Sprowles, Angela Rich and Tracy Smith. Humboldt State University
- 4 ASCEND STEM: (Academic Success through Curriculum Enhancement and Nurturing to promote Degree completion in STEM). Robert A. Koch, David Bowman and Raman Unnikrishnan. California State University, Fullerton
- 5 CSU Channel Islands (CI) STEM Collaboratives Grant: Retaining, Inspiring, Supporting and Engaging RISE Students in STEM at CI. P. Hampton, S. Aloisio, H. Baker, Bourgeois, M. Francois, B. Gillespie, J. Leafstedt, J. Miller, A. Robles, C. Sackerson, L. Sanchez California State University, Channel Islands
- 6 CSU STEM Collaboratives Project: Fresno State Demonstration Site. Andrew Lawson, Mara Brady, Jai-Pil Choi, Madhusudan Katti, Pete Van de Water, Beth Weinman, Whitney Menefee, and Jaime Arvizu. California State University, Fresno
- 7 FYrE@ECST: Commit to Excellence. Belong to Community. Emily Allen, Frances Hidalgo, Eva Schiorring, Mark Tufenkjian, Deborah Won. California State University, Los Angeles
- 8 CSUEB's SUCCESS Program (Supporting Undergraduates through Collaboration, Care, and Empowerment to Succeed in STEM). C. Inouye, E. Wildy, D. LeDuc, A. Richardson, E. Yeager, T. Smith, and S. Couch. California State University, East Bay
- 9 (STEM)2--Strengthening Transfer Education & Matriculation in STEM. Maria V. Dela Cruz, Felipe Salazar, Sam Barrozo, Diana Serna California State University, Fullerton.
- 10 Warriors on the Way to Stem. J. Cruthird A. Guzman, V. Parra. California State University Stanislaus
- 11 Central Valley Math and Science Alliance. J. Cruthird, H. Stanislaw, J. Youngblom. California State University Stanislaus

- 12 Connecting Latino Students to a Culture of Research to Increase Academic Performance and Retention in the Major. E. R. Marinez, G. Galvez, N. Gatdula, S. Gomez Zwiép, A. Monge. California State University Long Beach
- 13 Developing New Engineering Degree Options for Underserved Hispanic Students in the Southern San Joaquin Valley. Y. Ampatzidis, L. Cabrales, A. Houtman, D. Saini, and J. Talamantes (PD). California State University, Bakersfield
- 14 Project Acceso: Achieving a Cooperative: College Education Through STEM Opportunities. P. Hampton, C. Wyels, C. Romero, D. Rodriguez, L. Profant, L. Knudson, A. Flores, R. Cartwright, S. Birmingham, and C. Bake. California State University, Channel Islands
- 15 CSU Monterey Bay's HSI STEM & Articulation Program. W. D. Head, and H. E. Unruh. California State University, Monterey Bay
- 16 Promoting Success for Under-Represented Transfer Students at CSU Northridge. R.G. Ryan, N.R. Durdella, and C. Lawrence. California State University, Northridge
- 17 HSI Web Portal. Tatevik Sardaryan, Felix Villa, Paulo Osuna, Edwin Salazar, Sergio Gonzales. California State University, Northridge.
- 18 SF BUILD: Enabling Students to Represent in Science. A. Ben-Zee,, T. Baird, T. Chitewere, C. Domingo, K. Bibbins-Domingo, and L. Márquez-Magaña. San Francisco State University and University of California, San Francisco
- 19 An Innovative Approach to Recruit and Retain Historically: Underrepresented Students in Engineering. Cordelia Ontiveros, Gerri Cole, Nicole Gutzke, and Jaklen Keshishyan. California State Polytechnic University, Pomona
- 20 Using an Urban Agriculture Community-Based Research: Project to Enhance Student Learning in STEM. Sara E. Johnson and John Bock. California State University, Fullerton
- 21 Integrating STEM into K-8 Teacher Preparation: Fresno State's Liberal Studies STEM Concentration. California State University, Fresno
- 22 Mathematics and Science Teacher Initiative. California State University, Fresno
- 23 Connecting Science Learning for Future Teachers: Applying and Assessing the Three Dimensions of the Next Generation Science Standards in Teacher Preparation Courses. Fred Nelson, Mara Brady. California State University, Fresno
- 24 Virtual Labs for General Education Biology. Robert Desharnais, Paul Narguizian, & Ji Son. California State University, Los Angeles

- 25 Developmental Math program. Hongde Hu. California State University, Monterey Bay
- 26 PRISM: CSUSB Strengthening the Scientific Workforce. Sally McGill, Rachel Weiss, Paul Dixon, Kim Cousins, Min-Lin Lo, Kerstin Voigt, and Rollie Trapp. California State University, San Bernardino
- 27 Stepping Up STEM at San Francisco State: An Integrated Freshman Year Experience to Increase and Retain STEM Majors. Jeremy Qualls, Martha Shott, Nathan Rank, Lynn Stauffer. Sonoma State University
- 28 MENTORES: Mentoring, Educating, Networking and Thematic Opportunities for Research in Engineering & Science. Behnam Bahr and Lily Gossage. California State Polytechnic University, Pomona
- 29 Assessment of Student Preparation for Calculus-based Mechanics. Michelle Lagana, Monika Kress, Cassandra Paul, Andrew Reid, Michael Kaufman, Olenka Hubickyj. San Jose State University



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# AN INNOVATIVE APPROACH TO RECRUIT AND RETAIN HISTORICALLY UNDERREPRESENTED STUDENTS IN ENGINEERING

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## ABSTRACT

Research shows that the number of women pursuing degrees in STEM (Science, Technology, Engineering, and Math) fields is disproportionately less than the number of men pursuing degrees in the same fields.<sup>(1-2)</sup> Cal Poly Pomona Women in Engineering (CPP WE) seeks to do its part in countering this disparity by engaging all men and women within the College of Engineering for the purposes of recruiting, retaining, and graduating greater numbers of female students.

CPP WE focuses on four objectives: 1) engaging students through K-12 outreach activities for young women to increase awareness of and exposure to multiple engineering programs and their great impact on society; 2) providing a welcoming environment for prospective students to learn about College of Engineering and Women in Engineering programs; 3) retaining and graduating current female students by fostering a supportive community and enriching their experiences within the College of Engineering; and 4) creating a supportive network of alumnae to provide mentoring to current female students and to increase career and internship opportunities for students.

This study will examine in greater detail the efforts of CPP WE as it pertains to objective 3. CPP WE strives to achieve these goals by providing program activities such as WE Chat, a program that provides female students within the College of Engineering opportunities to have lunch with female faculty from their respective departments in order to engage them in conversations about their career paths to engineering, challenges they faced, and advice to women pursuing engineering degrees.

Data from WE Chat post-surveys from 2013 - 2015 indicate the following results: 1) female students of all year levels attend WE Chats; 2) female students have increased levels of confidence as a result of attending WE Chats; 3) female students have a desire to seek out the faculty hosting WE Chats as mentors; 4) female students have an increased knowledge of the lives and careers of faculty members who participate in WE Chats; and 5) female students have a desire to attend more events hosted by CPP WE.

As one of the largest engineering colleges in the nation, Cal Poly Pomona is positioned to make a significant impact in increasing the number of women in the engineering workforce. The efforts of CPP WE programs, such as WE Chat, play a vital role in retaining female engineering students as these programs create environments conducive for female students to thrive in the classroom and beyond in their careers.

1. Burke, R.J., 2007. *Women and minorities in STEM: A primer*, in: Burke, R.J., Mattis, M.C. (Eds.), *Women and minorities in science, technology, engineering and mathematics*. Edward Elgar Publishing Inc., Northampton, MA, pp. 3-27.

2. Hughes, R.J., 2010. *Keeping university women in STEM fields*. *International Journal of Gender, Science and Technology*. 2(3), 416-436.

CPP WE is supported by Edison International and the Kellogg Legacy Project Endowment Fund.

## **A MULTI- METHOD INVESTIGATION OF THE SITUATIONAL CUES AND CONTEXTS INHIBITING WOMEN IN STEM SETTINGS**

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### **ABSTRACT**

The proposed research, based on a contextual approach to studying social identity threat will examine the hypothesis that subtle situational cues, such as numerical representation, gender segregation, and an institution's motivational orientation affect women's aspirations, persistence, and performance in STEM majors and careers. We will also explore the causal mechanisms through which these cues influence outcomes. This research program will offer practical guidance to universities that seek to develop interventions that will create equitable and inviting STEM educational environments. Cal Poly will continue to collect pilot & follow-up survey data.

Sponsors: *National Science Foundation*

## **CSU SCIENCE TEACHER AND RESEARCHER (STAR): STRENGTHENING K-12 SCIENCE TEACHING IN CALIFORNIA**

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### **ABSTRACT**

<sup>1</sup>The California State University (CSU), with the leadership of California Polytechnic State University, San Luis Obispo (Cal Poly) and its Center for Excellence in Science and Mathematics Education (CESaME), propose to continue and expand its nationally significant Science Teacher and Researcher (STAR) program. The STAR program attempts to address the severe shortage of well-qualified science teachers in California and the nation by creating a prestigious dual professional pathway that engages pre-service and early career educators both as scientists and as teachers of science. The program derives from the work of the Business Higher Education Forum (BHEF) and its science, technology, engineering, and mathematics (STEM) initiative, co-chaired by Warren Baker, President of Cal Poly.

Sponsors: *S. D. Bechtel, Jr. Foundation.*

## STEM-UP INITIATIVE

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### ABSTRACT

Great Minds in STEM (GMiS) in partnership with CSULA, United States Patent & Trade Office, USC Keck Medical Facilitates and the California Science Center will share STEM resources through a variety of collaborative activities , dialogues and other interactions. The summer STEM training for educators will have the mission of building capacity in technology and engineering medical & medicine education. This collaboration intends to improve the understanding of the learning and teaching of elementary, middle, and high school students and teachers as they gain knowledge and apply engineering design processes to technological problems and best practices. This summer weeklong course is design for educators interested in integrating STEM and medicine into their lesson plans.

The objectives of this training program is to: assist and guide elementary, middle and high school educators and Administrators in learning and adopting new pedagogic approaches, as well as the STEM in medicine and future medial technologies; provide a forum and platform where by educators can learn how to integrated hands on approaches that resonate with the newest science standards as articulated in the Next Generation of Science Standards for Students and Tomorrows Workforce as well as Common Core Curriculum; inform educators on the impact of the current state of STEM education & medical resources and the STEM workforce on global economic competitiveness; and provide access to resources reflective of the current technologies and advancements in STEM in particular in medicine and medical advances. Additionally, this project aims to increase the awareness and interest of students entering in STEM education including but not limited to medical careers, and increase the awareness of educators as it relates for USPTO STEM careers and opportunities for students.

This week long workshop series will give educators a wider cultural conscientious of what STEM means in education. Resources at this workshop will provide educators with techniques currently available, and will teach educators how to integrate and implement STEM in their classroom. Pedagogy, definition, curriculum development, examples math and science curriculum, careers, and hands-on activities and active learning will be covered during this workshop, as well as research activities in the classroom. There will also be a several technical tours that occupy STEM workforce and STEM awareness.



# CSULA - SUMMER TRANSPORTATION INSTITUTE

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## ABSTRACT

Cal State LA University Auxiliary Services, Inc (UAS) is pleased to host the 15th annual non-residential Summer Transportation Institute (STI) program with a total of 45 high school student participants.

### Program Objectives

The Institute is designed to stimulate and sustain interest in transportation for the secondary school students in order to increase the numbers who choose a career in the transportation industry. The CSLA-STI designs the following behavioral objectives to be achieved by student participants:

1. Explore career opportunities in the transportation industry;
2. Comprehend the past, present, and future direction of transportation;
3. Investigate sources of energy and their environmental impact;
4. Identify methods of moving people and cargo;
5. Identify users and providers of transportation systems;
6. Recognize the many devices and methods used to manage transportation systems;
7. Explore the areas of transportation safety;
8. Recognize the linkages between transportation systems;
9. Explore the importance of construction engineering issues in transportation;
10. Study the applications of current research technology to the transportation industry.

The CSLA Summer Transportation institute is developed through the cooperative effort of California State University, Los Angeles, Federal Aviation and Administration (FAA) and several other public and private agencies. In the past thirteen years the orientation and closing programs was always well attended by the participants and their parents, faculty and university staff. CSLA/UAS has always accomplished its goal of meeting the STI objectives to stimulate transportation career interest in secondary school students. The university has a continuing commitment to provide quality educational opportunities and seeks to expand its efforts to assist young students.

## EXPANDING OPPORTUNITIES FOR PRE-HEALTH PROFESSIONALS

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### ABSTRACT

California State University, Los Angeles (Cal State LA) HCOP is designated as a Comprehensive Program that was first implemented over 25 years ago in 1984. Since that time, it has served more than 1700 disadvantaged pre-health professional students using a comprehensive approach to mitigate the disparities observed in healthcare access and delivery. Between 1990 and 2009, over 784 Cal State LA students matriculated into a wide array of (allied) health professional programs. As evidence of our continued commitment to the underserved, in 2009, 61% of Cal State LA students accepted to US medical schools came from groups underrepresented in the health professions.

The Cal State LA HCOP objectives use an extensive educational pipeline approach that is focused on East Los Angeles where the number of neighborhoods classified as extremely poor rose by a staggering 80% between 1990 and 2000.

The pipeline provides interventions that begin in middle school with a proven successful Saturday Academy for grades 6-10. Upon completion of 10th grade, HCOP alumni go on to participate in a residential summer intensive program. They attend SAT preparation workshops and participate in science enrichment courses typically encountered in the first year of a pre-health professional curriculum. After graduating high school with an improved GPA, the students continue in the pipeline by attending Cal State LA to begin their pre-health professional academic career. At Cal State LA the students find a welcoming, rich, multi-cultural environment (85% minority) in a University that ranks 12th in the nation for the number of baccalaureate degrees awarded to minority students (Black Issues in Higher Education, 2004) and 3rd in California with respect to Hispanic B. S. graduates.

As undergraduate HCOP participants, they participate in a host of activities, including a rigorous science-oriented summer enrichment program, year round academic advisement, standardized test preparation workshops, clinical volunteering, an academic research experience, and application support services. Students, who gain acceptance to health professional schools, then participate in an intensive pre-matriculation.

# CA MATHEMATICS AND SCIENCE PARTNERSHIP (CAMSP): SALINAS CITY ELEMENTARY MATHEMATICS AND TECHNOLOGY PARTNERSHIP

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## ABSTRACT

The Salinas City Elementary Mathematics and Technology Partnership (SCEMATP) will unite K-5 educators from Salinas City Elementary School District (CSESD) with faculty in both mathematics and technology at California State University, Monterey Bay (CSUMB) as well as members from Monterey County Office of Education (MCOE) in a partnership to infuse technology into the mathematics curriculum using both cutting edge technology and pedagogical training. The main goal of the SCEMATP project is to improve teacher pedagogical knowledge of mathematics and technology instruction to develop and evaluate lessons that support open-ended problem solving, inquiry based, and project-based methods of query, investigation, exploration, application and communication. In order to meet this goal, we will:

- **Build strong Professional Learning Communities (PLC)** that unite K-5 educators, administrators, and faculty from CSUMB in the common goal of improving student learning;
- **Motivate and excite teachers** to use technology in their mathematics instruction;
- **Develop a sustainable collection of online resources** to share best practices, solve common issues, and improve student performance;
- **Collect and utilize data** to continue to refine classroom practices centered around technology and mathematics instruction.

# PROJECT LEAD THE WAY CALIFORNIA AND THE CSU SYSTEM

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## ABSTRACT

Five CSU campuses (Cal State Chico, Cal State East Bay, San Jose State, Cal Poly Pomona and San Diego State) are currently partnered with Project Lead The Way (a National non-profit organization) to support more schools and teachers (through teacher training, admissions, student engagement, etc.) than any other University or University system in the U.S. Project Lead The Way (PLTW) is a national program that provides curriculum and support to schools offering K-12 STEM programs and high school career pathway programs in engineering, biomedical science, and computer science. It is currently taught in over 7,500 schools nationwide. The curriculum has been developed and continuously reviewed and refined by K-12 teachers, experts from business and industry, university partners, and the PLTW curriculum staff. The CSU partnership has trained over 2,900 STEM teachers in 755 school programs (245 CA school districts) with a K-12 student enrollment of over 59,000 this year. The California PLTW program is the largest in the nation. Currently, ten CSU faculty are directly involved in the PLTW programs, some serve as instructors in the summer teacher training sessions.

The program has benefited not just SDSU but the other CSU engineering campuses by helping to create better educated and prepared students going into their professional education. Over 25% of the students entering engineering at Cal Poly Pomona are from PLTW high schools, at SDSU that number is 20%. The supporting campuses have also been successful in engaging their business supporters in their STEM efforts. SDSU partnered with PLTW thirteen years ago to initiate a formal partnership for statewide awareness and support for the program. The aforementioned CSU campuses, as the State Affiliates for the PLTW, are responsible for teacher training, information dissemination, professional development of teachers, school certification, industrial and private sector partnerships, and general support for the school programs in California. In addition, some of the CSU affiliates offer admissions preference and scholarships to incoming students

## SUMMER TRANSPORTATION INSTITUTE 2014

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### ABSTRACT

San Jose State University proposes to conduct its eleventh annual Summer Transportation Institute (STI) during the dates of June 30 and July 25, 2014. STI will be offered as a 4-week/5 day non-residential class for high school students (rising 10th through 12th graders) on the campus of San Jose State University, San Jose, California. The STI is organized and run by the Mineta Transportation Institute (MTI), a national transportation policy studies organization established by Congress in 1991. In 2012, the SJSU/MTI program involved a total of approximately 30 high-school students officially enrolled in the program, 94% of which represented Hispanic and Asian ethnicities.

## MESA ENGINEERING PROGRAM.

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### ABSTRACT

The goal of the MESA Engineering Program at San Jos State University is to increase the number of high caliber college graduates entering the engineering profession from educationally disadvantaged backgrounds. MEP creates opportunities for its students and prepares them for entering professions requiring degrees in engineering.

Existing services will be improved and maintained and MEP will focus its energy on the following additional goals for 2011-2014.

Provide leadership and professional development opportunities to MEP, SOLES SWE and BASE by their increased involvement with the Industry Advisory Board (IAB).

Increase the number of MEP freshman utilizing tutoring services in the areas of English, Science and Math.

Increase SJSU MEP visibility

Increase the number of scholarships for SJSU MEP students

## MESA ENGINEERING PROGRAM.

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### ABSTRACT

The goal of Mesa Engineering Program is to increase the number of high-caliber, industry ready graduates completing degree in Engineering and/or Computer Science at San Jose State University. Through coordination, facilitation and promotion of academic, professional and personal development activities and services, MEP creates opportunities for continued student growth and development as they prepare for entrance into professions requiring technology-based degrees.

The main program priorities for 2014-15 are:

- 1 - Information Systems: Improve existing processes and data management systems as a means of facilitating the generation of performance reports and program evaluations as well as meeting MESA and Institutional data requirements.
- 2 - Networking and Professional Development: Coordinate and facilitate increase interaction of MEP participants with local industry and industry professionals by establishing partnerships with local industry in support of MEP services and activities.
- 3- Peer Advising and Mentoring: Restructure existing peer advising services and increase involvement of the entire MEP community through implementation of a peer mentoring program.

## MESA Engineering Program

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### ABSTRACT

1. Senior Biomedical Engineering student, Kyle Soder under the supervision of the PI, will serve as Entrepreneurial Lead (student) on this project. Kyle is the inventor and designer of an original idea which he will be developing during this grant.

2. Senior Biomedical Engineering student, Aneshkumar Tilwani, under the supervision of the PI, will serve as Entrepreneurial Lead (student) on this project. Aneshkumar is the inventor and designer of an original idea that he will be developing during this grant.

3. The purpose of this project is to market a personalized cancer diagnostic tool that is a cheaper, more accurate, and less invasive way to improve early detection of prostate cancer by detecting the material selected directly from cancerous cells into the urine. A'Lester Allen will serve as the Entrepreneurial Lead Student on this project under the direction and mentorship of Prof. Erogbogbo. A'Lester Allen will serve as the Entrepreneurial Lead Student on this project under the direction and mentorship of Prof. Erogbogbo.

4. The purpose of this project is to manufacture and create a prototype of a clear UV protection thin film, which can replace sunscreen. This film will have the ability to protect harmful chemicals and dust that can penetrate inside the skin.

Alina Lim will serve as the Entrepreneurial Lead Student on this project under the direction and mentorship of Prof. Erogbogbo.

## MATH, ENGINEERING, SCIENCE ACHIEVEMENT MESA

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### ABSTRACT

The Statewide Mathematics, Engineering, Science Achievement (MESA) Program, housed at the University of California Office of the President in Oakland, has developed a model for helping educationally disadvantaged students successfully complete a college-preparatory, math-based plan of study in order to be competitively eligible for admittance into selective four-year institutions and major in math-based majors like engineering.

SJSU, as a subawardee, is collaborating with Gavilan Community College to increase STEM degrees, increase the number of Hispanic and low income students attaining degrees in the STEM fields, and create a model for Transfer/Articulation.

## **THE CSUSM STEM CENTER AND ASSOCIATED STEM SUPPORT PROGRAMS#**

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### **ABSTRACT**

CSUSM has employed both internal and external resources to develop, implement, and sustain a comprehensive suite of high-impact support programs for CSUSM Science, Technology, Engineering, and Math (STEM) students. These efforts have a locus in a STEM Center, a campus site that provides 35-hour a week drop in-tutoring for students in STEM gateway courses and now has over 10,000 student visits annually (roughly 800 distinct students). Associated activities include supporting STEM faculty in bringing new pedagogical practices to STEM classrooms via an Active Learning Pedagogy Support program (ALPS) and Supplemental Instruction (SI) for many STEM courses. Pedagogical innovations have been further supported through a Learning Assistant program – a program that takes high achieving students who have completed a STEM course and returns them to that course to help the instructor implement innovative pedagogies. Lastly, the STEM Center is also a hub for a STEM Ambassador program that uses high-achieving CSUSM STEM students to provide STEM specific outreach to the local K-12 population and community colleges.

# Supported in part by National Science Foundation STEP Grant #1068477, PhysTEC, and CSU MSTI Program

## **CAL POLY PEEPS: PROGRAM FOR ENGINEERING EXCELLENCE FOR PARTNER SCHOOLS**

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### **ABSTRACT**

This project will provide for up to 12 scholarships per year to academically talented students with financial need from the Cal Poly Partners program that are majoring in Science, Technology, Engineering and Mathematics (STEM) programs. The primary objective is to increase the numbers, and accelerate the rate of students graduating in STEM fields.

*Sponsors:*

*National Science Foundation (S-STEM)*



## THE INTEGRATED MIDDLE SCHOOL SCIENCE (IMSS) PARTNERSHIP

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### ABSTRACT

The Integrated Middle School Science (IMSS) Partnership is a collaborative project that is developing, implementing, and studying a comprehensive middle school science teacher professional development (PD) model. The IMSS Partnership was established by an \$11.97 million grant from the National Science Foundation in October 2010 and is funded for five years. The lead institution is CSU East Bay and the primary partner is the Alameda County Office of Education (ACOE). IMSS consists of a variety of other partners including county offices of education, administrators and teachers from up to 10 school districts, and other institutions such as the California Science Project and the Exploratorium.

The main five strands of IMSS include:

1. Teacher leadership development where teachers take on facilitation roles for PD, Lesson Study, curriculum design and instructional coaching (gradual release model);
2. District-based PD that provides a structure to build collaboration among teachers through professional learning during the school day regarding NGSS and CCCSS;
3. Intensive PD during summer institutes and Saturday workshops at CSU East Bay where teachers continue to deepen their science and pedagogical content knowledge.
4. Lesson Study where teachers collaborate to gain insight into instructional practices;
5. Leadership Institutes where district teams (composed of administrators and teachers) meet to plan how to support science instruction, implement reform measures, and align resources.

Designed to transform middle school science teaching and learning, IMSS focuses on schools that serve predominately low-income, underrepresented minority students. Our goals include increasing the quality of middle school science instruction (aligned with NGSS), facilitating sustainable institutional change in our partners to support science instruction, and studying the impact of the partnership on students, teachers, and institutions. Since its formation, IMSS has developed more than 50 teacher leaders at 34 school sites in 10 districts in the San Francisco Bay area. In 2013-14, we provided more than 11,000 hours of professional development for 230 middle school science teachers that impact more than 28,000 students.

The IMSS Partnership is funded as a Targeted Math-Science Partnership by the National Science Foundation under grant number DUE-0962804 to CSU East Bay. Additional funding for the IMSS Partnership comes from continuing support from the California Science Project to the East Bay Science Project at CSU East Bay.

**CALIFORNIA STATE UNIVERSITY EAST BAY**  
**MATHEMATICS SCIENCE ENGINEERING ACHIEVEMENT PROGRAM**

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**ABSTRACT**

Founded in 1970, the Mathematical Science and Engineering Achievement Program (MESA) has supported educationally disadvantaged students so they can excel in math and science studies and graduate with baccalaureate degrees in math- and science-based fields. To the extent possible by California law, MESA emphasizes participation by students from groups with low eligibility rates for four-year institutions.

Today MESA serves 20,299 K-12 students, 4,707 community college students and 3,186 university students. MESA began operating at California State University East Bay (CSUEB) in 2007 and quickly grew to serve West Contra Costa because of the high need among students in that district. The CSUEB MESA Schools Program (MSP) today serves 1,200 students at 23 elementary, middle and high schools in Contra Costa and Alameda County.

MESA's model includes innovative, interactive curriculum, structured professional development and training activities for K-12 math and teachers and planned activities throughout the year for their students. The curriculum is grounded in a STEM-based engineering design process by which students design, fabricate and field test basic scale model machines and devices and enter them into competition against one another. It is designed to motivate, excite and instill confidence in students to pursue their STEM studies, complete high school and college, and enter a successful career. Other elements of the program include assistance with test preparation, academic advising, introduction to college life, group study courses, academic planning and corporate-driven volunteering, mentoring and sponsorship.

Acknowledgement:

MESA is funded by the University of California Office of the President, California State University East Bay College of Science, and private and corporate grants.

## **PROJECT ACCESO: ACHIEVING A COOPERATIVE COLLEGE EDUCATION THROUGH STEM OPPORTUNITIES**

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### **ABSTRACT**

As part of a Title V HSI-STEM grant (P031C110161) from the Department of Education, CSU Channel Islands (CI) is collaborating with its regional community colleges (educational partners) to achieve four goals: (1) to increase the number of Hispanic and low-income students who are succeeding in and graduating from STEM majors at CI; (2) to increase the number of Hispanic and other low-income students interested in pursuing a bachelor's degree in STEM; (3) to develop and disseminate model transfer and articulation agreements between CI and its educational partners; and (4) to assist Hispanic and other low income students in their development of critical STEM skill sets including critical thinking, analytical reasoning, scientific literacy, and interdisciplinary communication.

Project ACCESO was funded in Fall 2011 and over the past three years, we have implemented project services designed to address four activity areas:

1. Improving the CI Campus' Capacity for STEM Instruction and Research
2. Enhancing STEM Student Success
3. Providing STEM Research Opportunities
4. Widening the STEM Pipeline through P-14 STEM Outreach

CI has seen a 50% growth in the number of STEM majors on campus since Fall 2010 to Fall 2013, which resulted from a 100% increase in the number of students who are Hispanic or low-income (target population) while the non-target student population remained nearly constant (6% increase). Prior to Project ACCESO, target students showed significantly lower gateway STEM course pass rates (target 75% vs. non-target 82%) and lower STEM GPA (target 2.576 vs. non-target 2.772). Project ACCESO has implemented a range of STEM Student Success Services including STEM Tutoring, Peer-Led Team Learning, and a pre-first-year Summer Scholars Institute. The grant provided over 4500 hours of STEM tutoring in grant year 3 (Fall 2013 – Fall 2014) to 650 unique STEM students.

## LONG BEACH BRIDGES TO THE BACCALAUREATE (LB3) PROGRAM 2014-2019

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### ABSTRACT

In order to meet the increasing demand for highly trained human resources in STEM, our nation must provide outstanding education and training in the associated technical disciplines. The literature indicates that there is great potential to help meet these demands by engaging and supporting the development of students from underrepresented and underserved (UR/US) backgrounds. For UR/US constituencies, community college (CC) serves as a critical gateway to eventually completing baccalaureate degrees and graduate programs. Long Beach-area CCs are some of the most ethnically and culturally diverse in the nation, and represent an outstanding pool of potential talent upon which to develop professionals and leaders in the STEM workforce. California State University, Long Beach (CSULB) is also one of the most diverse universities in the nation, and well recognized for its academic excellence. By partnering with Long Beach City College (LBCC) and Cerritos College (Cerritos), the proposed work takes advantage of this special opportunity to pursue mechanisms that are effective in promoting, supporting, and preparing students from UR/US groups to be successful in the key developmental stages between CC and successful attainment of baccalaureate degrees. Using a highly student-oriented and vibrant research environment at CSULB as a center-point, and substantial experience in effective student development programs, this partnership's overall objective is to increase the number of UR/US students choosing and successfully completing baccalaureate degrees in the biomedical and behavioral sciences, and to foster their pursuit of related advanced degrees and career goals. This Long Beach Bridges to the Baccalaureate (LB3) Program has four specific aims, as follows:

- 1: Actively recruit and engage LBCC and Cerritos students and their families to provide them essential information about educational pathways and career opportunities within biomedical and behavioral sciences, and facilitate their approach and success in university transfer.
- 2: Develop research and academic science skills and interests in UR/US students, beginning at the CC level, to enhance their success in transitioning to university and in completing baccalaureate degrees in the biomedical and behavioral sciences.
- 3: Strengthen the relationship between the CSULB, Cerritos and LBCC science programs, to improve integration of curricula and training opportunities for students pursuing biomedical and behavioral degree areas, facilitating a more "seamless" transition to the university.
- 4: Increase the number of UR/US students from LBCC and Cerritos applying and transferring to CSULB or other baccalaureate programs in biomedical and behavioral sciences, and increase their retention and graduation rates.

# TRANSFORMING OPEN-ACCESS COLLEGES AS A PATH TO UPWARD MOBILITY THROUGH COHORT BASED DEGREE PROGRAMS

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## ABSTRACT

California State University Monterey Bay and Hartnell College have designed and implemented a cohort-based, accelerated Bachelor of Science degree program in Computer Science that aims to remove administrative barriers, provide targeted academic support, and instill high expectations and grit to enable traditionally underrepresented students to succeed and excel in STEM. This represents a new model for bachelor's degree completion centered on cohort learning communities, community college/university partnership, and clearly defined course pathways as mechanisms for improving enrollment, retention, transfer, graduation and post-graduation placement.

The initial cohort began in fall 2013. Cohort 3 started pre-college math and computer science preparation and will begin courses in fall 2015. Enrollment for cohort 1 is 27 students, cohort 2 is 28, and cohort 3 is 36. Demographic makeup is 80% first generation, 80% Hispanic, and 35.4% female. While students primarily take courses at Hartnell for the first half of the program and at Cal State Monterey Bay for the second half, they are integrated into both campuses through cross-enrollment and cohort enrichment activities.

To date, results are as follows:

- **Transfer rate:** 27 out of 32 cohort 1 students transferred from Hartnell to Cal State Monterey Bay, compared to the typical, non-cohort CS transfer rate of 3 students per year.
- **URM Graduation:** In spring 2015, 1/6 of Hispanic and 1/10 of women CSU CS graduates are estimated to come from Cal State Monterey Bay, compared to spring 2014 when only 1/30 of all CS graduates came from Cal State Monterey Bay.
- **Graduation rate:** Cohort 1 is on track to achieve a 3.5-year graduation rate of 84%.
- **Academic quality:** For summer 2015, multiple students are being considered for or have secured internships at Apple, Cisco, Facebook, Salesforce, and Uber.
- **Degree cost to student/family:** Through community college/university partnership and a pre-defined degree pathway that results in on-time graduation, total tuition and fees is under \$15,000.

Future efforts will focus on **continued, data-driven improvement of academic quality** with the goal of graduates who are able to compete with students from any top computer science program in the country for jobs and post-graduate academic opportunities. Additionally, significant effort will go into implementing **institutional changes that will sustain and expand accessibility to program elements**, allowing for impact on a broader student base.

## Acknowledgments

This project is supported by awards from the National Science Foundation (STEP award #1317649), the Matsui Foundation, and the Monterey Peninsula Foundation. Any opinions, findings and conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of these organizations.

## CSU MONTEREY BAY'S HSI STEM & ARTICULATION PROGRAM

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### ABSTRACT

CSU Monterey Bay's program under the U.S. Department of Education's HSI STEM and Articulation grant capitalizes on CSUMB's new and rapidly growing STEM majors and minors. Within the scope of the grant the university has launched a new B.S. degree in Marine Science, developed new minors in Chemistry and Statistics, fortified young majors in Biology and Computer Science, and restructured its Environmental Science, Technology & Policy B.S. degree.

**Undergraduate research:** The high impact practice of undergraduate research is a cornerstone of the program and is housed in CSUMB's newly formed Undergraduate Research Opportunities Center (UROC). UROC's mission is to build students' educational ownership, intellectual vibrancy, and scholarly identity. UROC achieves this through mentored undergraduate research; rigorous, authentic, and calibrated scholarly activities; and the development of intellectual, personal, and social capital. From modest beginnings, UROC now has 8 staff members, 5 of whom are funded by the university. The campus also provides permanent office and classroom space in the university's library, which is the student hub of campus. The matching endowment element of our grant has grown to \$1.5 million with a \$2 million goal by the end of the grant, and a \$10 million ultimate goal.

**Curriculum:** Early phases of the grant focused on curricular efforts to develop and enhance individual STEM courses, and to solidify connections between and among courses. Growth and innovation continue at the major, minor, and program levels. The Computer Science and Information Technology (CSIT) major is now aligned with current industry and national standards. Statistics faculty developed three courses for the new minor, as well as an online statistics modules and a virtual textbook. Faculty from the Division of Science and Environmental Policy (SEP) collaborated on a model bioreactor, which uses bacteria and vegetation to remediate agricultural runoff. The reactor is being used for faculty and student research in biology, ecology, and chemistry.

**Writing:** We are piloting a workshop for faculty using CSUMB's shared writing criteria as a mechanism for responding to student writing. At the student level, we are testing the use of Calibrated Peer Review, a web-based tool that improves the quality of peer feedback while reducing faculty instruction time. We have also developed a Writing Fellows program that trains upper division students to serve as writing instructors and reviewers for lower division students. UROC's Writing and Professional Communication Associate has designed an innovative online summer writing support course to help students develop their written voice and audience awareness, and is working with faculty to develop in-class writing modules.

**Community College Transfer and Articulation:** In response to the rapid evolution of CSUMB STEM majors and minors, we are developing Degree and Career guides for community college students, particularly those from our regional community colleges. The guides will describe CSUMB's STEM majors, highlight career opportunities, and lay out CSUMB course pathways. We have ongoing major initiatives focused on improving community college transfer transition into STEM majors at CSUMB and in strengthening connections with community colleges, spearheaded by UROC's Outreach Coordinator.

**Best Practices and Program Findings:** The program is communicating best practices and program findings related to mentor preparation, faculty engagement, undergraduate research, social capital, and the use of technology and writing interventions to support traditionally underrepresented students in STEM.

# **TRANSFERRING STEM STUDENT SUCCESS THROUGH THE PASS GO PROGRAM: A HIGHER EDUCATION COLLABORATION IN CALIFORNIA'S INLAND EMPIRE**

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## **ABSTRACT**

PASS GO, a five year Title III grant program from the U.S. Department of Education, has served students and supported wider institutional efforts at California State University, San Bernardino (CSUSB) in collaboration with San Bernardino Valley College (SBVC). There is a pressing need to educate residents as only 28.5% of Inland Empire high school graduates completed coursework necessary to enroll in state universities compared with 35.2% in California (1).

PASS GO seeks to increase the number of Hispanic and/or low income students obtaining degrees in Science, Technology, Engineering, and Mathematics (STEM) fields and affirm articulation agreements between 2-year Hispanic-serving institutions and 4-year institutions in these fields. The program supports students through expanding and strengthening the STEM pipeline and building a bridge for SBVC's STEM students to succeed as CSUSB STEM majors. Program activities at CSUSB include: offering Academic Career Education (ACE) workshops, career counseling, and assessment to increase students' knowledge of STEM career options and soft skills; placing students in STEM-based internships; providing study marathons in specific STEM courses; and affirming five STEM articulation agreements.

Many objectives have been accomplished in three program years. Faculty from CSUSB and SBVC reviewed articulation agreements in Biology, Chemistry, Computer Science, Math, and Physics. Twelve STEM study marathons have increased the number of hours students spend preparing for exams and improve students' confidence. Seven CSUSB students who attended SBVC returned to SBVC to provide Supplemental Instruction support, further strengthening the bridge between the institutions. Sixty one students have been placed in STEM internships—students are highly satisfied with internship experiences and agree they are both better prepared for the workforce and also have strengthened their learning experience through the internship. Intern supervisors are highly satisfied with the interns' performance; several students have secured employment from their sites. Half of SBVC STEM transfer students met with a counselor and many have completed ACE modules for career soft skills training. Longer-term outcomes (increasing student retention, persistence and graduation rates in STEM) will be assessed in 2016 at the end of the grant.

*1. Moore, C., Shulock, N., 2006. State of decline? Gaps in college access and achievement call for renewed commitment to educating Californians. California State University, Sacramento, Institute for Higher Education Leadership & Policy.*

## CENTRAL VALLEY MATH AND SCIENCE ALLIANCE

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### ABSTRACT

The Central Valley HSI STEM Articulation and Transfer Project at California State University, Stanislaus supports the Central Valley Math and Science Alliance (CVMSA). CVMSA is a coalition of 13 faculty, 6 staff, and about 130 students annually. Programming fosters diverse faculty-guided scientific research and mentoring experiences in Biology, Chemistry, Computer Science, Geology, Mathematics, and Physics. Interventions are designed to strengthen and expand high-impact practices targeting Hispanic/first generation and low income STEM student representation, engagement, retention, and graduation.

CVMSA Faculty Mentors receive reassigned time along with travel and research support to increase discipline immersion for student participants. The Commons, a Science and Math Resource Center, serves as a one-stop resource for all science and technology majors seeking peer and academic support. The location is staffed with Peer Mentors and STEM faculty. The space is also available for individual or group study.

CVMSA students are given added opportunities to engage with faculty, participate in scientific research, and attend credit-bearing workshops. The majority of participants are paired with grant faculty as mentees and research associates. Approximately 10 faculty-to-student engagement events are planned each academic year. Student who are new to scientific research are also able to benefit from an annual series of workshops on science and scientific research.



## WARRIORS ON THE WAY TO STEM

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### ABSTRACT

Through the Central Valley HSI STEM Articulation and Transfer project, California State University, Stanislaus has partnered with Merced College and San Joaquin Delta College to implement Warriors on the Way to STEM (WOW 2 STEM). Collaborations emphasize improvement of the articulation and advising process to account for barriers to transfer and degree completion after transfer.

WOW 2 STEM supports Hispanic and low income STEM transfers by bridging the gaps between student needs, counselors/advisors, faculty, and institutions. Interventions driven by transfer enrollment patterns, academic trends, critical elements of a smooth transfer process, and strategies for developing and preserving collaborations with all partners are facilitating reductions in the achievement gap.

STEM Transfer Roadmaps serve as a key tool for advising prospective transfers. The roadmaps are tangible guides tailored to students' academic goals and facilitate consistency in the advising message to prospective transfers interested in CSU Stanislaus. Students walk away from advising sessions knowing what lower division and upper division courses are required for transfer and degree completion. Prospective transfer students also receive access to a variety of presentations, workshops, and events intended to promote discipline immersion and faculty-to-student interaction.

## (STEM)<sup>2</sup> – STRENGTHENING TRANSFER EDUCATION & MATRICULATION IN STEM

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### ABSTRACT

Numerous studies, including several from the Tomás Rivera Policy Institute (Taningco, 2008), indicate that Hispanic and low income students are less likely to enter STEM professions because, compared with other students, they are less well prepared for college. These students take longer to earn STEM degrees, have poorer first-year persistence rates, and transfer from two-year colleges into STEM fields in fewer numbers.

In this context, California State University, Fullerton (CSUF) and three of its feeder community colleges, Citrus College, Cypress College, and Santiago Canyon College, created Strengthening Transfer Education & Matriculation in STEM - (STEM)<sup>2</sup>. This multifaceted project funded by the U.S. Department of Education is designed to encourage STEM degrees, retain students in STEM, produce more community college STEM transfers to four-year institutions and, ultimately increase the number of Hispanic and low-income students attaining STEM degrees.

(STEM)<sup>2</sup> works closely with its partners colleges to fund full-time STEM advisors, develop cohort communities, and implement a peer mentoring program where CSUF STEM students encourage community college STEM transfers. The Summer Research Experience (SRE) provides community college students hands on experience working in research laboratories at CSUF. The Academic Transition Program (ATP) and Transfer Resource Center (TRC) at CSUF support the transition and retention of transfer students in the STEM majors.

Over the past year, peer mentors and STEM advisors served over 1300 students in the cohort communities. The SRE program has yielded successful transfer rates: 100% transfer rate for the 2012 cohort and 89% transfer rate for the 2013 cohort. Students who participated in ATP had higher rates of persistence after the first semester than the total STEM Transfer Class. The TRC has seen increased usage from Year 2 to Year 3; over 90% of students utilizing the TRC were upperclassmen (Junior standing and above) and over 40% Hispanic. Moreover, in Year 3, (STEM)<sup>2</sup> achieved its grant project objective of a 20% increase of Hispanic or low-income students who receive CSUF STEM degrees by Year 5 of the grant.

1. *Taningco, Maria Teresa V., 2008. Latinos in STEM Professions: Understanding Challenges and Opportunities for Next Steps—A Qualitative Study Using Stakeholder Interviews. Tomás Rivera Policy Institute Research Paper.*

#### Acknowledgements:

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- CSUF Administrators – Dr. David Bowman, Dr. Mark Filowitz, Dr. Susan Barua and Dr. Bob Koch

## **CSU CHANNEL ISLANDS (CI) STEM COLLABORATIVES GRANT: RETAINING, INSPIRING, SUPPORTING, AND ENGAGING (RISE) STUDENTS IN STEM AT CI**

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### **ABSTRACT**

As the newest of the 23 campuses of the California State University system, CSU Channel Islands (CI) is committed to its mission of "placing students at the center of the educational experience," and we seek to implement innovative approaches that will help all STEM students succeed in their college education. Institutional data show that Hispanic CI STEM students have significantly lower course pass rates and grade point averages (69.8% pass rate, 2.19 GPA) than non-target CI STEM students (80.5% pass rate, 2.59 GPA), and nearly one in four STEM freshmen leave STEM majors after two years. Although CI is a small campus (5754 undergraduate headcount for Fall 2014), we have a great unmet need to address the educational preparedness of STEM freshmen. High failure rates for students in gateway STEM courses like general chemistry I and II (30 – 40%) place our students at risk of being *STEM Leavers* who, as a result of failing a key gateway STEM course, decide to major in a non-STEM discipline or, worse, leave CI without completing a degree.

Through its STEM Collaboratives grant, CI will implement an integrated program that will address the attrition of students from CI STEM majors by integrating (a) a summer bridge STEM experience, (b) freshmen STEM experiences consisting of learning communities between a STEM course and one or more general education courses, and (c) the redesign of A particular focus of the project will involve the redesign of a first year seminar course (UNIV 150) that meets the general education critical reasoning requirement, so that it covers scientific reasoning and science ethics. Three learning community tracks will be created that will engage 160 STEM students during the Fall 2015 and Spring 2016 semesters, and 220 students in Fall 2016. The learning community STEM courses will include Introductory Chemistry, General Chemistry I and II, Intermediate Algebra, and Pre-Calculus.

This project seeks to create a culture change at CI where STEM Leavers become STEM-RISer's who engage in STEM coursework that integrates with their non-STEM coursework and who succeed in their gateway coursework leading to their retention as STEM majors.

## CENTRAL COAST STEM INSTITUTES (CCSI)

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### ABSTRACT

The Santa Maria-Bonita School District, Core LEA, and California Polytechnic State University, Core HE, have formed a working partnership to provide STEM professional learning (professional development) for math teachers in grades 3 through 8. Classified as a high-need LEA, it currently enrolls 15,500 students but it has been growing at an alarming rate of approximately 450 new students per year for the past five years. Currently there are 70 LEA teachers in these targeted grade spans that have signed a Letter of Commitment to participate for the 3-year cycle of the CaMSP grant. The goal of the project is to build capacity within schools and the district to make sustained changes that will improve student achievement in mathematics, enhance teachers' content and pedagogical knowledge that leads to positive changes in best teaching practices, and lastly, to improve the IHE's role in the preparation of teachers.

*Sponsors:*

*U.S. Dept. of Education (NCLB) via CA Dept. of Education via Santa Maria- Bonita School District*

# HYBRID MATH COURSES FOR CORE MATH COURSES

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## ABSTRACT

We are implementing a model in our course Math 104A, Precalculus: Algebra. This is a required gateway course for all STEM students. Students take it after completing the remedial math sequence (or passing the ELM exam). Math 104A builds on the skills and knowledge that students acquire in the remedial sequence (or, if they did not need to take this sequence, on their high school math background).

The hybrid lab model is appropriate for this course because many students in this course desperately need the additional help and support that this model would provide. These students greatly benefit from the opportunity to participate in workshops led by an experienced leader and to utilize technology to master the necessary prerequisite material in which they are often deficient. One-unit workshops are a co-requisite of Math 104A. This workshop is required for all students. The workshops are taught by teaching assistants and part time faculty members.

The delivery system for the homework is a combination of online and traditional homework. Students are expected to complete problems related to each unit in the course using MyMathLab, while also working towards mastery of the course concepts and prerequisite (remedial) concepts using the Knewton platform. The Knewton objectives and MyMathLab homework are common to all sections. Both the MyMathLab homework and the traditional homework are correlated to the lectures and exams. However, the Knewton platform is meant to both remediate and reinforce the individual student's content knowledge, and therefore students have different assignments for the portion of the homework devoted to mastery of concepts.

Deeper Learning Objectives for Math 104A:

The final exam has at least two or three problems that assess students' deeper understanding of the material. Math 104A is a prerequisite course for the study of calculus and it is therefore essential that students be prepared to apply the concepts presented in Math 104A to new situations. Deeper Learning Objectives (DLOs) for this course include:

1. Synthesis of multiple techniques to solve problems.
2. Identifying the best method for solving a problem and being able to explain the benefits of using the chosen method.
3. Formulating equations involving functions, based on given constraints.

## LAYING THE FOUNDATION FOR STEM SERVICE LEARNING

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### ABSTRACT

Cal Poly, SLO will be offering a professional learning community (PLC) to grow its capacity in STEM service-learning. A PLC is an extended learning opportunity to foster collaborative learning among colleagues with a particular purpose. In our case, that purpose is to develop our institutional capacity around service-learning with a focus on science, technology, engineering, and math. Through participation in a PLC, faculty and staff will enhance their knowledge of service-learning pedagogy as they work together and with the local community as a collaborative team with the ultimate goal of improving retention and graduation.

Sponsors:

*Association for Institutional Research*

## THE IMPACT OF CHANGE OF MAJOR ON TIME TO BACHELOR'S DEGREE COMPLETION WITH EMPHASIS ON STEM DISCIPLINES: A MULTILEVEL DISCRETE-TIME HAZARD MODELING APPROACH

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### ABSTRACT

When students are dissatisfied with their original choice of major or cannot satisfactorily complete the required coursework, they are often faced with the tough decision of either changing majors, or worse yet, dropping out of college. Since a large proportion of students switch majors at least once during their college career, it is important to examine factors associated with "switching major" behavior, as well as its impact on student success. The two primary aims of the proposed research study are to: 1) Identify and examine the student level and institutional level factors that predict the likelihood of changing major; and, 2) Investigate the impact of change of major on student persistence and graduation rates over time. Particular interest will be given to students who switch to and from science, technology, engineering, and mathematics (STEM) majors.

Sponsors:

*1. Association for Institutional Research*

# IMPROVING QUANTITATIVE SKILLS OF LIFE SCIENCE MAJORS AT CAL STATE LOS ANGELES

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## ABSTRACT

Life science students graduating from undergraduate institutions over the next ten years will have the opportunity to make a strong impact on the growing fields of personalized medicine, genetically modified crops, and the war on bio-terrorism. The challenge is that biological data are being gathered and characterized at an increasingly rapid pace and the tools for data analysis are complex. For future biologists to contribute to these exciting new fields, a change in the traditional life science curriculum is required. To help equip our students with the skills necessary for their success, we have formulated the following goals:

- A. Improve quantitative skills of biology and biochemistry undergraduate students.
- B. Integrate concepts and skills between biology and quantitative sciences (physics, math, chemistry, and computer science).
- C. Prepare students for graduate programs and careers in bioinformatics.

**To strive toward these goals we propose to accomplish the following specific aims:**

### **1. Modify the mathematics requirements for the Bachelor of Science degree in Biology.**

We will modify the mathematics requirements for the Bachelor of Science degree in Biology, and design a new mathematics sequence that is more relevant to the biology curriculum.

### **2. Introduce quantitative teaching modules into the biology courses.**

We will implement web based teaching modules for biology lectures and laboratories, which explain the mathematics and physics behind biological concepts. These biological applications-based problems will also be used in mathematics and physics laboratory sections. By working on the same quantitative problems in the biology courses, and in mathematics or

### **3. Offer a Minor in Bioinformatics for students with cross-disciplinary interests**

There has been an increasing demand in the workforce for graduates with skills in computer programming, biological sciences and mathematics. We propose to design a Minor in Bioinformatics for students with an interest in this emerging area.

### **4. Create a campus-based Center for Interdisciplinary Quantitative Analysis populated by faculty and students in physics, math, chemistry and computer science.**

The Center for Interdisciplinary Quantitative Analysis (CIQA) will enable faculty from biology, mathematics, physics, chemistry and computer science to come together for development of teaching modules, training workshops, and an ongoing exchange of ideas.

# TRANSFORMING EXPERIENCE OF COMPUTER SCIENCE

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## ABSTRACT

Prof. Kang of the Department of Computer Science (CS) at CSULA is collaborating with Prof. Yoon (CS, SFSU) on the project entitled “*Transforming Experience of Computer Science Software Development through Multiplayer Online Game Classroom Collaboration in Industrial Format*”. This work aims to create novel course materials and methods for developing a Massively Multiplayer Online Role Playing Game (MMORPG) to enable CS students’ to experience the complete software development process in more fun and engaging way through industrial collaboration setting. By participating in this project, we plan to develop and offer a MMORPG development course with systematically designed materials, structure, strategies, and resources. Through this course, students learn a more realistic and comprehensive software development process and environment currently executed by industries and improve their presentation, communication, and collaboration skills. Also, we will participate in testing, refining, and disseminating the developed course materials so that the materials can be more widely adopted by CS instructors in various institutions, including those who do not have sufficient background to develop game programming or senior-level software design courses from the ground up.



# DEVELOPMENT AND IMPLEMENTATION OF A NOVEL APPROACH TO TEACHING ENGINEERING FUNDAMENTALS TO ENGINEERING STUDENTS AT CSULA

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## ABSTRACT

The objective of this project is to develop, implement, and assess an integrated core curriculum for sophomore-level Engineering students at California State University Los Angeles (CSULA). This new sophomore curriculum is comprised of interactive, workshop-style courses and designed to thereby transform the student learning experience into an engaging student-centered one. The traditional pedagogical format (lecture, assign homework, and return graded homework) will be replaced by a series of laboratory courses and clinics that provide the students with ample practice working through engineering problems collaboratively with faculty, teaching assistants, and peers. The curriculum design is driven by outcomes established to help Engineering majors acquire a strong foundation in core competencies in 1) analysis, 2) applications, 3) design and modeling, 4) communication, and 5) professionalism. A three-quarter sequence will be developed for each of these areas. The curriculum is also designed to provide cohesiveness between the different courses in a given quarter so that students can focus on common topics from the perspective of each of the five competency areas and see the interconnectedness of the material they are learning in all five classes. The new core curriculum is expected to increase student success in the College of Engineering, Computer Science and Technology (ECST) at CSULA, while improving the passing rate of the Engineering-in-Training (EIT) exam. Through this new curriculum, sophomores will receive a firm grounding in the fundamentals of engineering and will be able to design and solve basic engineering problems using theoretical, experimental, and numerical approaches, while appreciating the applicability and limitations of these approaches. Students will be able to think critically, analyze data, and generate appropriate data if needed. They will also be able to communicate their results and findings both orally and in writing. Ultimately, they will be better prepared for upper-level engineering courses which will in turn enable them to succeed as professional engineers upon graduation.

# CSU STEM COLLABORATIVES

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## ABSTRACT

California State University Los Angeles is located in East Los Angeles, in a county where 97.1% of residents are Hispanic, 26.8% live below the poverty line, and only 5.4% of adults over 25 hold a bachelor's degree. Cal State LA serves as a gateway to higher education for the youth in this population, and our College of Engineering, Computer Science, and Technology (ECST) serves as a gateway to STEM careers.

ECST continues to address challenges in retention and graduation, particularly among under-represented student groups. As an example, while Hispanics represent more than 60% of students who enroll in our College, they comprise fewer than 30% of students who graduate. During the past five years, ECST has launched several initiatives to address this situation, including a pre-freshman summer bridge (called STEP), physics and math Academic Excellence Workshops, and the hiring of Student Success Center staff. Preliminary results have shown an increase in retention and in the starting math levels, but have not resulted yet in an improvement in grades or in faster advancement through the Calculus sequence required for engineering and computer science.

First-Year Experience for ECST (FYrE@ECST), engages the students in the ECST community from the outset, despite the challenge of being on a commuter campus, through (1) STEP, a pre-freshman summer bridge program to prepare them to start the Calculus sequence in their first year, a critical factor in on-time graduation from engineering and computer science programs; (2) Introduction to Engineering and Technology, a new 3-unit first-year engineering and technology course with hands-on design projects; and (3) supplemental instruction workshops to enhance our students' critical thinking in math and physics. All of these components will be integrated through a new comprehensive developmental advisement plan (MyGoldenEagle Flight Plan, or GEFP) as well as a professional learning community (PLC) for faculty and staff who participate in the FYrE programs in ECST and across campus.

In 2013, Cal State LA had the highest Hispanic engineering enrollment in the CSU at 56% but awarded only 29% of its engineering degrees to Hispanics. With this support, ECST is taking a major step toward achieving our six-year goal of doubling the 6-year graduation rate and of closing the gap between Hispanic enrollment and Hispanic degree-earning.

# DEVELOPING EFFECTIVE AND ENGAGING PRACTICES (DEEP) IN STEM EDUCATION: SUPPORTING LEARNING VIA UNIVERSITY-COMMUNITY COLLABORATIONS

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## ABSTRACT

This project aims to strengthen STEM learning and teaching by leveraging and fostering partnerships between the expertise and resources of universities, afterschool programs, and informal science education institutions (ISEIs). Three collaborative models will be implemented and studied to learn their respective benefits for providing future teachers with informal science experiences that develop their inquiry-based, hands-on science teaching expertise. The first model, Early Field Experience, will be in partnership with the Los Angeles Unified School District's Beyond the Bell after-school program and aligned with a science course for STEM undergraduates, including students pursuing teaching careers. The second, a Teaching Practicum Experience, will be conducted with the Long Beach Boys and Girls Club. It will involve elementary and secondary teacher candidates and will be built into the pedagogical methods course that is a central part of teacher preparation. The California Science Center and the Aquarium of the Pacific will offer the third, a paid informal science Internship for new teachers before they begin their classroom roles.

Because STEM learning is everywhere, not exclusively in the classroom, this project taps into informal settings in an effort to enable teacher candidates to gain experience with children and teens in out-of-school environments that feature engaged, impactful learning. While crossinstitutional partnerships are a recognized way to leverage resources for mutual goals, such efforts are frequently difficult to sustain. Thus, the project's evaluation not only examines impacts on future teachers and the youth they work with in informal science settings. It also examines the collaborations established for the models in order to identify challenges and factors that are effective in overcoming them. At the end of the project, three models will have been developed that draw upon the most prevalent informal science learning experiences for preparing future teachers and STEM teacher leaders. All three are models that the California State University wishes to use on an expanded basis on its 22 campuses that prepare the majority of California's new teachers. [W.M. Keck Foundation]

## DEVELOPMENTAL MATH PROGRAM AT CSU-MONTEREY BAY

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### ABSTRACT

CSU-Monterey Bay has developed an innovative and effective program designed to increase the success of students who are required to take and complete developmental math in the first year of college. This Program is particularly effective with the student population at CSUMB which is strongly first generation and often coming from educational disadvantaged backgrounds. To accomplish this, the department worked collaboratively to build a coordinated, unified program organized around activities and student work rather than standard lecture formats. Key to this program is its cost effectiveness with large class sizes reducing the need of multiple sections, each with its own faculty member and student assistants. Technology plays a key role in this program, being used for enhancing class presentation and discussion; coordination of communications between faculty and between faculty, students assistants and students.

## **PREPARATION OF PRE-HEALTH PROFESSIONAL STUDENTS: THE SOURCE OF DIVERSITY FOR THE HEALTH PROFESSIONS.**

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### **ABSTRACT**

The Science Educational Equity (SEE) Program at Sacramento State is a comprehensive student services center in the College of Natural Sciences and Mathematics at Sacramento State. The mission of the program is to provide academic advising, career guidance, and social support to underrepresented students who are pursuing careers in science research, science teaching, and health professions. To fulfill this mission, the SEE program applied for and received funding from The California Wellness Foundation (TCWF) in order to prepare a diverse group of pre-health professional students as a source for diversity in the health professions. To this end, funding from TCWF provided core-operating support for one student services professional, the SEE Activities Coordinator, dedicated to serving students in the SEE program interested in pursuing a health Career. The SEE Activities Coordinator assisted 256 unduplicated, underrepresented students in their pursuit of health careers over the three-year grant period. The SEE Activities Coordinator provided a suite of activities to students, which included workshops, advising sessions, visiting speakers, and professional school application assistance. In addition the SEE Activities Coordinator tracked all current and past student in the program as they are admitted into health professional school. A total of 110 students have been admitted to health professional school from 2002-2014 and 77 students have graduated professional school and are currently practicing health professionals.

## DEVELOPMENT OF A NEW CENTER FOR SCIENCE AND MATH SUCCESS AT SACRAMENTO STATE

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### ABSTRACT

The College of Natural Sciences and Mathematics at Sacramento State is experiencing a renaissance in student success initiatives aimed to support students in science and math courses. Within the last five years, departments in NSM have launched successful programs to help students succeed in gateway courses, like calculus and general chemistry, help students obtain academic advising, and most recently, help undergraduate students obtain high-quality research experiences in the classroom. These new program initiatives complement long-standing student support programs, like the Science Educational Equity Program, which has served underrepresented students in the College for nearly thirty years. Collectively, these college-based services and programs offer students the support that they need in order to enhance their success at the University. There are strong partnerships and synergy among programs, and to formalize this relationship, the College of NSM is launching the new Center for Science and Math Success in 2015. The Success Center will bring under one umbrella the following existing programs: Science Educational Equity, Peer-Assisted Learning, Commit to Study, Sacramento State LSAMP, and PASS (Peer Assisted Student Success) Advising. In addition, the Success Center will focus on the implementation of interventions designed to contribute to overall student success and engagement, with the goal of increasing retention and graduation rates for students in the college. Moreover, the Success Center will serve as a hub for the development and dissemination of innovative pedagogical and student support to help students across the University improve their success in introductory science and math courses. As a collective, programs under the Success Center umbrella will leverage resources, establish collaborations, obtain funding, and strategically develop programs to meet the needs of math and science students at Sacramento State.

## THE SACRAMENTO STATE SUSTAINABLE INTERDISCIPLINARY RESEARCH TO INSPIRE UNDERGRADUATE SUCCESS (SIRIUS) PROJECT

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### ABSTRACT

Many studies illustrate the positive influences of undergraduate research experiences on student learning and attitudes (1, 2). At Sacramento State over 90% of the biology majors surveyed reported a desire to participate in undergraduate research, but only 3% per year have the opportunity to work in a traditional faculty-mentored setting. To address this discrepancy, the Department of Biological Sciences is re-designing twelve existing laboratory courses to include Course-based Undergraduate Research Experiences (CUREs). The re-designed courses will span the entire curriculum and provide all 2,000 majors and pre-majors repeated experiences working on a real scientific problem - human impacts on the American River Ecosystem. To enhance the interdisciplinary nature of their experiences, students will gather, analyze and share data across courses as diverse as Ecology, Genetics, and Cell Biology. The *SIRIUS Project* leverages funding from The National Science Foundation Improving Undergraduate STEM Education program and the W.M. Keck Foundation to provide faculty training, curriculum development, communication technology, research equipment, and assessment of student learning and attitudes. This unique, innovative design will transform our entire curriculum to better engage students and prepare them for the 21<sup>st</sup> Century scientific workforce. To ensure effective scaffolding and alignment, sixteen scientifically-diverse faculty are working together in a long-term Faculty Learning Community (FLC) to design, review, implement and evaluate the new curriculum. We specifically aim to create a unity of purpose across our department and to build a student-centered curriculum that promotes engagement, critical thinking, and science literacy. To accomplish the objectives of the SIRIUS program, faculty receive training in 1) student-centered pedagogies, including inquiry-based and cooperative learning, 2) the science of the American River, 3) the use of advanced technology, and 4) effective assessment methods. This model is replicable across disciplines and to other geographic regions with their own scientific challenges.

1. Lopatto, D. (2007). *Undergraduate research experiences support science career decisions and active learning*. *CBE - Life Science Education*, 6, 297–306.

2. Russell, S., M. Hancock, and J. McCullough. (2007). *The pipeline: Benefits of undergraduate research experiences*. *Science*, 27, 548–549.

# PROJECT PASS (PEER-ASSISTED STUDENT SUCCESS): STEM IMPROVING STUDENT PERFORMANCE IN STEM GATEWAY COURSE AND RETENTION IN STEM

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## ABSTRACT

Project PASS: Peer-Assisted Student Success is an NSF-funded initiative that utilizes Peer-Assisted Learning (PAL) and Early Intervention Advising (PASS Advising) to increase student success in introductory STEM courses<sup>1</sup>. Both PAL and PASS Advising programs serve students enrolled in gateway math, chemistry, or biology courses. The PAL program, which serves over 1000 students annually, implements the Peer-led Team Learning model<sup>2</sup> to provide supplementary instruction to small groups of students. Unique features of PALs:

- PAL Facilitators (leaders) are engaged in professional development and action research throughout the term via a STEM teaching & learning course
- Faculty create scaffolded curriculum for all PAL sessions
- PAL Facilitators do not tutor, but promote the development of individual and group STEM learning skills through guided questioning

The PASS Advising program identifies 500+ students per year in gateway STEM courses that are “at risk” for leaving STEM. PASS Advising integrates best practice academic and non-academic peer advising<sup>3</sup>. Key features:

- PASS Advising identifies and begins advising of “at risk” students before the term
- PASS Advising is conducted by undergraduate students collaboratively trained by academic and student affairs personnel.

PAL and PASS Advising programs work synergistically with STEM equity, first year experience, and teaching and learning professional development programs.

The pass rate of PAL students is on average 15 percentage points higher than non-PAL students (range: 7-30 percentage points). This difference remains even when factors such as high school GPA, Math SAT, and repeat status are considered. The PASS Advising program has improved the 2 year retention of “at risk” students in STEM by 14 percentage points. PAL and PASS Advising help to “close the achievement gap”, bringing STEM success of URM students in line with non-URM students and form the focal point of a STEM Student Success Center.

1. National Science Foundation STEM Talent Expansion Program, Project PASS: Peer Assisted Student Success, NSFDUE-106838, Sacramento State, 2011-2016

2. Gosser, D.K., Jr., Kampmeier, J.A., Varma-Nelson, Pratibha 2008. Peer Led Team Learning: 2008 James Flack Norris Address, *Journal of Chem Ed.* 87 (4) p. 374-380.

3. Tinto V., *Taking Student Retention Seriously: Rethinking the First Year of College*

<http://survey.csuprojects.org/gedocuments/taking-student-retention-seriously--rethinking-the-first-year-of-college>



# PEER ASSISTED TEACHING AND LEARNING IN CALCULUS I

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## ABSTRACT

Calculus I is a well-known bottleneck course with high enrollments and low success rates. At Sacramento State, Calculus I serves a variety of majors, including mathematics, physics, chemistry, geology, computer science, and engineering. In Fall 2014, 93 out of 281 Calculus I students earned repeatable grades. Calculus I students, often freshmen, lack both study skills and the ability to engage in the active learning demands of the university environment. They have difficulty understanding that learning comes from independent and intra-personal study, rather than a hierarchical transfer of knowledge from master to student.

To address these challenges, the Department of Mathematics and Statistics has teamed with the Center for Teaching and Learning to implement two projects: a Peer Assisted Learning (PAL) program and a Calculus Faculty Learning Community (FLC). The PAL program is a type of supplemental instruction where students, not faculty, facilitate learning.<sup>1</sup> This model employs senior students, who can empathize with the inevitable cognitive frustrations that arise during learning, to coach novice students to acquire and practice effective study skills. The Calculus FLC, will enable mathematics faculty to collaboratively design and review scaffolded worksheets for the PAL program and align the scope and sequence of the separate Calculus I sections.

The results of a pilot effort supported by the National Science Foundation<sup>2</sup> is extremely encouraging. In Fall 2013, there was a 16.7 percentage point difference in pass rates between PAL and non PAL participants, 90% of students enrolled in PALs passed Calculus I, while only 74% of non PAL students passed. This represents the highest overall pass rate in Math 30 in over a decade (58% compared to 77%, an increase of 19 percentage points).

We were recently awarded a CSU Chancellors Proven Course Redesign Grant to fully implement the PAL and FLC programs. With this support we will develop a standard course syllabus and calendar to better coordinate the PAL program and establish continuity between the Pre-Calculus, Calculus I, and Calculus II courses.

1. Congos, D., Schoeps, N., 1993. *Does supplemental instruction really work and what is it anyway? Studies in Higher Education*. 18, 165–175.

2. National Science Foundation STEM Talent Expansion Program, Project PASS: Peer Assisted Student Success, NSF DUE–106838, Sacramento State, 2011-2016

## INVESTIGATING STUDENT SUCCESS USING EVIDENCE-BASED STRATEGIES

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### ABSTRACT

The College of Natural Sciences (CNS) is dedicated to creating the systemic change necessary for Science, Technology, Engineering & Mathematics (STEM) majors to be successful. CNS is largest and fastest growing college at CSUSB, a Hispanic-Serving Institution, in which more than 70% of the students are first generation. CSUSB serves a region that the Milken Institute ranks last in educational attainment when compared to the 50 largest metropolitan areas in the US. Our goal is to create a culture of evidence-based teaching and learning that fosters deep learning in students, and provides sustained faculty development opportunities. The first step in effecting this systemic change was a focus on STEM courses that have high failure rates and therefore play a key role in preventing students from making progress towards a degree.

With financial support from an NSF grant, the director of the campus' teaching and learning center, and the college dean supported a six-person faculty learning community (FLC). This FLC, which includes faculty members from biology, chemistry, and physics spent 2013-2014 identifying learning "bottlenecks" in courses and studying the evidence-based teaching practices most likely to foster students' deep learning of these difficult concepts. FLC members are now pilot-testing evidence-based teaching practices such as process oriented guided inquiry learning, on-going formative assessment, and intentional rapport building in their courses. The FLC members are studying the impact of these interventions on student learning and ultimately on retention and time to graduation. The number of students directly impacted by this intervention in fall 2014 was 639. These faculty members are likely to adapt what they are learning to other courses they teach, thus indirectly impacting additional students.

Faculty learning, like student learning, must be supported in an on-going and recursive fashion, so a one-shot intervention is insufficient. We are moving from an FLC model, which is a finite learning opportunity, to a Community of Practice model, a model which increases faculty interest in teaching and learning and which provides a safe and supportive environment for faculty to investigate, attempt, assess, and adopt new methods of teaching in a way that allows for: multiple on-going opportunities and forms of support; differing levels of participation; varying levels of experience and expertise among its members; and the group to function for an indefinite amount of time by evolving with the needs of the members of the community (Wenger, 2002).

*Wenger, E., McDermott, R., and Snyder, W., 2002. Cultivating communities of practice: A guide to managing knowledge. Harvard Business School Press, Boston.*

# ASSESSMENT OF STUDENT PREPARATION FOR CALCULUS-BASED MECHANICS

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## ABSTRACT

In the Fall 2013 semester, the Department of Physics and Astronomy at San Jose State University pioneered an optional introductory physics course ("Physics 49") to improve student outcomes in the first semester of calculus-based physics ("Physics 50"). We will present the outcomes of our first cohort of eighteen "49ers" and compare their outcomes with the 400 other students in Physics 50 who opted not to take the intro course. We will also present data on the correlation of Force Concept Inventory (FCI) scores with the grade in Physics 50 for the "49ers" and the rest of the class. The FCI is a widely-used assessment of the basic physics knowledge of students in introductory physics courses. It is administered at the start and end of the course. Our long-term goal is to identify at-risk students before they get poor grades in Physics 50, ease the transition through bottleneck courses, and ultimately to improve STEM graduation rates, which correlate strongly with the grade in Physics 50. SJSU is a large public university that serves the Silicon Valley area of California. This work was originally presented at the 2014 Physics Education Research Conference in Minnesota and this abstract was published in the 2014 PERC Abstracts.

**THE EFFECT OF SUPPLEMENTAL INSTRUCTION ON  
TRANSFER STUDENT SUCCESS IN FIRST SEMESTER CALCULUS\***

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**ABSTRACT**

This study focused on the impact of Supplemental Instruction (SI) on student achievement in first semester calculus for transfer students over a three-year period. Transfer students participating in SI achieved dramatically higher passing rates and course grades than did non-SI transfer students, despite no significant differences in academic predictors between the two groups. The results here indicate that while SI has been shown to be an effective tool for many students, the academic and social elements of SI may be especially significant for STEM transfer students enrolled in gateway courses such as first semester calculus. This research was supported in part by a grant from the National Science Foundation.

\*Bonsangue, M., CadwalladerOlsker, T., Engelke, N., Fernandez-Weston, C., Filowitz, M., Hershey, J., Moon, S., Renne, C., Sullivan, E., Walker, S., and Woods, R. (2013). "The effect of supplemental instruction on transfer student success in first semester calculus." *The Learning Assistance Review*, 18(1), 61-75.

# **THE CSUF BIOLOGY UNDERGRADUATE RESEARCH SCHOLARS TRAINING PROGRAM (BURST): TO EXPOSE, ENGAGE, AND IMMERSIVE UNDERGRADUATES IN BIOLOGICAL RESEARCH**

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## **ABSTRACT**

CSU Fullerton has a strong tradition of engaging students in faculty-mentored research and has maintained external funding for several student research-training programs. In 2013, with support from our Provost, we started the Biology Undergraduate Research Scholars Training Program (BURST) to expand our successful NSF-supported Southern California Ecosystems Research Program (SCERP). Our three-tiered structure broadens participation of early-career students by exposing them to research and careers in biology (Tier 1), engages students in the culture of research (Tier 2), and immerses Scholars in authentic research experiences and leadership opportunities (Tier 3) to improve persistence, graduation rates, and long-term success. BURST includes elements known to lead to student success: Students (1) connect with a community, (2) develop leadership skills through program events and faculty mentorship, (3) develop effective communication skills, (4) engage in high quality and diverse interactions with multiple faculty mentors, and (5) Scholars receive financial support so they can devote 15-20 hours per week to their faculty-mentored research. In Tier 1, BURST collaborates with student clubs to sponsor events where beginning students learn about research and biology careers. Tier 2 focuses on mentored trips to undergraduate research conferences. The Tier 3 BURST Scholars conduct research and participate in professional development and leadership opportunities as peer mentors for Tier 1 and Tier 2 activities. We also maintain a Web page and Facebook page where research and internship opportunities, scholarships, and student profiles are highlighted. As a result of participating in BURST Tier 1 activities, students are more likely to pursue an undergraduate research experience, and several participants have entered research labs. High-impact practices like SCERP and BURST require significant support and faculty investment, but lead to transformative experiences and successful outcomes for our students.

# DEVELOPING AND SUSTAINING AN EFFECTIVE SUPPLEMENTAL INSTRUCTION PROGRAM

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## ABSTRACT

For the past thirty years supplemental instruction (SI) has been used to help support student success in courses that have traditionally had high non-success rates.<sup>6,7</sup> The goal of SI is to improve retention and success of undergraduates in key gateway courses in STEM disciplines as well as in challenging courses in non-STEM areas. Further, SI aims to reduce the achievement gap between groups of students who have traditionally been underrepresented in the STEM fields.<sup>1,2,6</sup> Supplemental instruction is neither tutoring nor having students do extra recitation assignments.<sup>7</sup> Rather, students work in structured collaborative groups led by undergraduate SI leaders for 3-4 hours per week to work on problems and develop study skills based on that week's lessons in a highly interactive setting. Studies have documented the effectiveness of SI in college and university-level STEM disciplines,<sup>1,2,4,5</sup> as well as the positive impact on the SI leaders themselves.<sup>3</sup> Moreover, there is evidence that SI can have positive effects on students' self-efficacy and performance in STEM majors long after the SI-based course has ended.<sup>2</sup> SI has been shown to address concerns related to marginalization of groups of students out of STEM disciplines, including students of color; transfer students; students with disabilities; veterans and re-entry students; and students whose gender identification is female.

1. Bonsangue, M., Filowitz, and Woods, et. al. 2013. *The Effect of Supplemental Instruction on Transfer Student Success in First-Semester Calculus*. *Learning Assistance Review*, 18(1), 61-75.
2. Drew, D. 2011. *STEM the Tide: Reforming science, technology, engineering, and math education in America*. Baltimore: Johns Hopkins Press.
3. Hartmann, K. and Tran, C. 2015. *The Impact of Supplemental Instruction on SI Leaders*. *To appear in Dimensions*
4. Hensen, K. A. and Shelley, M. C., 2003. *Impact of Supplemental Instruction: Results from a large, public, Midwestern university*, *Journal of College Student Development*, 44(2), 250–259.
5. Rath, K. A., et. al. 2012. *The impact of supplemental instruction in entry-level chemistry courses at a midsized public university*, *Journal of Chemistry Education*, 89(4), 449–455.
6. Treisman, P. U. 1985. *A study of the mathematics performance of black students at the University of California, Berkeley*. Unpublished doctoral dissertation, Berkeley, California.
7. *UMKC's Supplemental Instruction Program*, 2015. <http://www.umkc.edu/asm/si/>

## ENGINEERING LEADERSHIP PATHWAY SCHOLARS 2 PROGRAM

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### ABSTRACT

The San Jose State University (SJSU) Engineering Leadership Pathway Scholars (ELPS) program provides support services and activities to motivate and prepare students to complete the B.S. engineering degree with attitudes, knowledge, and skills to be leaders in the 21st century workforce and to pursue graduate degrees. By providing students with opportunities to learn about the complexities of engineering leadership and the many potential paths of an engineering career, by helping students to create and implement leadership development plans, and by involving them in shaping the ELPS program, we develop and reinforce qualities to lay the foundation for future leaders. The goals of the project are to: 1) graduate students on time with high academic achievement and transfer and native graduation rates of 80%, 2) institutionalize leadership development activities from ELPS phase 1, and 3) expand the mentoring

## DEVELOPMENT OF A CLASSROOM OBSERVATION FORMAT AND PROTOCOL TO ASSESS STUDENT

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### ABSTRACT

In higher education, classroom observations are typically conducted to review and evaluate the instructor's performance. At many institutions these observations follow a protocol consisting of an observer responding to a survey during or after an observation. The survey asks the observer to rate the instructor on various items ranging from the clarity of their board work, to the level of interactivity in the classroom. There are two major weaknesses to this method. The first is an issue of calibration. The survey asks for a rating, and different observers will rate the same lesson differently. Multiple observations of the same instructor are needed in order to average out these effects. The second is an issue of feedback. If an instructor scores poorly or well on a certain item, they aren't necessarily given any feedback on what they did to earn that rating or on how to improve. If they disagree with a rating, they may actually think that it was an issue of observer calibration.

For this exploratory project, we propose the development of an observing format (based on prior work with a similar well-tested tool ) and protocol that is less subjective and more informative than traditional survey methods. Furthermore, this protocol will be explicitly linked to classroom observables correlated with positive learning outcomes, and thus provide evaluators with useful information on the state of undergraduate STEM courses. The SPOT (or Student Participation Observation Tool) is a computerized observing format and protocol that allows an observer, using a laptop or tablet, to categorize classroom actions in real time (during the actual observation).

**COLLEGE OF SCIENCE RESEARCH AND TEACHING SCHOLARS  
(NSF-STEM).**

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**ABSTRACT**

This proposal seeks to provide scholarships to students at San Jose State University majoring in Biological Sciences, Chemistry, Geology, Meteorology and Physics. The students would be known as the College of Science Research and Teaching Scholars. Aside from the scholarship students will receive mentoring, academic and career support from programs already in place at the institution or programs funded by the grant. The Scholars will be offered opportunities to do research with faculty and/or participate in teaching apprenticeship type activities which include facilitating Academic Excellence Workshop, Summer Preparation Courses and Tutor to Teach. Career Partners such as Calera, Genentech and Gilead Sciences will provide students with opportunities to interact with scientists in industry and tours of science labs at their facilities.



# STEPPING UP STEM AT SONOMA STATE UNIVERSITY: AN INTEGRATED FRESHMAN YEAR EXPERIENCE TO INCREASE AND RETAIN STEM MAJORS

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## ABSTRACT

Through its NSF Funded program *S3: STEPPing Up STEM at SSU*, Sonoma State University (SSU) has effectively combined many high impact strategies to demonstrate gains in both attracting and retaining undergraduate STEM majors. *S3* was designed and implemented at SSU by faculty across the School of Science and Technology as well as cross discipline pedagogy experts. The program utilizes three key elements. The first element, and consequently bulk of the effort is a STEM First Year Experience investigating the regional watershed. This interdisciplinary class combines biology, math modeling, and critical thinking to address issues surrounding the Russian River watershed while facilitating strong personal connections with SSU. Innovative pedagogies and high-impact practices have allowed the program to show measurable success in only three years' time. Most notably, based on a matched cohort model with propensity score analysis and tracking the first year's cohort shows that students are roughly three times as likely to have a declared STEM major as are students in a comparable control group. The program targets prospective as well as entry STEM majors to enhance student engagement in scientific inquiry and provide direct exposure to researchers and regional resource managers. The course consists of 12-units that meets general education requirements in critical thinking, life science, mathematics, and science laboratory. The second element of *S3* is to offer supplemental instruction to enhance the success of existing STEM majors in introductory STEM courses. The third element expands the MESA (Mathematics, Engineering, Science Achievement) model by providing additional academic and career advising, tutoring, and undergraduate research opportunities for students, in order to help retain them in STEM. These practices can be readily incorporated into campuses especially in cohort building and STEM freshman courses.

*S<sup>3</sup>: STEPPing Up STEM at SSU is supported by the National Science Foundation Grant# 1068445*

# STRENGTHENING THE FOUNDATION FOR STEM STUDENT SUCCESS

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## ABSTRACT

STEM student success at its foundation relies on complex and context-specific socio-economic and political factors; this is what often impedes the inventive thinking that is critical to genuine change in student success programming. Cal Poly Pomona has strong retention and graduation rates, but an annoyingly persistent achievement gap. Programs to address this have been vulnerable to the vagaries of grant funding, the changing interests of project leaders, and often cannot be expanded beyond their initial audiences. The objective of Cal Poly Pomona's project, **Strengthening the Foundation for STEM Student Success**, is to build on current campus structures to avoid these pitfalls.

The CPP STEM Project is a cross-disciplinary, cross-divisional collaboration designed to provide students with the resources and skills that they need for success as a STEM major at a comprehensive public polytechnic university. The project capitalizes on proven student success programs and the expertise of faculty, staff, administrators, and student leaders. The goals of the project are to:

- Expand STEM first-year experience activities—based on ‘high-impact practice’ activities coordinated across STEM disciplines — to increase retention in STEM majors;
- Employ an ‘action research’ approach (via mixed-methods strategies) for evaluation—so that team leaders can determine revisions needed during and after the project period;
- Share and publish work broadly —among on-campus venues, CSU system-wide meetings, STEM symposiums, Student Success conferences, and other educational opportunities for information dissemination.

The CPP STEM project is designed around Cal Poly Pomona's *learn by doing* model. It

1. **Summer Experiences:** Enhance the existing mandatory 3-day summer residential orientation with STEM social and productive persistence activities;
2. **First-Year Experiences:** Expand the FYE lab to demonstrate the relevance of STEM through project-based learning culminating in a Fall STEM Poster Showcase;
3. **Freshmen Fridays:** Create opportunities for students to engage with STEM industry speakers and participate in ‘soft skills’ workshops;
4. **Peer Mentoring:** Link faculty, upper division students, and freshmen through a *pyramidal model*; and
5. **Course Re-Design:** Modify college algebra and trigonometry using *Learning Assistant* model, and supplement calculus with a new “Just-in-Time” course).

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# ACADEMIC CATALYST FOR EXCELLENCE SCHOLARSHIP PROGRAM

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## ABSTRACT

Students planning to major in science or engineering make up approximately 30% of all incoming college students, however, the attrition rate is the highest among all undergraduate disciplines. In a broad national study of attrition, it was reported that engineering education loses about 53% of undergraduate students of which roughly 40% switch to non-science fields. Another study points out that the most attrition occurs during the first two years. The attrition rate in the College of Engineering and Computer Science (ECS) at California State University, Fullerton (CSUF) was profound and similar to the national trend. In 2011, with the funding availed from the NSF, ECS at CSUF established the ECS Academic Catalyst for Excellence (ACE) Scholarship Program designed to reverse its historical legacy of high student attrition. This program awards scholarships to ECS students over the 5 year period of the project and leverages a well-established network of ECS and University student services to support ACE scholars (recipients of the ACE scholarship) majoring in ECS majors. The program targets academically promising but economically disadvantaged students with emphasis on first generation college students and underrepresented students.

ACE scholarship serves as a catalyst that allows students to focus diligently on their academics. This coupled with the ACE support services such as summer orientation, peer mentoring/tutoring, academic counseling, lunch speaker series, priority registration, professional development workshops, academic internships and job fairs, translates into improved academic success, increased student retention, reduced time-to-degree and a greater number of ECS students securing positions in the engineering workforce or transferring to graduate programs.

## References:

K. George, "Evaluating the Impact of ECS Academic Catalyst for Excellence (ACE) Scholarship Program," *Proceedings of the 2013 ASEE-PSW conference*, April 2013.

K. George, "A STEM Scholarship Program Model to Reverse High Student Attrition," *Proceedings of the 2012 ASEE-PSW conference*, February 2012.

## Acknowledgments

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# **BURST FORTH: A PILOT PROGRAM INCORPORATING AUTHENTIC BIOLOGY RESEARCH EXPERIENCES INTO FRESHMAN ORIENTATION**

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## **ABSTRACT**

Biology departments nationwide are grappling with high enrollments in introductory majors' courses but disappointing retention rates. Part of the problem stems from mismatches in student vs. department expectations of effort, engagement, critical thinking, quantitative reasoning, and problem solving skills. Undergraduate research experiences engage students, promote retention, and increase graduation rates. In summer 2014 we piloted the Biology Undergraduate Research Scholars Training program Freshman Orientation Research Training Hour (BURST FORTH), incorporating a mentored, authentic research experience into freshman orientation as a way to better align student and departmental expectations. Using a stratified sample design, over three days we split 153 incoming biology majors into participant and non-participant groups. Non-participants received a campus tour, while participants spent 75–90 minutes investigating the effect of temperature on development and hatching success of an endemic fish, the California grunion. Students took measurements and made conclusions from pooled data. We used a team of undergraduate and graduate peer-mentors to introduce new students to the culture of the biology department. Intensive promotion through multiple media outlets (including a dedicated Facebook page and campus website) and invitations to campus administrators, who worked alongside student participants in the lab, fostered integration across academic and co-curricular elements. Surveys administered to participants, non-participants, and peer-mentors allowed us to assess immediate outcomes, and ongoing assessment will track student performance, retention rates, and attitudes about biology in the first year courses and beyond.

# NSF UNDERGRADUATE RESEARCH AND MENTORING IN BIOLOGY AT CSU FULLERTON: SOUTHERN CALIFORNIA ECOSYSTEMS RESEARCH PROGRAM

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## ABSTRACT

The Southern California Ecosystems Research Program (SCERP) is a two-year undergraduate research-training program funded by NSF - Undergraduate Research and Mentoring in Biology (previously Undergraduate Research and Mentoring in Environmental Biology) that supports annual cohorts of 5. Our goal is to engage underrepresented minority and urban-raised students in understanding the ecology of changing southern California ecosystems via field research, while preparing scholars for graduate school. The program has three major components: an intensive summer field course, independent research with faculty mentors, and weekly group research and professional training meetings during the academic year. The summer field course builds a community of scholars through skills training and social bonding. Faculty mentor individual scholars through independent research that culminates in a senior thesis. First-year scholars present research at national undergraduate conferences (e.g., SACNAS) and advanced scholars present research at discipline-based conferences. Scholars participate in ethics training and prepare for graduate programs. Our annual research showcase celebrates accomplishments and offers family and friends insight into the SCERP experience, which has been critical for developing family support for our underrepresented students. Institutional support provides release time, a room where scholars gather, field vehicles, and a collaborative atmosphere where faculty are recognized and rewarded for their ongoing mentoring of undergraduate research. Career paths are diverse and over the past 13 years, 58 students have completed the program; 88% are active in biology/ecology, 31 students have been accepted to, enrolled in, or completed graduate degrees; 9 PhD and 22 MS.

## **ASCEND STEM (Academic Success through Curriculum Enhancement and Nurturing to promote Degree completion in STEM)**

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### **ABSTRACT**

In ASCEND STEM, CSUF identifies challenges with persistence, timely completion of STEM degrees, and the availability of key information about teaching and learning in STEM departments. Interventions designed to address these concerns seek to improve learning power for students entering STEM majors, raise to greater than 90% the proportion of students entering their second year with 24 or more units, improve data-driven decision-making and easing access to student-success data for predictive modeling, advisement and tracking, and increase the percentage of science and math faculty practicing scientific teaching. The process begins during STEM-specific one-day summer orientation experiences, when incoming students engage in preparation and acculturation activities that include authentic research experiences. Their learning power will be assessed using the Effective Lifelong Learning Inventory (ELLI) and any apparent issues will be addressed during two, first-year courses that combine discipline content with critical reading, analytical thinking, strategic learning development, and peer mentoring. These courses initiate a STEM-oriented thematic general education pathway to be designed and scheduled to fit STEM students' interest and availability. The many high-impact practices to be introduced into this GE pathway also complement the redesign of STEM-important bottleneck courses that is underway as part of other funded projects. Information on learning power, academic performance and persistence is to be incorporated into a predictive model of successful student behavior that predicates a role for intrusive advisement. Throughout the project, peer mentors, program coordinators, and advisers coach the students to keep them on track to graduation. The need to increase the percentage of science and math faculty who use scientific teaching models will be addressed in professional development workshops offered to faculty teaching in the project. An external team will perform formative and summative evaluation that tracks the quality and intensity of project activities, monitors progress toward program goals, and authenticates program outcomes through various research designs.

Faculty teams are developing summer research exposures (Hoese & Meyer) and first-semester courses that respond to the ELLI profiles. In CECS, READ 101 is being paired to EGGN 100 (Nair and Bowers). In CNSM, CNSM 100 and READ 101 are being integrated into a single course that addresses quantitative reasoning and learning literacy (Bartles Angus and Norman). The STEM-oriented general education pathway, *Science, Technology & Society*, will include: ENGL 101 (Amaro); READ 290 (Biggs); HCOM 100 (Blumer), HIST 110A/B (Brunelle and Markley); HIST 180 (Spooner); and LBST 101 (Ali) who will participate in a faculty learning community as they reshape their courses.

## **EDU: THIS IS NOT A GAME: TEACHING COMPUTER SECURITY CONCEPTS IN A FIRST YEAR COURSE USING AN ALTERNATE REALITY**

*Z. Peterson<sup>1</sup>*

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### **ABSTRACT**

This proposal incorporates the design, creation, evaluation, and dissemination of a security-themed, introductory course to computer science, designed to teach computer security concepts and general computer science principles to first-year, undergraduate students. The proposed coursework will be centered around a series of security-themed challenges whose solutions can only be found through the understanding of select core computer science and computer security principles. The challenges will be thematically connected through a course-long narrative, presented as an alternate reality game (ARG). An ARG is a story-driven, trans-media art form, designed to engage players in collaboratively uncovering and interpreting fragments of a story, distributed across multiple forms of media, and using the "real world" as its platform. The creation of this course is motivated by a need to heighten the understanding and awareness of privacy and security in an increasingly pervasive digital world, to act as a gateway to future education and careers in computer science, and to generally promote interest in science, technology, engineering and mathematic (STEM) disciplines. The course will also strive to be social and inclusive, attempt to stimulate counterfactual thinking, and be supportive of student autonomy—many the pedagogical aspects shown to be lacking in current computer science curricula.

*Sponsors:*

*National Science Foundation – SaTC*

## **CAMPUS BUILDINGS THAT TEACH SUSTAINABILITY: USING LEED-RATED BUILDINGS AND LANDSCAPES AS LEARNING LABORATORIES AT CAL POLY, SAN LUIS OBISPO**

*M. McDonald*

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### **ABSTRACT**

On college campuses, green buildings and sustainable landscapes are increasingly part of the physical environment designed to promote student learning, health, and interaction. This project seeks to utilize a soon-to-be completed building on the Cal Poly campus as the focal point of interdisciplinary studies related to sustainable environments. The objective is to develop coursework that utilizes building data from the energy and water management systems, in combination with on-site handheld instruments and low-cost data loggers, in order to engage students in the investigation of the environmental performance in their “own backyard”. The project will be conducted as a redesign of an existing course within the College of Architecture and Environmental Design as the institutional framework, but is intended to serve as a launch pad for student and faculty research, community service learning, and curriculum development university-wide including STEM disciplines, first-year seminars, writing intensive courses, collaborative assignments, diversity learning, and capstone experiences.

*Sponsors:*

*CSU Chancellor's Office*

## **ACTIVELY BUILDING THE DRIVE TO ACHIEVE THROUGH EVERYDAY ENGINEERING LEARNING**

*J. Chen*

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### **ABSTRACT**

Grit – defined as passion and perseverance for long-term goals – is likely to be important to individuals trying to achieve a STEM degree, which requires not only talent but its focused and sustained application over a long period. This project proposes to: create a smartphone app to measure the quantity and quality of active learning, produce a model of student success as a function of the quantity and quality of active-learning experiences, and characterize the relationship between active learning and grit growth. The ultimate goal of this project is to improve the retention and graduation rates of all STEM students, particularly women and underrepresented minorities.

Sponsors:

*1. National Science Foundation (HER Core)*

## **COLLABORATIVE RESEARCH: SUPPORTING PEDAGOGICAL INNOVATION FOR A GENERATION OF TRANSFORMATION VIA INQUIRY-BASED LEARNING IN MATHEMATICS (SPIGOT)**

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### **ABSTRACT**

SPIGOT, Supporting Pedagogical Innovation for a Generation Of Transformation, will recruit mathematics instructors and provide intensive four-day workshops in Inquiry-Based Learning (IBL) and a suite of support systems through an existing, privately funded infrastructure known as the Academy of Inquiry-Based Learning (AIBL). SPIGOT's objectives are: (a) At least 120 instructors will participate in one of three summer workshops. (b) At least 50% of participants will implement IBL in at least one course. (c) At least 60% of participants will be early-career faculty who can use these methods through their professional lives. (d) At least 40% of participants will be active in at least one follow up activity (mentoring, Visiting Speakers Bureau, attendance at the Legacy of R. L. Moore Conference, and submitting proposals to the AIBL Small Grants Program). (e) An evaluation-with-research study will enable adjustments during the project, and contribute to the knowledge base on STEM faculty development

Sponsors:

*National Science Foundation (TUES)*



# **CREATING A REPLICABLE TRANSFORMATION PATH FOR CHANGE: A PILOT STUDY ON OVERCOMING THE BARRIERS TO INDIVIDUALIZED TEACHING AND LEARNING**

*L. Schlemer<sup>1</sup>*

<sup>1</sup>Industrial & Manufacturing Engineering , California Polytechnic State University, San Luis Obispo, CA, United States

## **ABSTRACT**

The project proposes a pilot study that demonstrates the potential of a structured learning community in participatory action research to facilitate continuous improvement in science, technology, engineering and mathematics (STEM) teaching and learning praxis. Open educational resources and participatory media tools serve as themes in the proposed inquiry, which revolves around three central research questions: 1.) How does a community of practice of participatory action research enable faculty to effectively individualize and assess alternative teaching and learning innovations? 2.) In what ways do web-based educational resources and participatory media foster deeper learning? 3.) What role does meaningfulness of the learning situation play in sustaining the engagement of both faculty and students?

*Sponsors:*

*National Science Foundation (TUES)*

# **THE CSUEB SUCCESS PROGRAM (SUPPORTING UNDERGRADUATES THROUGH COLLABORATION, CARE, AND EMPOWERMENT TO SUCCEED IN STEM)**

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## **ABSTRACT**

Of the STEM freshmen entering CSUEB in 2005, 19% graduated as a STEM major within six years, 32% switched to a non-STEM major, and 46% left without a terminal degree. CSUEB proposes the SUCCESS pilot program in response to the urgent need for innovative instruction and support networks to increase persistence, retention, and graduation of STEM majors. SUCCESS will draw upon and build cohesion between existing STEM education efforts and campus programs, which include previously funded course redesign work in the general biology, general chemistry, and developmental math sequences (all of which will continue to be improved and expanded under the current proposal); the Institute for STEM Education (ISE); EOP and its Student Transition and Retention (STAR) project; Freshman Learning Communities; the Student Center for Academic Achievement; and Academic Advising and Career Education. SUCCESS will braid three program strands into a supportive network of services for students: (1) a STEM-focused summer bridge program including theme-based learning experiences; (2) first-year STEM learning experiences connected to the summer bridge program; and (3) EOP/STAR program services and academic supports. In the proposed pilot program, two cohorts (one in grant period 2 and one in period 3) of approximately 30 freshman EOP students who have declared a biology major will be selected to participate. A STEM Case Manager will coordinate academic support, and a STEM Engagement Coordinator will coordinate opportunities for SUCCESS students to participate in career exploration, work-based learning and community engagement activities. A SUCCESS Community of Practice made up of faculty, staff, and students will meet monthly to monitor progress toward program goals, identify and promulgate successful pedagogy, and coordinate program activities among the constituents of SUCCESS. Following the grant period, primary goals will be to make the SUCCESS program one that is open to a larger number of STEM students, including non-freshmen, transfers, and students in STEM majors beyond biology.

# TEACHING COMPUTER SECURITY CONCEPTS IN A FIRST YEAR COURSE

*Z. Peterson<sup>1</sup>*

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## ABSTRACT

We propose the integration of a series of security-themed challenges into Cal Poly's existing introductory course to computer science, designed to teach computer security concepts and general computer science principles to first-year, undergraduate students. The work is motivated by a need to heighten the understanding and awareness of privacy and security in an increasingly pervasive digital world, to act as a gateway to future education and careers in computer science, and to generally promote interest in science, technology, engineering and mathematic (STEM) disciplines. The challenges will be diverse in scope and difficulty; students will need to draw upon a variety of core CS principles (e.g. sorting, encoding, and recursion) as well security-specific concepts (e.g. access control, cryptography, and software vulnerabilities) to solve them. Further, the challenges will be thematically connected through a course-long narrative, designed to engage players in collaboratively uncovering and interpreting fragments of a story, distributed across multiple forms of media, and using the "real world" as its platform.

*Sponsors:*

*National Science Foundation via Georgia Institute of Technology*

## BRIDGES TO THE FUTURE

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### ABSTRACT

The intent of the Bridges to the Baccalaureate project we propose for renewal is to reverse-engineer a training program from the characteristics of highly successful junior and senior biology and chemistry minority students that are motivated and competitive for PhD programs following completion of the BS. The created program will build on our prior accomplishments and result in the training of talented community college students with the qualities, achievements, and habits necessary for transfer to and success in strong four-year institutions. Our community college Bridges Fellows will be competitive for positions in MARC U\*STAR, RISE or similar research training programs at the baccalaureate institution, and be on a trajectory to enter PhD programs, postdoctoral appointments, and the establishment of high profile biomedical research careers.

Junior and Senior undergraduates motivated to pursue and succeed in PhD studies are intelligent and passionate about their biomedical disciplines. They have developed a deep level of disciplinary content knowledge, are familiar with the research literature, and are aware of gaps in existing knowledge. They are intellectually curious and adventuresome, and are comfortable formulating and asking disciplinary questions. They understand the structure of scientific research programs, and appreciate that creative ideas lead to research questions and hypotheses that can be tested through designed experiments. They have acquired the laboratory skills necessary to answer research questions through experimentation. They write and speak at a high level, appropriate for the demands of their disciplines. Motivation has allowed them to develop a strong work ethic. They understand that success is a habit won through training and focused effort. They are resilient, and appreciate that research at the edges of knowledge frequently results in missteps; that these are likely and perhaps necessary for the development of deeper understanding of their work. They maximize effectiveness through collaboration, gaining the insights that others bring to a project. They value interdisciplinary collaboration because chemists, life scientists, physicists, mathematicians and engineers think differently and each enriches the results of their joint work. They are ethical in their work and in their dealings with others. This Bridges effort begins the development of future biomedical scientists at the community college

## L.A. BASIN BRIDGES TO THE PhD PROGRAM

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### ABSTRACT

Through this renewal proposal Cal State LA, UCLA, and UC Irvine intend to increase the participation of minority group members in leadership positions in the American science enterprise. We seek to develop a viable model of collaboration between institutions that can be, and has been, adapted by others to likewise develop the talents of America's minority populations at their universities to bear on the scientific problems of the nation.

**Program Goal:** Enhance the M.S. programs at Cal State LA at the curricular and research levels so that they strengthen the academic and research careers of participating minority students, resulting in admission to top graduate programs in the biomedical sciences, and subsequent successful completion of the Ph.D.

**Institutional Goal:** During the coming three year period there will be a 25% increase in the number of minority masters of science students in the Department of Chemistry & Biochemistry and in the Department of Biology & Microbiology who enter Ph.D. programs following completion of the M.S.

We propose the following measurable objectives for the coming three-year grant period:

**Objective 1:** The LABB→PhD program will recruit six talented minority students on a two-year rotating basis.

**Objective 2:** The institution will provide continually updated coursework for the Fellows to prepare for Ph.D.- level work.

**Objective 3:** The Fellows will participate in a well-crafted program of original thesis research whose results are published in research journals, and presented at meetings.

**Objective 4:** Through co-curricular activities, the Fellows will enhance specific skills useful in their research projects, in their coursework, in oral and written communication, and in GRE test-taking in order to increase their competitiveness for entry into doctoral programs.

**Objective 5:** The Fellows will complete the M.S. program in two years with a minimum grade point average of 3.5.

**Objective 6:** At least 85% of our Fellows will enroll in Ph.D. programs in disciplines useful to the biomedical sciences, preferably at our bridge institutions, UCLA, UC Irvine, or the University of Southern California. Any Fellows who do not enter PhD programs will work in the biomedical research arena as MS-level scientists.

# PROMOTING POSTBACCALAUREATE OPPORTUNITIES FOR HISPANIC AMERICANS (PPOHA, U.S. DEPT. EDUCATION)

## CSULB “PROJECT HOGAR”

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### ABSTRACT

The overarching goal of Project HOGAR (Hispanic Opportunities for Graduate Access and Retention) is to develop the graduate program of one of the nation’s largest HSI universities, both in terms of quality and in its capacity to significantly enhance post-baccalaureate opportunities and success for Hispanic and underserved students. The five-year project goals are: 1: Strengthen the university’s recruitment efforts of Hispanic post-baccalaureate students by developing and implementing a comprehensive recruitment plan, to address relatively lower graduate enrollments; 2: Improve the experience and success of Hispanic post-baccalaureate students; 3: Enhance the scholarship, research and mentorship capacity of faculty to support Hispanic post-baccalaureate student success; 4: Improve the University’s graduate-level infrastructure to support Hispanic post-baccalaureate student success

The transition between undergraduate degree attainment and post-baccalaureate program entry represents a critical hole in the pipeline for Hispanic and other underserved student groups. Unfortunately, many students with great potential are lost during that transition, representing a leak of talent that can otherwise be developed and which can ultimately contribute to the nation’s advanced workforce and leadership. Master’s programs provide critical opportunities for these students, who may have discovered career interests late in their undergraduate programs or may have faced personal challenges (e.g., financial, work/family obligations, others) that limited their ability to prepare for advanced professional or doctoral programs.

Project HOGAR will establish for the first time in our University’s history a Graduate Studies Resource Center (GSRC), which will facilitate and develop programmatic effectiveness and opportunities, with direct impact on Hispanic and other underserved students. Our own pool of undergraduates who can benefit from this is tremendous: 35% are Hispanic, in a student body of greater than 36,000. CSULB is ranked 11th nationally in awarding undergraduate degrees to Hispanics and 13th for underrepresented students generally. However, our graduate enrollment for Hispanics is significantly lower, and our graduate program is relatively small (12% of total enrollment) compared to other universities including among CSU campuses, despite our continuing advancement as a research driven university. Project HOGAR capitalizes on our existing strengths and the outstanding opportunity existing here in Long Beach to expand post-baccalaureate opportunities and impact the national disparities.

Program implementation will entail a campus-wide integrative process by which programs and infrastructure will be developed and strategically coordinated. Specific components include comprehensive outreach programs reaching Hispanic and underserved students, enhanced student engagement relating to graduate education and professional/career goals, facilitation of graduate research/scholarship, growth of cultural competency and scholarship excellence in faculty mentors, and development of research infrastructure to support quality post-baccalaureate education. Project HOGAR and the emerging GSRC will serve as instruments to affect institutional change to foster these post-baccalaureate educational opportunities, research and scholarship excellence, and professional success of Hispanic and other underserved Americans.

## NIH MAXIMIZING ACCESS TO RESEARCH CAREERS MARC U\*STAR

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### ABSTRACT

The CSULB MARC U\*STAR training program offers an extraordinary opportunity for students seeking careers in biomedical research. This program, funded the National Institute of General Medical Sciences (NIGMS), aims to increase the number of underrepresented and underserved students (including: ethnic minority, students with disabilities, and low-income students) who can successfully gain acceptance into graduate programs leading to the Ph.D. degree in a biomedical science (biology, chemistry, psychology, epidemiology and other social and behavioral sciences). The goals of the program are to provide research training of undergraduate students to prepare them for entry into graduate programs leading to the Ph.D. in the biomedical sciences and develop their skills necessary to be successful in those programs. To achieve these goals, the program provides MARC Scholars with a solid curriculum, strong intramural and extramural research experience, personalized career and academic advisement and experience in presenting research on-campus and at national conferences/meetings. Scholars also gain exposure to a broad range of biomedical researchers through an enhanced seminar series in their respective departments.

MARC Scholars have the opportunity expand their research experience and training, engage in critical examinations of current research topics, and increase knowledge about research careers. Scholars are committed to the MARC Program for 21- 24 consecutive months, attend local and national conferences to present their research, complete a senior thesis in conjunction with their faculty mentor and the MARC Program, participate in a Summer Research Experience outside of CSULB in a nationally recognized research laboratory, and apply and enroll into Ph.D. Program at the completion of their CSULB degree.

### MARC U\*STAR at SJSU.

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### ABSTRACT

The primary goal of the NRSA MARC U-STAR training program proposed here is to improve the academic preparedness and research training of underrepresented, honors undergraduate science majors at San Jose State University (SJSU). In doing so, this will increase the number of SJSU students entering Ph.D. and combined Ph.D. degrees in the biomedical sciences. The intention of this program is to prepare project trainees to be highly productive, leading scientists with careers that reach up to 50 years into the future.

# MARC UNDERGRADUATE STUDENT TRAINING IN ACADEMIC RESEARCH

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## ABSTRACT

The goal of the proposed MARC U\*STAR project is to increase the number of outstanding minority science undergraduates that succeed in top PhD programs. This will require efforts focused on individuals, and efforts focused on the institution.

We propose an integrated four-year program that assists talented Cal State LA science students as they reach for excellence in their science disciplines, supports their motivation for a career in research, confident in their abilities, resilient to adversity in the laboratory or in the classroom, and develops their leadership skills.

This program is composed of two parts: first, a Pre-Trainee experience that begins the summer before students join the University as freshmen and continues through the lower-division until they complete the sophomore year. The emphasis for individuals in the Pre-Trainee component is establishment of a sound academic foundation by all science students in the participating departments, and integration into the intellectual and social life of their major department. The institutional component is a rethinking of curricula in all lecture and laboratory courses in the Biology, Microbiology, Chemistry and Biochemistry majors to include participation by students in research or research-like components in every course.

The second part of the Project is focused largely on the 20 Junior and Senior honors undergraduate trainees in the MARC U\*STAR, but also impacts the overall Cal State LA biomedical science education efforts.

The four year program is composed of: 1) a transformed and strong science curriculum enhanced by a program of deliberate co-curricular activities, including: 2) introduction to research early in the undergraduate career, followed by strong year-round research opportunities at Cal State LA and other institutions; 3) participation in special workshops, and in courses; 4) participation in a biomedical sciences seminar series; 5) careful academic and career advisement; 6) networking through the deliberate interaction of the MARC students with science faculty and other successful Cal State LA science students.



# **CAMPARE AND CAL-BRIDGE: TWO CSU NETWORKS INCREASING STEM DIVERSITY, PERSISTENCE, GRADUATION RATES, AND CONTINUATION TO GRADUATE PROGRAMS**

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## **ABSTRACT**

We describe two programs, CAMPARE and Cal-Bridge, with the common mission of increasing participation of groups traditionally underrepresented in astronomy and related fields, particularly underrepresented minorities and women, through summer research opportunities, in the case of CAMPARE, scholarships in the case of Cal-Bridge, and significant mentoring in both programs, leading to an increase in their numbers successfully pursuing a Ph.D. in the field.

CAMPARE is an innovative REU-like summer research program, currently in its sixth year, comprising a network of 14 CSUs and 8 California Community Colleges (most of which are minority serving institutions), and ten major research institutions in California and Arizona (University of Arizona Steward Observatory, the SETI Institute, JPL, Caltech, and the six UC campuses, UCI, UCSD, UCB, UCLA, UCR, and UCSB), where students from the 22 home institutions participate in summer research projects. In addition to the summer research experience, CAMPARE scholars are given extensive mentoring before and after their summer experience.

In its first five summers, CAMPARE sent a total of 49 students from 10 different CSU and community college campuses to 5 research sites of the program. Of these 49 participants, over 90% are from underrepresented groups: 25 are women and 24 are men; 22 are Hispanic, 4 are African American, and 1 is Native American, including 6 female Hispanic and 2 female African-American participants. Twenty-one (21) CAMPARE participants have graduated from college, and more than half (11) have attended or are attending a graduate program, including 8 enrolled in PhD or Master's-to-PhD programs. Over twenty CAMPARE students have presented at the AAS and other national meetings.

The Cal-Bridge program is a diverse network of higher education institutions in Southern California, including 5 UC campuses, 8 CSU campuses, and 7 community colleges dedicated to the goal of increasing the number of underrepresented minority and female students attending graduate school in astronomy or related fields. We have recently selected our inaugural group of five 2014 Cal-Bridge Scholars, including four women (two Hispanic and one part Native American), and one Hispanic man.

Once selected, Cal-Bridge Scholars benefit from financial support, intensive, joint mentoring by CSU and UC faculty, professional development workshops, and exposure to research opportunities at the participating UC campuses.

## CREST CENTER FOR ENERGY AND SUSTAINABILITY

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### ABSTRACT

**Overview:** The California State University, Los Angeles (Cal State L.A.) has established a new CREST Center for Energy and Sustainability (CEaS) under the leadership of Center Director Dr. Feimeng Zhou. CEaS embodies a new vision for a new CREST center that builds on existing strengths of Cal State L.A.'s Colleges of Engineering, Computer Science, and Technology (ECST) and Natural and Social Sciences (NSS). Our Center's mission is threefold: 1) to increase the number of underrepresented students in STEM fields and, especially, to put them on a path towards the professoriate; 2) to conduct innovative, multidisciplinary, research in energy and sustainability; and 3) to increase public awareness and engage policymakers in this nascent movement. Our consortium of partners includes representatives from institutions (i.e., middle and high schools, and a community college) with highly diverse student populations, public and private Ph.D.-granting institutions, the largest energy providers and utilities in the U.S., private industry, the Los Angeles Mayor's office, and national laboratories. Collaborating with these institutions helps us pursue a vision of conducting cutting edge research and transforming sustainable energy from environmental chic to accessible technologies that excite 6th-graders and benefit society. Our dedication to recruiting underserved students into STEM and our commitment to providing them with excellent research opportunities and high quality mentoring will ensure that our activities will address the gross underrepresentation of our students in STEM fields.

**NIH BUILDING INFRASTRUCTURE LEADING TO DIVERSITY**  
**CSULB BUILDING BIOMEDICAL RESEARCH PROGRAM**  
**RESEARCH ENRICHMENT CORE**

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**ABSTRACT**

The Research Enrichment Core of CSULB's BUILD Proposal is designed to create a substantial pool of biomedically trained researchers prepared to address the nation's lack of underrepresented minorities in biomedically-related research careers. Located in the most diverse city in the United States, CSULB is uniquely prepared to meet this challenge by addressing the needs of a diverse population of students at each stage of the student's undergraduate development. To accomplish these objectives the BUILD Leadership Team and its pipeline and strong research partners will:

- 1) Expand and formalize existing relationships with local high schools and community colleges to attract a diverse pool of students to biomedical research careers through culturally and contextually-relevant outreach and shared career explorations courses;
  - 2) Develop and implement an institutional core research curriculum that increases the number and diversity of students matriculating to biomedical research doctoral programs by infusing research training throughout the student undergraduate experience;
  - 3) Establish opportunities for underrepresented students to enter the research career pathway late in their undergraduate careers through a biomedical research certificate program; and,
  - 4) Work in collaboration with our pipeline/research partners to engage students early in mentored laboratory, clinical, and community-based participatory research training and experiences designed to enhance student and faculty engagement in biomedical research that supports matriculation to graduate programs and doctoral degrees supporting eventual biomedical and behavioral research careers.
- BUILD will facilitate the creation of a new curriculum, formalized extramural collaborations, and new cross disciplinary interactions to transform CSULB into a model training program for underrepresented students in biomedical and behavioral research.

**Relevance**

BUILD will facilitate the development of a program that can transform a large, public non-doctoral granting university into a biomedical and behavioral research training ground within a diverse urban setting. Planned activities and collaborations support a diverse pool of historically underrepresented students and provide the mentorship and training needed to ensure their success in doctoral programs and eventual biomedical and behavioral research careers.

# NIH RESEARCH INITIATIVE FOR SCIENTIFIC ENHANCEMENT (RISE)-3 AT CALIFORNIA STATE UNIVERSITY, LONG BEACH

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## ABSTRACT

The proposed California State University Long Beach (CSULB) RISE Program is designed to strengthen the biomedical and behavioral research scientist-producing pipeline – especially for underrepresented minority students. There are two components to the Program: one focused on the recruitment and training of undergraduate students through coursework and research laboratory experience leading to their entry into doctoral study and research careers, and a second focused on master's students who will receive course and research laboratory training to prepare them to enter doctoral study and research careers in the biomedical and

behavioral sciences. The goals of this CSULB RISE Program are to: 1) increase the number of URS completing degree studies in biomedical and behavioral science fields; 2) establish a research training curriculum that provides the skills needed by biomedical and behavioral researchers; 3) create an environment in which participants leave the program fully steeped in the culture and ethical practice of biomedical and behavioral research professionals; 4) increase the number of URS who successfully complete doctoral programs in biomedical and behavioral science fields.

To accomplish these goals, the proposed RISE3 program includes eight major types of activities collectively designed to attract students from underserved communities and help support and strengthen their identity as scientists, and to provide a progressively rigorous educational environment that promotes critical, analytical, quantitative, and creative thinking, and research skills that prepare them to successfully compete in Ph.D. programs in biomedical and behavioral fields:

- (1) outreach to recruit URS into biomedical and behavioral sciences research and into the RISE3 program and other student development programs;
- (2) training and support to enable lower division students to enter into directed research, leading to independent research and entry into PhD study;
- (3) hands-on career exploration by students throughout their undergraduate program that focuses on biomedical and behavioral career opportunities and pathways;
- (4) a series of courses and workshops designed to train students as ethical scientists, develop key academic and workforce skills, and prepare for successful graduate study;
- (5) intensive laboratory research experiences under the mentorship of biomedical and behavioral faculty research faculty members;
- (6) intensive biomedical-related shadow and research fellowship experiences on campus and at regional doctoral-granting institutions;
- (7) mentoring of matriculated RISE Fellows in their first two years after leaving CSULB as they transition to successful PhD studies, and
- (8) on-going learning community (RISE-LC) which facilitates knowledge and professional growth and exchange between current and former RISE participant

**NIH BUILDING INFRASTRUCTURE LEADING TO DIVERSITY  
CSULB BUILDING BIOMEDICAL RESEARCH PROGRAM  
STUDENT TRAINING CORE**

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**ABSTRACT**

The primary goals of the BUILD Student Research Training Program are to recruit, retain, and prepare undergraduate underrepresented students (URS) for entrance into PhD programs in the biomedical and behavioral sciences. The specific aims are to: 1) Establish a broad-reaching and culturally competent undergraduate research training program that builds on best practices from past and existing URS training programs at CSULB including: a) substantial financial and academic support; b) intensive mentored research lab experiences that begin early and expand as the URS progress in their academic program; and c) intimate small-group research training activities as part of a learning community (LC); and 2) Address the barriers URS experience as identified by our CSULB BUILD planning grant using innovative, evidenced-based URS best practices including: a) assets-based interventions designed to strengthen scientific efficacy, interest, and identity, which increase URS persistence in the research career pipeline; b) build awareness and utilization of cultural capital to increase the relevance of science; and c) expand the mentoring network and engage families in the URS' participation in the BUILD Student Research Training Program, resulting in a culturally-congruent science identity. Methods to achieve these aims include: a) engaging students in early research training in faculty labs at the sophomore year; b) creating a LC series that provides an intimate research training environment in the classroom; c) engaging students in progressive research skill-building courses that utilize project-based, active learning; d) supplementing the academic program with workshops and research colloquia; e) engaging students in innovative activities that make research experiences meaningful to their values and lives and build science efficacy; and f) cultivate a culturally-congruent science identity by building awareness of the contributions of culture to health equity research, joining family support and cultural capital. Activities are bolstered by multi-tiered mentoring networks that include program directors, faculty research mentors, LC graduate assistant mentors, peer participants, and their families in the training program.

**Relevance**

Doctoral training of underrepresented populations will transform the biomedical workforce and address the nation's growing scientific needs. Improving the relevance and quality of training so that the most talented underrepresented students become successful researchers will ensure research is informed by diverse researchers, and ultimately increase our nation's ability to achieve health equity for all.

**NIH BUILDING INFRASTRUCTURE LEADING TO DIVERSITY  
CSULB BUILDING BIOMEDICAL RESEARCH PROGRAM  
INSTITUTIONAL DEVELOPMENT CORE**

*K.M. Kelley,<sup>1\*</sup> L. Kingsford,<sup>1</sup> G. Urizar<sup>1</sup>*

<sup>1</sup>College of Natural Sciences and Mathematics, California State University, Long Beach

\*Presenting author. Contact: [Kevin.Kelley@csulb.edu](mailto:Kevin.Kelley@csulb.edu)

**ABSTRACT**

California State University, Long Beach (CSULB) has achieved much success in student diversity, academic quality, and higher graduation rates of underrepresented students (URS) as compared with national statistics, yet URS graduation rates continue to lag behind other demographic groups. Similarly, while CSULB generates one of the nation's highest rates of earned doctorates for comprehensive universities, disparities persist between URS and other demographic groups, meaning lower rates of entry into research careers. CSULB possesses a quality of foundation to succeed in reducing these disparities. Our BUILD Project will create a progressive system of engagement in research-integrated and culturally responsive programs, designed to produce highly trained students prepared to excel in biomedical and behavioral doctoral programs. The role of this Institutional Development Core Proposal is to enable and facilitate this process, providing a strategic plan for research infrastructure and faculty development. To provide excellent research training, a well coordinated, cutting-edge research environment that facilitates competitive faculty research programs is a necessity. Such a program will be in the best position to train students in research with the rigor to prepare them for success as they pursue competitive doctoral programs and research careers. Our strategic plan aims to: 1) Implement a "research infrastructure development plan" that builds upon current, but siloed, assets and resources, to develop a coordinated system facilitating broad access to state-of-the-art infrastructure that bolsters faculty research capacity and opportunities for cutting-edge student research training and education. 2) Develop faculty mentorship and pedagogical skills that engage diverse students early and through their undergraduate career, leading to greater retention, productivity, and success. 3) Increase the numbers of underrepresented doctoral-level research scientists at CSULB in biomedical and behavioral research disciplines, to provide role models and expanded research opportunities for students --explicitly integrated with this effort will be active recruitment of new faculty candidates to diversify CSULB's tenure-track faculty in the biomedical and behavioral disciplines.

Relevance

Built from a foundation of demonstrated success in student research training and education, implementation of the innovative programs described in this proposal will transform CSULB into a national model for best practices and strengthen its abilities to serve as an 'incubator' for diversifying the pipeline with outstanding recruitment and training in biomedical and behavioral research disciplines.

**NIH BUILDING INFRASTRUCTURE LEADING TO DIVERSITY  
CSULB BUILDING BIOMEDICAL RESEARCH PROGRAM  
OVERALL CORE**

*L. Kingsford,<sup>1\*</sup> G. Urizar<sup>1\*</sup>*

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**ABSTRACT**

The primary goal of the proposed BUILD initiative is to strengthen the ability of California State University, Long Beach (CSULB) to develop a pipeline for advanced doctoral degrees for those population groups most underrepresented in biomedical research. First generation-educated racial and ethnic minorities, people with disabilities, and those from disadvantaged backgrounds are gravely underrepresented in the biomedical disciplines. Data collected as part of our NIH BUILD Planning Grant reinforce the need to address the institutional and contextual barriers that underrepresented students (URS) often face when pursuing biomedical research careers. Through our CSULB BUILD initiative, we will develop and sustain an innovative and transformative infrastructure to engage and retain URS and provide them with exceptional research training and skills that will make them highly competitive for doctoral programs and entry into the biomedical workforce. The specific aims of this initiative are to: 1) Develop student outreach efforts, as well as student and faculty training opportunities, during an initial ramp-up period with our pipeline and research partners; 2) Establish a student research development program that engages URS earlier in their academic development, is larger in scope, and is culturally-responsive to our diverse student population; and 3) Work with our pipeline and research partners to provide cross-campus research opportunities and a sustainable research infrastructure for strengthening the URS doctoral pipeline. Furthermore, institutionalization of these efforts will be accomplished by strengthening the collaboration between our diverse biomedical programs and departments, our community college partners, and NIH-funded mentors at our research partner institutions.

Relevance

Increased representation of underrepresented students (URS) in biomedical research is imperative to best serve the nation's diverse population and its complex health challenges. The proposed CSULB BUILD initiative aims to develop a sustainable and transformative infrastructure that will engage and retain URS in the biomedical doctoral pipeline through exceptional and innovative research training.

# THE CALIFORNIA STATE UNIVERSITY LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION (CSU-LSAMP)

*L. Hammersley<sup>1</sup>*

<sup>1</sup>Department of Geology, California State University, Sacramento

## ABSTRACT

Initiated in 1993-1994, CSU-LSAMP is a coordinated and comprehensive program of the California State University dedicated to broadening participation in science, technology, engineering and mathematics (STEM) disciplines. When the Alliance was established, it included 18 campuses of the CSU. It has now expanded to include all 23 campuses of the CSU and is truly a system-wide effort of the California State University. CSU-LSAMP is jointly funded by the National Science Foundation (\$4.6M awarded in 2013 for a five-year period) and the Chancellor's Office (\$800,000 per year).

CSU-LSAMP's primary goals are to: (1) enhance the academic and professional preparation of CSU-LSAMP participants, most of whom are students from underrepresented minorities (URM); (2) improve persistence and graduation rates for CSU-LSAMP participants; (3) increase aggregate production of STEM degrees awarded by the CSU to URM students; and (4) increase the number of CSU-LSAMP students who advance to STEM graduate study. Although individual programs on the 23 campuses maintain a fair degree of autonomy in deciding how their programs are structured, all programs share a common set of goals, policies and procedures, and required program components, allowing the campuses to serve the needs of their own students while maintaining alliance-wide cohesion. CSU-LSAMP activities include academic support (academic excellence workshops, peer mentoring, summer bridge program), professional development (research experiences, publication and presentation of research, international science experiences, graduate school preparation activities), and financial support (textbook support, research stipends, travel awards).

Data collected over the past 20 years show the success of the CSU-LSAMP model. Most notably, our data show that retention and graduation rates in STEM for Hispanic CSU-LSAMP participants are higher than rates for non-minority STEM majors in the CSU. The "achievement gap" for Hispanic LSAMP participants has effectively been closed. The achievement gap for African American participants has been closed by 50%. Retention and graduation rates for URM participants are almost double those for non-URM participants. Data also show that more than 25% of CSU-LSAMP participants continue on to graduate studies. We believe the success of CSU-LSAMP stems from the combination of many high-impact practices into programs that serve students throughout their undergraduate career.



# SAN JOSÉ STATE UNIVERSITY STEM EDUCATION: BUILDING THE TECHNOLOGY PIPELINE

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## ABSTRACT

San José State University (SJSU)'s Jay Pinson STEM Education program is dedicated to improving access to educational opportunities for underserved communities within San José and works across the Colleges of Science, Education, Engineering and Social Sciences to support and develop programming that will increase the capacity of teachers and community-based instructors to deliver effective instruction in STEM; inspire SJSU students to pursue careers in STEM-focused work and education; mentor youth to enter and excel in the STEM career pipeline; and promote the public understanding of issues related to STEM education and research.

Current Jay Pinson STEM Education program initiatives, such as Youth/Girls STEM Network: Computer Science/Cybersecurity (Y/GSN: CS/Cyber), focus on creating awareness and promoting skill development in computer science and cybersecurity, STEM areas of opportunity and projected growth. SJSU is situated in the heart of Silicon Valley and it is projected that the demand for Computer and Information Research Scientists will increase 15% by 2022, job growth that is substantially faster than average.

The Jay Pinson STEM Education Program's Youth/Girls STEM Network: Computer Science/Cybersecurity (Y/GSN: CS/Cyber) is addressing these needs by creating out-of-school time, computer science/cybersecurity learning environments that enable youth (3rd-8th grade) in some of San José's most impoverished neighborhoods to learn essential skills while developing strong relationships with mentors. It involves SJSU students in STEM-focused service learning projects, professional development, and introduces them to teaching. Youth are provided mentors, engaging curricula, and support to pursue ongoing opportunities, while SJSU students hone communication, collaboration and leadership skills.

More broadly, the Jay Pinson STEM Education Program aims to contribute to developing a vastly larger workforce of skilled computer science/cybersecurity professionals. Particular attention is paid to recruiting and maintaining underrepresented groups within the college-bound, computer science/cybersecurity-focused pipeline.

## References:

Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2014-15 Edition*, Computer and Information Research Scientists, on the Internet at <http://www.bls.gov/ooh/computer-and-information-technology/computer-and-information-research-scientists.htm> (visited March 24, 2015).

## **LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION PROGRAM (LSAMP)**

*L. G. Simonian,<sup>1</sup>*

<sup>1</sup> Cal Poly San Luis Obispo, San Luis Obispo, USA

### **ABSTRACT**

The student scholars program was designed to increase the number of CSU-LSAMP students that enter graduate STEM programs by supporting undergraduate CSU-LSAMP students who have declared an interest in pursuing graduate study in STEM fields. The National Science Foundation and the U.S. Department of Energy (DoE) are collaborating to promote the development of human resources in STEM. The collaborations are supported through various NSF programs, such as the LSAMP program. This proposal is for LSAMP supplemental funding to support participation of faculty member Lonny Simonian (CAED - Construction Management) and three undergraduate students in the DoE "Faculty-Student Teams (FaST)" program at the Lawrence Berkeley National Laboratory in Summer 2011. The FaST program is one of four DoE initiatives intended to support the provision of hands-on research opportunities in DoE national laboratories during the summer and has long term implications for future collaborations that will enhance LSAMP student participation in state-of-the-art research.

Sponsors:

*1. National Science Foundation*

## SF BUILD: ENABLING STUDENTS TO REPRESENT IN SCIENCE

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### ABSTRACT

The ongoing underrepresentation of minorities in the sciences limits the effectiveness of our nation's biomedical research enterprise and constrains innovation and productivity in the scientific workforce. To overcome these limitations, the *overall goal* of the SF BUILD project is to transform education, research, training, and mentoring at the primary institution, San Francisco State University (SF State), by creating an intellectually safe, and affirming environment in which minority students and faculty can thrive. Our approach is grounded in the robust psychosocial literature on stereotype threat<sup>(1)</sup> that causes minority students to exit science, and emerging literature on interventions to mitigate this adverse phenomenon.<sup>(2)</sup> We propose comprehensive and sustainable teaching and research training reforms aimed at both addressing institutional deficits that trigger stereotype threat, and affirming the participation of individuals from underrepresented backgrounds in biomedical research through communal goal affirmation. This affirmation will be implemented in classrooms through case studies and near-peer mentoring activities, and in research facilities through investigative activities that “give back” to local communities by answering relevant biomedical questions. These approaches capitalize on the institutional history, strategic goals, and inherent diversity of SF State, a predominantly undergraduate institution that has attained national prominence for scientific teaching, research training, and preparation of underrepresented students for biomedical research careers. Our research partner, the University of California San Francisco (UCSF), will contribute to this effort by providing both biomedical training for SF BUILD scholars, and opportunities for collaborative research for SF State faculty that is relevant to local communities. We expect the program to result in an institutional transformation that creates an affirming and productive teaching and research environments for SF State science students and faculty, while invigorating biomedical research that improves local health.

### REFERENCES

1. Steele, C.M., 1997. *Stereotype threat and the intellectual test performance of African-Americans*. *J. Pers. Soc. Psychol.* 69,797-811.
2. Walton, G.M, Cohen, G.L., 2011. *A brief social-belonging intervention improves academic and health outcomes of minority students*. *Science*, 331,1447-1451.

### ACKNOWLEDGEMENTS

SF BUILD is funded by a grant from the NIH Common Fund 1U54MD009523-01.

**LOUIS STOKES ALLIANCE FOR MINORITY PARTICIPATION PROGRAM  
(LSAMP) STUDENT SCHOLAR**

*J. Lehr*

Ethnic Studies, Cal Poly San Luis Obispo, San Luis Obispo, USA

**ABSTRACT**

The student scholars program was designed to increase the number of CSU-LSAMP students that enter graduate STEM programs by supporting undergraduate CSU-LSAMP students who have declared an interest in pursuing graduate study in STEM fields. The National Science Foundation and the U.S. Department of Energy (DoE) are collaborating to promote the development of human resources in STEM. The collaborations are supported through various NSF programs, such as the LSAMP program.

Sponsors:

*1. National Science Foundation via CSU, Sacramento University Enterprises, Inc.*

**CENTRAL COAST STEM PROJECTS: TEACHER LEADERSHIP CAPACITY  
COLLABORATIVE  
(CCSP: TLC COLLABORATIVE)**

*D.M. Jimenez-Berber*

Liberal Studies, Cal Polytechnic San Luis Obispo, San Luis Obispo, USA

**ABSTRACT**

In collaboration with participating teachers, the Paso Robles Joint Unified School District and California Polytechnic State University will use a three-year intensive professional development program to create new curriculum modules that integrate engineering, technology and math into SCIENCE using the Common Core Science Standards in Mathematics and Next Generation Science Standards (NGSS) frameworks. The proposed work will simultaneously be developing regional NGSS teacher leadership capacity and aiding school sites in their adoption of NGSS. Professional development opportunities offered during the academic year will provide ongoing support and classroom follow-up to the intensive workshops provided during the summer. Teachers and their students in this program will get experience in inquiry based, hand-on activities that promote language development and higher thinking-skills. Centered in the College of Science and Math, leadership from Cal Poly will include faculty in the Sciences, Agriculture, Engineering and Education.

Sponsors:

*CA Dept of Education via Paso Robles Joint Unified School District.*

**CENTRAL CALIFORNIA PARTNERSHIP FOR TEACHER QUALITY PROGRAMS:  
CSU BAKERSFIELD, CSU MONTEREY  
BAY, CAL POLY**

*C. Hoellwarth*

Physics, Cal Polytechnic San Luis Obispo, San Luis Obispo, USA

**ABSTRACT**

This project proposes a hybrid (online and onsite) post-baccalaureate single-subject credential program in math and science. E-learning will transform Cal Poly's post-baccalaureate single-subject credential program into a delivery model to access a diversified and under-recruited candidate pool that can build the capacity of NCLB (No Child Left Behind)-highly qualified secondary-level math and science teachers for rural and geographically remote schools. Cal Poly will leverage its acclaimed STEM Leadership Program to enhance the professional development component for site administrators at partner schools. Faculty will participate in networked learning communities and clinical experiences, providing access and extending its reach to underserved areas. Integrating Web 2.0 and e-learning capabilities extends Cal Poly's reach across current partner programs throughout the course offerings of the School of Education.

Sponsors:

*U.S. Dept of Education via CSU Bakersfield*

**NOAA TEACHER AT SEA PROGRAM SUPPORT**

*J. Keller*

Physics, Cal Polytechnic San Luis Obispo, San Luis Obispo, USA

**ABSTRACT**

STEM Teacher and Researcher (STAR) fellows will be supported for nine week paid summer research experiences involving authentic research opportunities with NOAA researchers. Each STAR Fellows' commitment is 40 hours/week, with 2 hours/week dedicated to education workshop/seminar time co-facilitated by a NOAA Teacher At Sea alum ("Master Teacher") and university science education faculty member ("University Liaison") and the remaining time dedicated to research activities to be supervised by the assigned Research Mentor. Deliverables include a research poster and a research-based lesson plan to be developed with support from the Master Teacher and University Liaison. STAR staff housed at the Cal Poly Center for Excellence in Science and Math Education (CESaME) will recruit applicants, facilitate research placements, organize opening and closing conferences, coordinate Fellows' travel, guide education teams who lead the weekly education workshops, and administer program evaluation.

*Sponsors:*

*National Marine Sanctuary Foundation*

## **CSU SCIENCE TEACHER AND RESEARCHER (STAR): STRENGTHENING K-12 SCIENCE TEACHING IN CALIFORNIA**

*J. Keller*

Physics, Cal Polytechnic San Luis Obispo, CA, USA

### **ABSTRACT**

While the nationally recognized STEM Teachers and Researchers (STAR) Program, annually places 70 of the top future science teachers prepared by the CSU system, "the largest preparer of science teachers in the nation" into national research labs, scaling the program to provide research experiences to a larger proportion of credential seeking students will ultimately require the expansion of research opportunities at local university campuses and, eventually, industry. To address these issues, CESaME and SMEC propose to collaborate on a pilot project emphasizing a transitional pathway for students from underserved communities, specifically minority and first generation college students, to participate in research via local campus placements followed by an opportunity to bridge into second summer research placements at national laboratories. Initially, these HHMI STEM Teachers and Researchers (or HHMI STAR Fellows), will be recruited to local research placements at CSU Fresno and Cal Poly with the ultimate goal of disseminating the program model to campuses

Sponsors:

*1. Howard Hughes Medical Institute*

## **PREPARING AND RETAINING 15,000 EXCELLENT STEM TEACHERS: ADVANCING THE GOAL THROUGH THE STEM TEACHER AND RESEARCHER (STAR) PROGRAM**

*J. Keller*

Physics, Cal Polytechnic San Luis Obispo, CA, USA

### **ABSTRACT**

We propose to expand the STEM Teacher and Researcher (STAR) in 2013-14 to provide 75 summer research experiences at national research facilities to pre-service science and math teachers. Thereafter, we would like to assist in making STAR program opportunities available to future STEM teachers across the 100Kin10 network. Transformative in teacher preparation, STAR develops "teacher-researchers" who authentically bridge the worlds of professional scientific and engineering practices with classroom teaching and learning. Combining Carnegie Foundation funding of \$50,000, with other support for the program in 2013-14 will enable Cal Poly to serve additional participants, to continue its evaluation of the program, and invite other 100Kin10 members to learn about STAR at its August Closing Conference.

Sponsors:

*1. Carnegie Foundation via California State.*

## **CAMPUS-BASED RESEARCH EXPERIENCES FOR FUTURE SCIENCE TEACHERS: EXPANDING THE PARTICIPATION OF UNDERREPRESENTED STUDENTS IN STAR: 2014-2015: REPEATED INTERNSHIPS IN MULTIPLE ENVIRONMENTS**

*J. Keller*

Physics, Cal Polytechnic San Luis Obispo, CA, USA

### **ABSTRACT**

This proposal expands on a current HHMI pilot award both by bringing on additional HHMI Fellows to participate in campus-based research and by providing HHMI Alumni with the opportunity to engage in repeated research experiences in multiple environments. In doing so, we leverage the STAR Program's strong partnerships with federal research facilities to incorporate national recommendations to augment on-campus research experiences with off-campus ones. After completing a campus-based research experience at their home institution, fellows will be strongly encouraged to engage in a second summer research internship the following year at a national lab. Aspiring teachers from underrepresented groups in STEM will be especially encouraged to participate, as will those who experience cultural, socioeconomic, or other barriers to performing research at a national facility. The corresponding program evaluation research will provide much-needed insight into understanding and overcoming barriers to participation in teacher research experiences.

Sponsors: *1. Howard Hughes Medical Institute*

## **2014 STAR PROGRAM: PREPARING FUTURE TEACHERS THROUGH MENTORED MARINE RESEARCH**

*J. Keller<sup>1</sup>*

<sup>1</sup>Physics, Cal Polytechnic San Luis Obispo, CA, USA

### **ABSTRACT**

Through the STEM Teacher and Researcher Program (STAR), the California State University (CSU) system will involve seven pre-service and early career science and math teachers in authentic marine sciences research under the mentorship of researchers at NOAA Southwest Fisheries Science Center and the San Francisco State University Romberg Tiburon Center for Environmental Studies during Summer 2014. The project contributes to ongoing research efforts of the National Marine Fisheries Service and furthers the commitment of both the CSU and NOAA to the 100Kin10 Movement, a national effort to recruit, prepare, and retain 100,000 high quality STEM teachers over the decade. Fundamentally, the proposed work directly supports the mission of the National Marine Sanctuary Foundation to preserve, protect, and promote meaningful opportunities for public interaction with the nation's marine sanctuaries.

Sponsors: *1. Howard Hughes Medical Institute*

## **STAR - SOCIAL INVESTMENT PARTNERSHIP**

*J. Keller<sup>1</sup>*

<sup>1</sup>Physics, Cal Polytechnic San Luis Obispo, CA, USA

### **ABSTRACT**

The ultimate impacts of CSU STAR program are, as a result of research experience and subsequent professional development, to (a) enhance the classroom practice and retention of excellent early career STEM teachers and (b) to enable STAR Fellows to be leaders in preparing and inspiring K-12 students to pursue STEM careers. Research into the classroom practices of STAR alumni who are now in the classroom demonstrates identity transformation into teacher-researchers, a strong sense of community and connection with STAR Fellows and research mentors, enhanced confidence and commitment to the teaching profession, and classroom practices engaging students in authentic scientific and engineering practices. With the support for STEM teacher-researchers provided through this 100Kin10 project, we will be able to sustain and demonstrate the impact of the CSU STAR Program on the nature and quality of science, math, and engineering education in California and partner regions in other states.

Sponsors:

*1. Chevron via the CSU Chancellor's Office*

## **STEM TEACHER AND RESEARCHER (STAR) PROGRAM LONGITUDINAL TRACKING AND EVALUATION SYSTEM**

*J. Keller<sup>1</sup>*

<sup>1</sup>Physics, Cal Polytechnic San Luis Obispo, CA, USA

### **ABSTRACT**

As the STAR Program enters its eighth summer, there is a need for a tracking system that would contribute significantly to the knowledge base regarding research experiences for future teachers. We propose to a) develop a robust longitudinal research and evaluation methodology and tracking system to follow STAR alumni over a five year period, b) examine the range of impacts of the program overall, and c) examine impacts of the program on STAR Fellows who participate for one, two, or three years.

Sponsors:

*1. Noyce Foundation*



# INTEGRATING STEM INTO K-8 TEACHER PREPARATION: FRESNO STATE'S LIBERAL STUDIES STEM CONCENTRATION

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## ABSTRACT

In March 2013, a team of faculty members from the Kremen School of Education and Human Development, the Lyles College of Engineering, and the College of Science and Mathematics received a grant from the California State University Chancellor's Office as part of the Undergraduate Science for Future Elementary Teachers Initiative with major funding from the S.D. Bechtel, Jr. Foundation.

The project, which is supported by the campus's Mathematics and Science Teacher Initiative (MSTI), was designed to develop and implement an innovative 4-course Science, Technology, Engineering, and Mathematics (STEM) Concentration for the Liberal Studies major. Fresno State's Liberal Studies Review Committee approved this new concentration area on 1 May 2013. Members of the cross-disciplinary faculty team worked to revise three existing upper-division science courses and develop a new engineering literacy course. Workshops for course instructors helped to develop a deep understanding of the *Common Core State Standards, A Framework for K-12 Science Education*, and the *Next Generation Science Standards*, with an emphasis on mathematical, scientific, and engineering practices; crosscutting concepts; and the integration of mathematics, science and engineering.

The new Liberal Studies STEM Concentration consists of the following four courses (lead instructors):

- **NSCI 115 - Environmental, Earth, and Life Science** (Dr. Mara Brady: [mebrady@csufresno.edu](mailto:mebrady@csufresno.edu))
- **NSCI 116 - Energy, Technology, and Society** (Karl Runde: [krunde@csufresno.edu](mailto:krunde@csufresno.edu))
- **ENGR 191T - Engineering Literacy** (Dr. Fariborz Tehrani: [ftehrani@csufresno.edu](mailto:ftehrani@csufresno.edu); Nell Papavasiliou: [npapavasiliou@csufresno.edu](mailto:npapavasiliou@csufresno.edu); Lloyd Crask: [lloydc@csufresno.edu](mailto:lloydc@csufresno.edu))
- **PHYS 168S - Physics Pedagogy and Outreach** (Don Williams: [dwilliams@csufresno.edu](mailto:dwilliams@csufresno.edu))

The new concentration incorporates early clinical fieldwork, including innovative experiences that increase interest, enthusiasm, confidence, and competence in science teaching and learning for grades K-8. The new concentration has garnered strong interest among Liberal Studies majors – 2013-2014: 5 graduates; 2014-15: 11 graduates; and 81 in the pipeline!

For more information, contact Project Director Fred Nelson ([fnelson@csufresno.edu](mailto:fnelson@csufresno.edu), 559.278.0261) or MSTI Director Carol Fry Bohlin ([carolb@csufresno.edu](mailto:carolb@csufresno.edu), 559.278.0237). Also visit <http://tinyurl.com/CSU-HSI-STEM-Fresno-LSS> to view our poster.

An informational flyer for interested students can be downloaded from [http://fresnostate.edu/academics/stem/documents/LS\\_STEM\\_Top10Reasons.pdf](http://fresnostate.edu/academics/stem/documents/LS_STEM_Top10Reasons.pdf)

# CENTRAL COAST PARTNERSHIP FOR TEACHING EXCELLENCE

*Mark O'Shea<sup>1</sup>, Chance Hoellwarth<sup>2</sup>, Megan Gui<sup>3</sup>*

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Contact: [moshea@csumb.edu](mailto:moshea@csumb.edu)

## ABSTRACT

### **Project Description and Project Activities:**

1. Recruitment of teachers for high-need rural and remote schools, especially in STEM fields and in additional areas identified in collaboration with our partner school districts.
2. Improvements in teacher preparation at California Polytechnic State University, San Luis Obispo (Cal Poly) by placing the clinical experience at the heart of the curriculum and augmenting curriculum components identified in Absolute Priority.
3. Establishment of a full school year residency pathway to the teaching credential and a Master's degree to be completed within 18 months of matriculation at California State University - Monterey Bay (CSUMB).
4. New and current teacher support and development through planning a two year induction program with partner districts and professional development in teaching to internationally benchmarked college and career-ready standards in STEM fields and Literacy.
5. Using teacher performance and K-12 student success data for program improvement.

### **Summary of project objectives and expected outcomes:**

1. Increase the number of credential program completers in STEM fields (and other high demand areas identified by partners) by 10% each year of the project beginning in project year 2.
2. Attain a retention rate of 80% or higher for new teachers hired in partner districts three years after date of hire.
3. Attain a pass rate of 90% or higher on the Teacher Performance Assessment (edTPA) from all credential programs for which the assessment is a requirement.
4. Demonstrate improvements in K-12 student academic success measures in all classrooms where teacher candidates are placed and graduates are hired for each year of the project beginning in Year 3 through the application of integrated technologies.

**Total target number of teachers to be served by the project:** 3,263 teachers

**Project Partners:** CSUMB as lead, Cal Poly, and 10 public school districts: Salinas Union, Salinas City, Pajaro Valley Unified District, Gonzales Unified, Soledad Unified, King City Elementary, Chualar, Santa Maria Joint Union, Santa Maria-Bonita, San Miguel Joint Union, Monterey COE, Santa Barbara COE, and San Luis Obispo COE, with a total enrollment of 74,930 students.

## EXCELLENCE IN SCIENCE EDUCATION PLUS (ESCI+)

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<sup>1</sup> Department of Geology, Sacramento State University

<sup>2</sup> Center For Mathematics and Science Education, Sacramento State University

### ABSTRACT

eSCI+ is a partnership between the Center for Mathematics and Science Education at Sacramento State, the Sacramento Area Science Project at UC Davis, and the Elk Grove Unified School District. The goal of the project is to provide professional development in science education to approximately 50 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade teachers from EGUSD. The professional development program includes:

- Understanding specific science content through the use of scientific models and model-based reasoning
- Integrating literacy strategies in reading and writing into science instruction in alignment with the Common Core State Standards
- Organizing instruction around the three dimensions of the Next Generation Science Standards (science and engineering practices, cross-cutting concepts, and disciplinary core ideas)
- Managing productive student talk
- Practicing effective teacher talk
- Designing useful assessments aligned with NGSS and CCSS
- Developing collaborative culture through the use of the lesson study process.

The evaluation plan for the project includes:

- Yearly assessment of teacher learning of both science content and pedagogical principles
- Yearly assessment of student learning of science concepts
- Comparison groups of both teachers and students
- Reflective writing by the participating teachers
- Yearly surveys of teacher change
- Observation of demonstration lessons in lesson study
- Poster presentations by lesson study teams using professional-quality posters

To date, both the teachers in the project and their students have significantly outperformed the control groups every year, and the district has seen increases in scores on the 8<sup>th</sup> grade California Standards Test in science.

**FUNDER:** EGUSD subcontract from California Department of Education Math/Science Partnership grant

## FOLSOM CORDOVA USD TEACHER PROFESSIONAL DEVELOPMENT

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<sup>1</sup> Department of Geology, Sacramento State University

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### ABSTRACT

This contract supplied one day of professional development for 55 teachers for grades 6-12, including: One half-day (3 hrs) of professional development for about 55 FCUSD science teachers (grades 6-12) that included:

- A. A review of the intent of NGSS with a focus on the science and engineering practices.
- B. An exemplary science lesson aligned with the NGSS science and engineering practices.
- C. A debrief of the science experience to connect features of the lesson to the science and engineering practices.
- D. An examination of an effective tool for developing small sets of NGSS-aligned lessons.

**FUNDER:** Folsom-Cordova Unified School District

## SACRAMENTO AREA SCIENCE PROJECT

*J. Kusnick,<sup>1</sup> R. Hedman<sup>2</sup>*

<sup>1</sup> Department of Geology, Sacramento State University

<sup>2</sup> Center for Mathematics and Science Education, Sacramento State University

### ABSTRACT

The Sacramento Area Science Project is a joint program with UC Davis that provides professional development to approximately 500 K-12 teachers per year, supplies technical consulting to regional school districts, and conducts research into science education. Our primary programs over the past two years have included a monthly after-school workshop series called Science in the River City; consultation on implementation of the new Next Generation Science Standards (NGSS) and Common Core State Standards (CCSS) to six local school districts, research into the process of lesson study in improving science instruction, and one-week summer institutes for K-12 teachers on designing curriculum aligned with NGSS and CCSS. We have also provided services to the California Department of Education in the NGSS rollout.

**FUNDER:** UC Regents/California Subject Matter Projects

## STEM TEACHER PREPARATION STUDENT SUCCESS INITIATIVES AT SACRAMENTO STATE

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### ABSTRACT

Multiple colleges at Sacramento State are leveraging grant-funded projects to improve K-12 STEM teacher preparation and student success.

“Revitalizing Undergraduate Science Education for Future Elementary Teachers” supports a faculty work group and County Office of Education science curriculum specialist to 1) devise hands-on project-based lab assignments in undergraduate science courses for future elementary teachers, so they share the common theme of water, integrate engineering design practices, and align with new K-12 math and science standards; and 2) develop an upper division STEM field experience course for future K-8 teachers that places them in after-school programs working collaboratively with trained after school providers to implement STEM curriculum.

“CSU-Chevron STEM ZONE Partnership” enables new and current teachers to learn exemplary approaches for teaching STEM by increasing their skills and confidence in scientific and engineering concepts and practices; increasing K-12 student knowledge of and interest in STEM subjects; and creating sustainable resources for teacher professional learning.

“Sacramento Math and Science Teacher” Noyce NSF project supports future math and science teachers with scholarships and professional development, including workshops with the nationally recognized Parent/Teacher Home Visit Project.

“Grant Writing for the Next Generation Science Standards (NGSS) and the Common Core State Standards (CCSS)” is a cross-disciplinary Faculty Learning Community designed to align undergraduate science and teacher preparation courses to the new K-12 science, math and English/Language Arts standards. New content (e.g., engineering), new practices (e.g., standards of mathematical practice), and new paradigms (e.g., cross-cutting concepts in the sciences) are being integrated into undergraduate and teacher preparation coursework. The curriculum re-design is enhanced through targeted focus on content literacy strategies and “Linked Learning” principles.

The Solar Decathlon project challenges collegiate teams (engineering, construction management, business, communications and design students) to design, build, and operate full-scale solar-powered houses that are cost-effective, energy-efficient and attractive. Education students contribute by aligning Department of Energy designed K-12 solar curriculum to new science standards.

Funding Acknowledgement (in order of project description above): S.D. Bechtel, Jr. Foundation, Chevron, National Science Foundation, CSU Chancellor’s Office and Sacramento State Alumni Relations, US Department of Energy

## SANTA CLARA VALLEY MATHEMATICS PROJECT

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### ABSTRACT

The Santa Clara Valley Mathematics Project (SCVMP) is to develop teachers who can teach mathematics knowledge, understanding, and skills successfully to the diverse students in Region 5A. Teaching successfully means developing mathematical proficiency in the sense used by the National Research Council in Adding It Up (2001), encompassing: conceptual understanding – comprehension of mathematical concepts, operations and relations; procedural fluency – skill in carrying out procedures flexibly, efficiently, and appropriately; strategic competence – ability to formulate, represent, and solve mathematical problems; adaptive reasoning – capacity for logical thought, reflection, explanation, and justification; and productive disposition – habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.

## 2015 STEM TEACHER AND RESEARCH PROGRAM: PREPARING FUTURE TEACHERS THROUGH MENTORED MARINE RESEARCH EXPERIENCES

*B. Paavo*<sup>1</sup>

<sup>1</sup> College of Science & Mathematics, California Polytechnic State University, San Luis Obispo, CA, USA

### ABSTRACT

Through the STEM Teacher and Researcher Program (STAR), the California State University (CSU) system will involve five pre-service and early career science and math teachers in authentic marine sciences research under the mentorship of researchers. The project contributes to ongoing research efforts of the National Marine Fisheries Service and furthers the commitment of both the CSU and NOAA to the 100Kin10 Movement, a national effort to recruit, prepare, and retain 100,000 high quality STEM teachers over the decade. Fundamentally, the proposed work directly supports the mission of the National Marine Sanctuary Foundation to preserve, protect, and promote meaningful opportunities for public interaction with the nation's marine sanctuaries.

*Sponsors:*

*National Marine Sanctuary Foundation*

**INTEGRATING MOLECULAR FORENSICS INTO THE UNDERGRADUATE  
SCIENCE, TECHNOLOGY, ENGINEERING AND MATHEMATICS (STEM)  
CURRICULUM TO ADDRESS ENVIRONMENTAL, HEALTH AND FOOD SAFETY  
ISSUES IN CALIFORNIA**

*R. Cano,*

Science & Mathematics & Biological Sciences, Cal Poly San Luis Obispo, CA, USA

**ABSTRACT**

The requested pyrosequencing equipment, capable of rapid, sequence-based analysis of microbes, is key to: integrating explicit pedagogic, research and product development goals into the curriculum from introductory to advanced courses and senior capstone projects. The equipment fosters an experimental mindset and provides a platform for student involvement in developing a microbial forensics database to sub-type strains from a variety of sources. The proposed instrumentation will transform the way students experience the application of technology in scientific discovery and will contribute to the development of other applied research directions across campus.

Sponsor:

*Keck Foundation*

**PREPARING THE NEXT GENERATION OF STEM PROFESSIONALS:  
INTEGRATING COMPUTATIONAL THINKING INTO AN APPLIED MOLECULAR  
FORENSICS RESEARCH PROGRAM**

*C.L. Kitts,*

Science & Mathematics & Biological Sciences, Cal Poly San Luis Obispo, CA, USA

**ABSTRACT**

Combining analytical procedures in microbiology, biochemistry and bioinformatics, the program will engage students across the Colleges of Science and Mathematics (CSM) and Engineering (CENG) in educational experiences involving cutting edge applied research through the lens of an initial focus: production of a working database of E. coli sequences for use in tracking environmental contamination. The curriculum will be delivered to over 1,000 students each year in multiple lab-based courses. These courses will lay the foundation for a new emphasis in molecular forensics at Cal Poly that will lead students from the field, where E. coli is collected, to the laboratory, where the bacterial DNA is amplified and sequenced, to the computer, where the data will be evaluated and archived in a database. Each lab module will engage undergraduates in research with broad applications in the areas of food and water safety.

Sponsors:

*National Science Foundation (TUES)*

## THE EFFECT OF SUPPLEMENTAL INSTRUCTION ON TRANSFER STUDENT SUCCESS IN FIRST SEMESTER CALCULUS\*

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M. Filowitz,<sup>1</sup> J. Hershey,<sup>1</sup> S. Moon,<sup>1</sup> C. Renne,<sup>1</sup> E. Sullivan,<sup>1</sup> S. Walker,<sup>1</sup> R. Woods<sup>1</sup>

<sup>1</sup> California State University, Fullerton

<sup>2</sup> West Virginia University

### ABSTRACT

This study focused on the impact of Supplemental Instruction (SI) on student achievement in first semester calculus for transfer students over a three-year period. Transfer students participating in SI achieved dramatically higher passing rates and course grades than did non-SI transfer students, despite no significant differences in academic predictors between the two groups. The results here indicate that while SI has been shown to be an effective tool for many students, the academic and social elements of SI may be especially significant for STEM transfer students enrolled in gateway courses such as first semester calculus. This research was supported in part by a grant from the National Science Foundation.

\*Bonsangue, M., CadwalladerOlsker, T., Engelke, N., Fernandez-Weston, C., Filowitz, M., Hershey, J., Moon, S., Renne, C., Sullivan, E., Walker, S., and Woods, R. (2013). "The effect of supplemental instruction on transfer student success in first semester calculus." *The Learning Assistance Review*, 18(1), 61-75.



## ECOCAR 3: ADVANCED VEHICLE TECHNOLOGY COMPETITION

*D. Blekhman,<sup>1\*</sup> J. Bower,<sup>1</sup> R. Fang,<sup>1</sup> K. Smith,<sup>1</sup> Y. Wang<sup>1</sup>*

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*Underline: Student participants*

### ABSTRACT

Participation for the first time in an AVTC competition through the Eco CAR 2 Plugging Into the Future international competition has been transformational for both students and the university. In year 2 the team won 2nd place overall! Building on this experience, California State University Los Angeles (CSULA) is proposing to design and implement a Plug-in Hybrid Vehicle that meets and exceeds the competition design goals. The proposed vehicle will be developed to meet the stringent ZEV emissions standards as categorized by the California Air Resources Board. The engineering building integrates both EV charging stations and a nine-kW photovoltaic installation making it possible to charge the vehicle from a renewable resource.

Students design and build the mid-size vehicle utilizing innovative sustainable vehicle solutions and electric vehicle advanced propulsion technologies. The design considerations also include manufacturing flexibility, vehicle serviceability and consumer convenience. In addition to performance, the design approaches assure vehicle, passenger, and pedestrian safety and effective transportation systems integration. In meeting the competition challenges and needs of student training, the team will rely on the support from three colleges, the university administration, and its industrial, public and government partners and sponsors.

Southern California is the hub for introducing new and advanced vehicles in North America. For CSULA, located in the region and designated as a minority serving institution, the EcoCAR 3 competition is a unique opportunity to expose our students to state-of-the-art automotive technologies and participate in the development of 21st century automotive industry solutions. Coming from four disciplines in the College of Engineering, Computer Science, and Technology, the team's students will become the new generation of engineers, technicians and researchers to advance the automotive, energy, automation, and electronics industries. Several of the team alumni are employed in the automotive industry—for instance, GM. To support student learning, the college offers interdisciplinary courses such as Electric and Hybrid Vehicles, Advanced Engine Design, Fuel Cell Applications, and Electronic and Computer Controls. The one year senior design sequence offers students a credit for contributing to the project. Other credit options are also available.

# COMPARING PHYSICAL, VIRTUAL, AND HYBRID FLIPPED LABS FOR GENERAL EDUCATION BIOLOGY

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## ABSTRACT

The purpose of this study was to examine the impacts on learning, attitudes, and costs in a redesigned general education biology course that implemented web-based virtual labs (VL) to replace traditional physical labs (PL). Over an academic year, two new modes of VL instruction were compared to the traditional PL offering: (1) all VL with an in-person help center (VL-A) and (2) a hybrid flipped VL model where online labs alternated with in-person labs every week (VL-H). All three lab types included a face-to-face lecture with the same materials. Engaging inquiry-based exercises were developed around each VL activity where students are provided background information, guided through a series of basic experiments, encouraged to design their own experiments, and required to produce a simple scientific report that is delivered electronically. The VL-A group had the highest proportion of repeatable grades (below a C, 2.0 grade points) but students in the VL-H group achieved significantly better grades compared to the other lab instruction groups. The VL-H group also self-reported statistically significant shifts in their favorable attitudes towards biology. The personnel costs for the VL-A and VL-H models were 29% and 63% of the PL model, respectively, allowing more sections to be offered. These results suggest that carefully designed online lab opportunities can result in better student grades and more favorable attitudes towards science while reducing costs compared to traditional labs.

# RESEARCH INITIATION GRANT: HOW COLLABORATIVE PBL AND COMMUNITY INQUIRY AFFECT SELF-EFFICACY OF MINORITY GROUPS IN ENGINEERING

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## ABSTRACT

Goals and Objectives California State University, Los Angeles (CSULA) seeks funds to initiate an interdisciplinary research project that studies the impact of collaborative project-based learning on the efficacy of traditionally underrepresented minority groups in electrical engineering courses. Through the collaborative efforts between an experienced engineering faculty and a learning scientist with substantial expertise on knowledge building communities and instructional system design, the research results will be applied to EE440, an undergraduate computer networking course, to explore an innovative design model of an instructional system based on participatory design strategy and socio-constructivist theories. The goals of the proposed projects are three folds: 1) Improve the understanding of the factors that affect the efficacy of minority student groups in Engineering; 2) Develop better ways to measure the impact of collaborative learning in the developmental stages of the student learning process in addition to the learning outcomes; 3) Provide guideline to develop a more effective instructional system that integrates community inquiry in engineering courses to boost the efficacy of underrepresented minority students. In addition, the proposed research initiative will also help the PI (engineering faculty) to develop expertise in engineering educational research. The interdisciplinary partnership developed through the proposed project will continue beyond the project duration to work on larger scope engineering educational research project based on the results of the proposed work.

# ENHANCE COMPUTER NETWORK CURRICULUM USING COLLABORATIVE PROJECT-BASED LEARNING

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## ABSTRACT

We are developing a remote virtual laboratory to enhance computer network curriculum in both electrical engineering and computer science departments. The virtual lab will feature a comprehensive set of projects of various scopes to support project-based and inquiry-based learning in networking classes. The goals of the proposed projects are three folds: 1) Establish a cyber-infrastructure to enable remote learning which significantly improve the learning efficiency of students on a commuter campus; 2) Foster students' hands-on design and implementation skills in networking field; 3) Improve teaching and learning efficiency by integrating project-based and inquiry-based learning pedagogy.

Our proposed work aims to enhance the undergraduate computer network curriculum by incorporating collaborative project-based (CPBL) and inquiry-based learning using remote OPNET labs. Our project creates a comprehensive set of remote labs of various scopes to build up the students' design skills step by step. The developed lab sequence will be used in the course redesign of the networking courses in both Electrical Engineering and Computer Science departments. In addition, a guideline of how to integrate OPNET projects onto in-class teaching as CPBL tools will be developed. As a result of the proposed work, a complete set of lab material and teaching strategy guidelines will be developed to: 1) stimulate students' learning interest and make them more engaged in the classroom; 2) embed a pipelined training to enhance students' design skills in undergraduate computer networking curriculum; 3) help other educators to incorporate active learning components in their teaching practice.

This work contributes to the development of an effective teaching strategy in networking field to enhance the learning of students from underrepresented minority groups. The remote lab sequence can be used in multiple networking courses at both introductory and advanced levels to enhance the students' design skills, problem-solving skills and critical thinking. The developed instructional technology and educational modules can be transferred in other institutions and benefit the educational community. With a concrete dissemination plan that is fully supported by our college and by local industry, we are expecting to share our experience, findings, and results with colleagues worldwide and are looking forward to creating partners in multiple disciplines to extend the impact of our work.

# RUI: COLLABORATIVE RESEARCH ON PHOTODEGRADATION OF OXYGENATED POLYCYCLIC AROMATIC HYDROCARBONS ON ENVIRONMENTAL INTERFACES

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## ABSTRACT

Little is known about the photochemical and photophysical properties of oxygenated polycyclic aromatic hydrocarbons (oxy-PAH), which are present on aged particulate matter in polluted urban atmospheres. This is understandable because analytical techniques for the quantitative analysis of these compounds have emerged only recently. This proposal will apply emerging HPLC/M<sup>n</sup> analytical techniques to investigate the chemical kinetics of oxy-PAH in surrogates of particulate matter to elucidate the impact of this chemistry on the oxidizing capacity of the lower atmosphere.

The hypothesis of the proposed work is that singlet molecular oxygen ( $O_2(^1\Delta_g)$ ) produced by energy transfer from excited oxygenated polycyclic aromatic hydrocarbons (oxy-PAH) has a significant role on the oxidizing capacity of the lower atmosphere. To explore this hypothesis, four primary objectives for the proposed research have been formulated: (1) Identify oxy-PAH that are net sources of  $O_2(^1\Delta_g)$  in solution by measuring  $O_2(^1\Delta_g)$  product quantum yields and chemical quenching rates; (2) measure the degradation rates of oxy-PAH in aqueous solutions, on hydrophilic/ hydrophobic interfaces, and on real particulate matter to determine the photochemical lifetimes of oxy-PAH in different matrices; (3) characterize photoproducts of oxy-PAH using multiple analytical techniques, to elucidate the mechanisms of oxy-PAH photodegradation; and (4) determine the potential role of oxy-PAH photoexcitation on oxidation at the air/particle interface using both laboratory experiments and an air quality model.

Undergraduate research assistants are involved in all aspects of this study and prepared to pursue Ph.D. degrees followed by successful careers in research. The inclusion of undergraduates from groups underrepresented in the sciences is a high priority. CSULA, a Hispanic-Serving Institution located in the heart of East Los Angeles, serves students with some of the lowest socioeconomic indices within Los Angeles, 57.3% of whom are Latino. This project has the potential to increase the number of underserved students who select careers in the chemical sciences and pursue graduate education, directly addressing the nation's critically-low number of students preparing for careers in the chemical sciences.

# RUI: QUANTIFYING LARVAL BEHAVIOR TO RECONCILE GENETIC CONNECTIVITY WITH BIOPHYSICAL MODEL PREDICTIONS

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## ABSTRACT

Dispersal is a critical life-history trait linking ecological and evolutionary processes. Transport of planktonic larvae affects colonization success and population persistence for benthic animals, and influences genetic subdivision of populations, local adaptation, and speciation. However, recent studies question the long-held assumption that pelagic larval duration (PLD) determines how far larvae are advected. This has applied significance, as oceanographic models used to predict exchange among marine protected areas often use PLD as the key larval parameter. Our data for Caribbean gastropods show genetic breaks are not congruent with model predictions, and levels of structure are inconsistent with larval lifespan, highlighting a need for new theory.

The proposal will address 3 inter-related objectives: **(1) Are genetic connectivity estimates from mtDNA and nuclear markers congruent, and consistent with model predictions?** Data for mitochondrial and nuclear loci will be used to test for selection on mtDNA, estimate rates of gene flow and times of divergence, and assess levels of connectivity within each species. **(2) Are genetic connectivity and PLD correlated?** More broadly, we will test the assumption that larval period determines dispersal, using comparative methods in a phylogenetic framework to correct for effects of relatedness among species. **(3) Does larval behavior explain genetic structure in species with long PLD?** At least two of our focal species are under-dispersed, with genetically isolated demes despite a 30-day PLD. Conversely, at least one short-PLD species has no genetic structure over large regions of the Caribbean. We will build on past work quantifying larval behavior to ask if species-specific differences in larval swimming facilitate local retention, making species deviate from expected connectivity patterns. We will also test whether pre-competent larvae respond to habitat cues in a way that influences dispersal, as occurs in fish. This work will reconcile life-history theory, oceanographic models and genetics, by mechanistically explaining breaks in connectivity; the results will deepen our understanding of how larval behavior can determine the pace of divergence among populations.

## REU SITE: RESEARCH EXPERIENCE FOR UNDERGRADUATES IN CHEMISTRY AND BIOCHEMISTRY

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### ABSTRACT

This proposal describes the research and student development activities of a domestic REU site. The REU site supports a total of 40 community college students (10 students in each of four summers) to carry out guided original research in the Department of Chemistry & Biochemistry at California State University, Los Angeles (CSULA). Students served by this program are selected primarily from groups underrepresented in the sciences including African-American, Hispanic, Native American, and Asian/Pacific Island students. The program focuses on the very high concentration of underrepresented students enrolled in regional public community colleges in the Los Angeles Basin.

The primary objective of this REU site is to provide a comprehensive research experience for community college students who have had little, if any, prior exposure to research activities with the aim of encouraging students from these groups to pursue careers in the chemical sciences. The purpose of targeting community college students is twofold: to reach students early in their academic careers to make them aware of and excite them about the possibility of engaging in chemical research as a career path, and to tap the vast population of students in the Los Angeles Basin who begin their college experience in a community college where they have minimal access to participate in research activities of any kind. REU participants select research project from an array of topics including inorganic and organic synthesis, electron spin resonance spectroscopy, nuclear magnetic resonance spectroscopy, infrared and laser spectroscopy, enzyme kinetics, plant genetics, electrochemistry, organometallic photochemistry, protein assays, mass spectrometry, atmospheric chemistry, lipid biochemistry, environmental analysis, and electrophoresis. Participants present their findings to CSULA students, faculty, and administrators as well as community college faculty at a research symposium hosted by the CSULA Department of Chemistry & Biochemistry at the completion of the program each summer.

# **RUI: COLLABORATIVE RESEARCH: SPATIAL REALISM IN THE MUSSEL BED DISTURBANCE PARADIGM**

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## **ABSTRACT**

Our understanding of how physical disturbance shapes the structure of populations and communities owes much to field studies of wave-generated gap formation in mussel beds. Prior studies depict mussel beds as a non-equilibrium system, in which disturbance is spatially unpredictable, generating a random patchwork of mussel cover and gaps. The proposed work would test assumptions and predictions of an alternative view - that disturbance shows predictable landscape patterns that depend not merely on spatial distribution of external forcing (wave stress) but also on biological processes determining the structure of the aggregation. Specifically, spatially varying mussel productivity (recruitment and growth), physiological stress, and predation interact to produce landscape patterns in the structure of the mussel cover. Certain regions of the mussel bed develop as mono-layers attached directly to the rock, resisting disturbance. Other regions develop in multi-layered configurations that when very deep force superficial mussels to attach solely to adjacent mussels instead of the rock surface, and cause interior mussels to only weakly attach to either rock or one another, favoring propagating disturbances. Therefore, spatial patterns of gap formation and recovery emerge from a unified landscape process.

The project forms an alliance among a Minority Serving Institution (Cal State LA), a comprehensive university with a unique center for marine spatial analysis (Cal State Monterey Bay) and a Tier 1 Research Institution (UCLA). The partners have considerable mentoring and outreach support systems to draw upon. The project creates a co-mentoring program for Cal State LA students, providing an intensive introduction to spatial analysis of marine ecosystems, an unmatched field research experience, and exposure to research labs of a PhD granting institution, including potential PhD advisors. Numerous educational enrichment and training activities are planned for the three campuses and the field venue, Bamfield Marine Sciences Centre. The project will broaden participation of under represented minorities in biological oceanography on the West Coast, and provide a unique resource in that regard. Additional outreach to the public and K-12 teachers will be done through COSEE-West.



**CAL POLY POMONA & CAL STATE LA COLLABORATIVE CIRM BRIDGES  
PROGRAM TO ENHANCE STEM CELL RESEARCH TRAINING & EDUCATION**

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**ABSTRACT**

Robert Nissen and Sandra Sharp have established a basic cell culture class for students at Cal State LA. With advice from our collaborators at Cal Poly, where a beginning cell culture course is already in place, a stem cell culture course is being developed as part of the proposal. The Cal State LA course incorporates significant hands-on experience in basic cell culture. The course content includes the biology of cells in culture, including embryonic stem cells. The course also discusses the meaning of embryonic vs. more developed stem cells, and the advances that have allowed derivation of stem-like cells from differentiated cells.

Robert Nissen and Sandra Sharp will provide advisement for students on our campus who seek admission to the program and who are already in the program.

The full-time coordinator, housed at Cal Poly Pomona, works out the details of student interviews with prospective mentors for internships.

# CIRM STEM CELL RESEARCH BIOTECHNOLOGY TRAINING PROGRAM

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## ABSTRACT

The \$3.5 million California Institute for Regenerative Medicine (CIRM) funded stem cell biotechnology training program at California State University Long Beach (CSULB), has three major goals: (i) educating the public about the medical, biological, and technological advances of stem cell research and recruiting new scientists into the workforce, (ii) training students in the theory and techniques of stem cell research and (iii) retaining these trainees in long-term career opportunities in stem cell research in California.

To educate non-scientists and to increase the number of informed California citizens in the theory and potential of stem cell research, a new general education course was developed at a local community college (Irvine Valley College) as a bridge to the program at CSULB. At CSULB a stem cell/regenerative medicine module was added to the existing large, lower division, general education lecture course "Introduction to Human Diseases," together with two new courses, "Stem Cell Biology" and "Bioethics & Public Policy." Up to 2,000 qualified students may enroll in these courses as part of their B.S., M.S, or Biotechnology Certificate program. Undergraduate, graduate, and post-baccalaureate certificate students who excel in these courses are encouraged to apply for the stem cell internship. Candidates are selected on their performance in prerequisite courses, a resume, a personal statement, a letter of recommendation from their research advisor, and an interview. Up to ten students enter this two-year stem cell training option each year, which was added to the existing Biotechnology Certificate Program. The program has been full to capacity nearly every year since its inception in 2009 (seven cohorts).

The first year is training at CSULB, and the second is CIRM-funded internships at stem cell host institutions UCI or the City of Hope. The students selected take a tissue culture/stem cell techniques course, which includes a week of intensive stem cell training at the University of Southern California (USC) or at Children's Hospital Orange County (CHOC). The interns are "matched" with stem cell host laboratories at City of Hope (CoH) or University of California at Irvine (UCI) where they perform their ten-month (two semester) full-time internships. During the internship the students are involved in a variety of projects including exploring cures for brain cancer and leukemia, treating spinal cord injury, and basic research on stem cell biology. The CSULB-CIRM interns meet regularly with the internship mentor at CSULB who provides academic and professional support. The host PIs formally evaluate the students. This evaluation process includes completion of assessment forms and meetings with the CSULB internship mentor during site visits. At the beginning and end of the internship period, the students evaluate their internship experience. Data from these evaluations is used to assess the students, the program, and to identify areas for improvement. Nearly all students completing this program have been offered positions for further study or employment in the stem cell biotechnology workforce. Many of these students are currently employed in California as research technicians, continued their studies in M.S. or Ph.D. programs, have gone on to Medical School or are teaching science.

# COLLABORATIVE RESEARCH: CRITICAL ISSUES ON COLD REGION PRECIPITATION CHARACTERISTICS

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## ABSTRACT

The proposed study brings three scientists with expertise in climate, atmospheric circulation, and statistics together to form a strong team to tackle some fundamental yet critical problems associated with precipitation characteristics unique to cold regions. This is to be accomplished through four research goals specifically designed for Pan-Arctic land areas for which long-term historical records are available. Results will greatly benefit climate modeling studies, hydrological/snow model development, and environmental and ecological research in cold regions.

**Goal One:** to determine spatial and temporal patterns of change in the frequency of precipitation types and their associations with surface air temperatures.

**Goal Two:** to uncover the critical temperatures and other relevant geographical/environmental and atmospheric variables that are associated with different types of precipitation specific to Arctic regions.

**Goal Three:** to construct the climatology and geographical patterns of rain-on-snow events and to define its potential changes under a warming climate.

**Goal Four:** to quantify the impact of atmospheric circulation on precipitation characteristics and rain-on-snow events.

This specific project provides financial support and a research opportunity for a graduate student to study climate change as her Master's degree thesis. Additionally, this research allows Dr. Ye to create a series of undergraduate/graduate courses, including Introduction to Global Climate Change, a Global citizenship course for the honors college, and seminar courses focused on exploration, physical environment, and climate change in high-latitudes. Dr. Ye also serves as a volunteer mentor for high school students engaged in research projects that fulfill environmental credits at Alhambra High School. NSF support and collaboration with Dr. Cohen and Dr. Polyakova enhance Dr. Ye's research and expand her professional network as well as boosting the PI's impact on a younger generation.

# **RUI: HYPHENATED SURFACE PLASMON RESONANCE TECHNIQUES FOR ENHANCED BIOMOLECULAR INTERACTION STUDIES AND BIOMARKER DETECTIONS**

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## **ABSTRACT**

The proposed project aims at coupling analytical techniques on-line to surface plasmon resonance (SPR) for studies of facile molecular binding events and trace detection of important biomarkers relevant to neurological disorders. Three projects are proposed. In the first project, electrochemical flow-injection SPR will be used to determine ligand/receptor binding wherein the receptor redox state affects the binding affinity. In the second project, imaging SPR for high-throughput screening of potential inhibitors of  $\beta$ -secretase, which cleaves the amyloid precursor protein (APP) to produce pathogenic amyloid P (A $\beta$ ) peptides, will be attempted. The goal is to search small molecules that may prevent AP peptides from being generated, thus providing a possible therapeutic treatment of Alzheimer's disease (AD). In the final project, sensitive and label-free SPR detection will be conducted on-line with size-exclusion chromatographic separation of amyloidogenic proteins/peptides. AP peptides, tau protein, and their oligomer aggregates in body fluids (e.g., cerebrospinal fluids and urine samples) of AD patients will be separated and quantified. The on-line SPR detection will be conducted using postcolumn regeneration of the sensor surface, with the goal of developing a clinically viable method for early AD detection and diagnosis.

The abovementioned projects are built on the PI's productive research, with the involvement of a large number of undergraduate students, on SPR instrumentation and applications in the past decade and the vital support from the previous RUI grant for this line of research. Support for this research effort allows for the offering of research training to undergraduate students, M. S. graduate students and postdoctoral associates in several important areas of chemistry (analytical instrumentation, device fabrication, surface chemistry, biosensor, and neurochemistry). The proposed project will also have broader impacts on various aspects, including the development of new tools for molecular interaction studies and biomarker detection, transfer of knowledge, and motivation of undergraduate students, particularly those from minority groups, to pursue advanced degrees in science.

# CONNECTING LATINO STUDENTS TO A CULTURE OF RESEARCH TO INCREASE ACADEMIC PERFORMANCE AND RETENTION IN THE MAJOR

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## ABSTRACT

As part of the HSI STEM grant awarded to California State University, Long Beach, the Winter Research Experience and Summer Bridge to The Beach were developed as research training programs to connect Latino students to a culture of research to increase interest and persistence that will in turn positively impact academic performance and retention in the major. Specifically, both research programs aim to increase students' (1) understanding of the research process and the creativity it takes to make contributions in STEM; (2) ability to apply the knowledge learned in courses to research; (3) data analysis and interpretation skills, and (4) awareness and knowledge of ethical conduct in their respective fields.

The Winter program pairs Latino students who have completed the majority of their lower division STEM major courses with a faculty mentor who engage and direct them in research for 10 weeks, beginning during the winter session. The Summer program targets incoming transfer students from various community colleges by pairing them with faculty research mentors. This 9-week research experience is meant to facilitate a transfer student's transition and integration from community college to the CSULB STEM culture. In addition to the research that students perform with faculty, they have an orientation week where they learn about the campus, services available to them, and skills they need to successfully transition to the CSULB STEM environment. Furthermore, throughout the summer they engage in weekly professional development workshops on topics including STEM careers in research, presenting effective oral presentations, and applying to graduate school.

To date 55 Latino students (57% male, 43% female) have participated in these programs. Among the participants, 73.6% had junior status, 50% declared a major in the College of Natural Sciences and Mathematics and 48% declared a major in the College of Engineering. Preliminary analyses included conducting paired sample *t*-tests to assess gains on research skills.<sup>1</sup> Results indicate significant ( $p < .001$ ) positive gains in (1) interpreting results, (2) understanding how knowledge is constructed, (3) understanding the research process, (4) ability to integrate theory and practice, (5) laboratory techniques, (6) understanding ethical conduct in research, and (6) understanding how scientist think.

1. Lopatto D., 2004. *Survey of Undergraduate Research Experiences (SURE): First Findings*. *Cell Biol. Educ.* 3, 270–277.

## Acknowledgements

The CSULB HSI STEM program is supported by a grant from the US Department of Education through the FY 2011 Title III, Part F, Hispanic Serving Institution (HSI) STEM and Articulation Programs (Award No. P031C110151).

## **KECK ENERGY MATERIALS RESEARCH PROGRAM (KEMP) AT CALIFORNIA STATE UNIVERSITY LONG BEACH**

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### **ABSTRACT**

Discovery and characterization of novel energy-related materials are critical to meeting future energy and technology needs of society. Preparing a diverse student population for 21st century STEM fields—and for materials sciences particularly—requires integrating cutting-edge technologies and emerging methods across disciplines in both curriculum and laboratory research experiences. The Keck Energy Materials Research Program (KEMP) at California State University, Long Beach (CSULB) creates a new and exciting interdisciplinary educational program that is explicitly integrated with engagement in energy materials research by undergraduate students and their faculty mentors. KEMP expands research instrumentation critical for energy-related materials research opportunities, engages students in collaborative interdisciplinary research with faculty PIs of distinct yet complementary expertise, and supports the development of interdisciplinary courses essential for launching a new Materials Science Degree Option that bridges across the Departments of Chemistry and Physics. KEMP aims to develop into a nationally significant model for enhancing education in materials science at the undergraduate level. (W.M. Keck Foundation)

## **REU SITE: FROM THE INTERTIDAL TO THE OCEAN DEEP: -MONTEREY BAY REGIONAL OCEAN SCIENCE REU PROGRAM.**

*Corey Garza*

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### **ABSTRACT**

California State University Monterey Bay (CSUMB), a Hispanic-Serving Institution (HSI) with a strong undergraduate research program, will serve as the hub of the new REU program. In addition to research opportunities at CSUMB, we will place students at 5 partner institutions: Hopkins Marine Station of Stanford University, the Naval Postgraduate School, Moss Landing Marine Laboratories, the Monterey Bay Aquarium Research Institute, and the Elkhorn Slough National Estuarine Research Reserve. The Monterey Bay REU program leverages the scientific and educational assets of the Monterey Bay region to increase the diversity and number of students prepared for careers in Ocean Science. To accomplish this goal we will: 1) recruit 12 REU participants with an emphasis on students from underrepresented groups and those with limited access to Science, Technology, Engineering, and Mathematics (STEM) research; 2) prepare students in advance of the 10 week REU for the rigors of undertaking original research; 3) engage students in innovative research in Oceanography, Marine Biology and Ecology, Ocean Engineering, and Marine Geology; 4) provide rigorous research and professional development support for students during and after the REU to maintain interest and involvement in the Ocean Sciences; and 5) provide students with high-caliber faculty mentoring across all phases of the REU experience.

The REU program builds on the CSUMB Undergraduate Research Opportunities Center's (UROC) successful undergraduate research training model. Students will receive training in reviewing literature, formulating a hypothesis, understanding and justifying the use of study designs, hypothesis testing, and conveying the importance of their work to a scientific audience. Students will develop research projects in Oceanography, Marine Biology and Ecology, Ocean Engineering, and Marine Geology to advance our understanding of the mechanisms that structure the Monterey Bay and similar ecosystems, and the potential impact of emerging threats, such as climate change, on ocean systems. Students will come away prepared to lead and make significant intellectual contributions within Ocean Science and address the global research questions of the 21st century.

The REU program builds on CSUMB's strength as a Hispanic Serving Institution (HSI) with a track record of engaging diverse student populations in undergraduate research and preparing them for careers in STEM fields. Our REU program employs: 1) a recruitment strategy that engages with the diverse cultural value systems of our target population, 2) an integrated research, training, and mentoring program that supports students throughout the research experience and as they prepare for careers in Ocean Science, and 3) a mentoring approach that recognizes varying levels of access and preparation, and creates an individualized training plan that elevates student performance, self confidence, and identity as an Ocean Scientist. This integrated recruitment and student support plan will increase the diversity of students pursuing Ocean Science careers to fill the growing societal need for scientists who bring new perspectives and approaches to address the emerging research needs of 21st century Ocean Science.

# IMPROVING STUDENT SUCCESS IN AGRICULTURE-RELATED SCIENCES WITH ACADEMIC SUPPORT AND CAREER MENTORING

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**Priority Need Areas:** Global Food Security and Hunger; Climate Change; Sustainable Energy; Childhood Obesity; Food Safety; and Water Quality

**Educational Strategies:** Supplemental Instruction, Experiential learning, Bridge Programs

**Project's Primary Disciplines:** Biology, Chemistry, Written and Oral Communication

**Purpose:** Increase the diversity of Graduates in Degrees that serve Agricultural and Natural Sciences

**Audience:** Underrepresented minority undergraduates at CSUMB

**Number of Students that will Benefit from the Project:** 1100

**Products:** 1) SI Learning Activities for CHEM 111, BIO 210 and 211; 2) Experiential Learning Activities; 3) Website; 4) New Ag Journalism Course; 5) New Pathways in agricultural focused concentrations; 6) Four year (2+2) pathway for community college students in agricultural.

**Outcomes/Impact:** We will accomplish the following (as measured by):

- Improve student success in high-risk courses (GPA)
- Improved SEP curriculum (Number of students)
- Increased student awareness and knowledge of SEP program and of opportunities in agricultural fields, including research, internship, and employment opportunities (Surveys)
- Increased knowledge of skills needed for those jobs (Upper division courses completed)
- Increased retention and graduation of students (Number of students)
- Increased enrollment in SEP agriculture and natural resource degree program (Number of students)
- Increased participation in student research and internships (Number of students)
- CSUMB students eligible for USDA Mission Critical Objectives (Student transcripts)
- CSUMB students better prepared for agricultural workforce (Student transcripts)
- Increased number of students applying for agricultural jobs (Employer and student surveys)
- Increased number of students pursuing graduate studies (Number of students)
- More and stronger candidates for regional and national workforce (Employer surveys)
- Stronger agricultural and natural resource workforce (Employer surveys)



# CONTEMPORARY HEALTH AND NUTRITION WITHIN THE YUCATÁN PENINSULA: *CULTURA FUERTE-MAYA SANA*

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## ABSTRACT

**Proposed Goal:** California State University Monterey Bay's (CSUMB) College of Health Sciences and Human Services (hereafter CHSHS) requests funding to formally plan and establish a new study abroad program in the Yucatán. In collaboration with the *Universidad Intercultural Maya (UIMQROO)*, Millsap's College Yucatan sites (including *Kaxil Kiuic*, Casa Millsap's and MPARC), and *Fundación Haciendas del Mundo Maya*. The Dean of CHSHS, Dr. Britt Rios-Ellis, and CSUMB faculty are committed to creating an enriching program that links nutrition and culture through an 18-day study abroad experience. Dr. Rios-Ellis has worked for over 20 years in nutrition-related programming for underrepresented Spanish-speaking Latinos.

Earlier this year, in response to Mexico's assuming first place as the most obese country in the world, Dr. Rios-Ellis led a team of researchers to conduct a needs assessment of the nutritional practices of a Mayan community in the Mexican state of the Yucatan. In collaboration with the *Fundación Haciendas del Mundo Maya*, the team collected anthropometric data and 24-hour nutritional recall on over one third (n=333) of the residents of the Yucatan-based Mayan hacienda community of Santa Rosa de Lima Maxcanu. Dr. Rios-Ellis and her team, in partnership with bilingual (Mayan and Spanish-speaking) community and the *Fundación* staff, developed a research protocol that linked qualitative and quantitative data collection to better understand the changes in dietary practices of a rural Mayan community within contemporary Mexico. Quantitative data collection included the use of a Tanita bioimpedance scale to determine, biological age, body fat mass, percent body fat, body mass index, organ fat weight, waist circumference, height and weight. In addition a subset of participants were involved in eight focus groups to assess health and nutrition practices, physical activity behaviors and beliefs, concerns and attitudes among children, youth, parents, grandparents, and health workers. CSUMB CHSHS will be provided the opportunity to study the Mayan diet, learn the ingredients in various Mayan recipes and taste Mayan dishes, study *El Plato de Buen Comer Maya* developed by the *Universidad Autonoma de Yucatan* (UADY), become familiar with the results of the needs assessment, receive training in nutritional and health assessment methodology, and actually engage in a nutritional needs assessment in partnership with *Fundación Haciendas del Mundo Maya* and UIMQROO representatives. Furthermore, students will become familiar with health and nutritional practices in the Yucatan and learn the benefits and challenges posed by the award winning *Oportunidades* Program (Leroy et al, 2008), which grants nutritional subsidies, education and training, school uniforms, and cash subsidies to families that keep their children, specifically girls, in school. The needs assessment found that, although community residents engage in some physical activity through their non-mechanized activities, participants recommended the initiation of Zumba or other dance- exercise options. In response, CHSHS students will work with our award winning Kinesiology faculty to design a 30-minute exercise program that incorporates both Spanish and Mayan music and train community residents in proper techniques.

**AIR: OPTION 2: CREATION OF AN ECOSYSTEM FOR BIOPHOTONICS  
INNOVATION (EBI)**  
**NATIONAL SCIENCE FOUNDATION IIP AIR ACCELERATING INNOVATION  
RESEARCH GRANT**

*W. D. Smith<sup>1</sup>\**

<sup>1</sup> Principal Investigator. Department of Electrical and Electronic Engineering, California State University, Sacramento, Sacramento, California

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**ABSTRACT**

Subaward Principal Investigator Warren D. Smith, Ph.D., has broad experience in biomedical instrumentation research and education. He has collaborated in biomedical instrumentation research and development with over 30 clinicians at medical schools at UC Davis, UC San Francisco, UC San Diego, and UC Irvine, as well as Yale University and Carolinas Medical Center. He developed and taught lecture/laboratory courses on diagnostic and therapeutic devices for the cardiovascular, respiratory, fluid balance, and thermoregulatory systems. His teaching experience includes biomedical electronics, advanced biomedical instrumentation design, digital signal processing, biomedical modeling and simulation, assistive technology, rehabilitation engineering design, ergonomics, and medical imaging, including X-rays, CT, ultrasound, and nuclear medicine.

Dr. Warren Smith serves as the main liaison on the Sacramento State campus for the NSF AIR “Creation of an Ecosystem for Biophotonics Innovation” (EBI) 2-year grant. In this capacity, he informs the faculty and students of the College of Engineering and Computer Science about EBI projects that may be of interest to them.

Dr. Smith has mentored a very large number of students at CSUS, at the bachelors and masters levels, in biomedical engineering and electrical and electronic engineering, as well as other engineering fields.

For the NSF AIR project, Dr. Smith co-mentors CSUS students working on collaborative projects with Dr. Steve Lane, CBST Chief Scientific Officer, and other researchers at the Center for Biophotonics Science and Technology, toward their MS degrees.

Dr. Smith works with CSUS students on medical technology prototyping and coordinates access to facilities and equipment at CSUS by EBI project students and postdocs. He also provides engineering expertise to EBI participants, as necessary.

# AUTOLOGOUS THROMBIN DEVICE

## NATIONAL SCIENCE FOUNDATION I-CORPS TEAMS GRANT

*W. D. Smith,<sup>1\*</sup> J. R. Chapman,<sup>2</sup> M. Singh<sup>3</sup>*

<sup>1</sup> Principal Investigator. Department of Electrical and Electronic Engineering, California State University, Sacramento, Sacramento, California

<sup>2</sup> Mentor. Stem Cell Partners, LLC, Sacramento, California

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### ABSTRACT

We have developed an improved method of preparing autologous thrombin (from the patient's own blood) as an alternative to bovine thrombin. Annually, between 370,000 and 500,000 patients in the United States are exposed to topical bovine thrombin for surgical hemostasis.<sup>(1)</sup> Thrombin is a clotting factor that plays a key role in the wound-healing stage of hemostasis.<sup>(2)</sup> In 1990, the first description of bovine thrombin antibodies with cross-reactivity to native coagulation factors was reported,<sup>(2)</sup> resulting in an FDA warning letter and a black-boxed warning on the package insert. Bovine thrombin is known to carry the infectious agent bovine spongiform encephalitis and other viruses pathogenic to mammals. A first-generation autologous thrombin device is marketed by Biomet Corporate to overcome the effects of bovine thrombin; however, it is limited in market acceptance because of the addition of 20% ethanol to stabilize the thrombin. With our Autologous Thrombin Device, there is no need to add any stabilizers, such as ethanol, making our thrombin fully biocompatible for patient use.<sup>(3)</sup>

Our innovation enables a new thrombin therapeutic to be generated not only for hemostasis applications, but also for regenerative medicine applications as cell delivery scaffolds. We are the first to create autologous thrombin that poses no risk of an immune response, transmitting an infectious disease, or causing a cytotoxic reaction at the site of placement. We have the safest thrombin compared with bovine thrombin, recombinant thrombin, pooled human serum thrombin, and the first generation autologous thrombin. Our technology will enable researchers to employ our thrombin to prepare platelet gels and fully autologous fibrin sealant for stem cell delivery to wound sites.

Our autologous thrombin will be of use in wound care including treatment of skin ulcers, which affect 5.7 million people in the US, costing the healthcare system nearly \$20 billion, annually. Our Autologous Thrombin Device offers cost containment by achieving more rapid surgeries, fewer blood transfusions, and fewer side effects compared with other thrombin sources on the market. The current thrombin market is \$1.4 billion annually, with a \$183 million share for bovine thrombin.

1. Lomax, C., September 4, 2009. *Safety of topical thrombins: the ongoing debate. Patient Safety in Surgery*, 3:21 [<http://www.pssjournal.com/content/3/1/21>].

2. Ham, S.W., Lew, W.K., and Weaver, F.A., 2010. *Thrombin use in surgery: an evidence-based review of its clinical use. Journal of Blood Medicine*, 1:135-142.

3. Chapman, J.R., 2005. *U.S Patent Application No. PCT/US2013/061756. Sacramento, CA: U.S Patent and Trademark Office.*

**I-CORPS SITE: A BIOLOGICAL SCIENCES SITE FOR THE CALIFORNIA STATE  
UNIVERSITY**

**NATIONAL SCIENCE FOUNDATION INNOVATION CORPS (I-CORPS) SITES  
GRANT**

*D. Forer,<sup>1</sup> W. D. Smith,<sup>2\*</sup>*

<sup>1</sup> Student Principal Investigator. Department of Electrical and Electronic Engineering, California State University, Sacramento, Sacramento, California

<sup>2</sup> Faculty Principal Investigator. Department of Electrical and Electronic Engineering, California State University, Sacramento, Sacramento, California

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**ABSTRACT**

A wireless stethoscope is developed to protect the health care provider from infection from the patient and prevent the spread of infection from patient to patient. Basic care requires physicians to be able to listen to the patient's internal organs such as the heart and lungs, measure the patient's heart rate, and view the patient's electrocardiogram (ECG). Our wireless stethoscope allows physicians to safely listen to a patient's heartbeat and view its graphical representation, or phonocardiogram (PCG). Integrating ECG leads into the device allows the physician to see the patient's ECG signal plotted to a remote display. The sensor module that comes in contact with the patient can be discarded. The transmit module is inside a sterilized container and can be reused. The patient's ECG and PCG signals, along with the average heart rate, are displayed on a tablet, phone, or laptop computer.

**PFI:AIR RESEARCH ALLIANCE – ECOSYSTEM FOR BIOPHOTONICS  
INNOVATION (EBI) – BUILDING SUSTAINABILITY**  
**NATIONAL SCIENCE FOUNDATION IIP PFI: AIR ACCELERATING INNOVATION  
RESEARCH GRANT**

*W. D. Smith<sup>1</sup>\**

<sup>1</sup> Principal Investigator. Department of Electrical and Electronic Engineering, California State University, Sacramento, Sacramento, California

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**ABSTRACT**

Subaward Principal Investigator Warren D. Smith, Ph.D., has broad experience in biomedical instrumentation research and education. He has collaborated in biomedical instrumentation research and development with over 30 clinicians at medical schools at UC Davis, UC San Francisco, UC San Diego, and UC Irvine, as well as Yale University and Carolinas Medical Center. He developed and taught lecture/laboratory courses on diagnostic and therapeutic devices for the cardiovascular, respiratory, fluid balance, and thermoregulatory systems. His teaching experience includes biomedical electronics, advanced biomedical instrumentation design, digital signal processing, biomedical modeling and simulation, assistive technology, rehabilitation engineering design, ergonomics, and medical imaging, including X-rays, CT, ultrasound, and nuclear medicine.

Dr. Warren Smith serves as the main liaison on the Sacramento State campus for the NSF PFI:AIR “Ecosystem for Biophotonics Innovation” (EBI) 2-year renewal grant. In this capacity, he informs the faculty and students of the College of Engineering and Computer Science about EBI projects that may be of interest to them.

Dr. Smith has mentored a very large number of students at CSUS, at the bachelors and masters levels, in biomedical engineering and electrical and electronic engineering, as well as other engineering fields.

For the NSF PFI:AIR project, Dr. Smith co-mentors CSUS students working on collaborative projects toward their MS degrees, together with Dr. Steve Lane, CBST Chief Scientific Officer Emeritus and other researchers at the Center for Biophotonics Science and Technology.

Dr. Smith works with CSUS students on medical technology prototyping and coordinates access to facilities and equipment at CSUS by EBI project students and postdocs. He also provides engineering expertise to EBI participants, as necessary.

# W.M KECK SUMMER UNDERGRADUATE TRAINING PROGRAM ON GLOBAL CHANGE AND EMERGING INFECTIOUS DISEASE

*V. Casas,<sup>1</sup> S. Maloy<sup>1</sup>*

<sup>1</sup>College of Sciences and Center for Microbial Sciences, San Diego State University

## ABSTRACT

The impact of global climate change influences the dissemination and severity of infectious diseases—from changes in the geographical distribution of insect vectors to the transmission in food and water. Countering these problems will require scientists with expertise that crosses traditional scientific disciplines and who are facile with computational modeling and mathematics. The goal of this summer training program is to expose entering freshmen, returning sophomores, or community college transfer students with little to no research experience to interdisciplinary research in STEM fields. This intensive summer program includes hands-on training in environmental field work, laboratory methods in microbiology and molecular genetics, computer simulation and mathematical modeling, coupled with workshops on research skills, scientific writing, and responsible conduct of research. The field and laboratory experiences focus on characterization of virulence genes from microbial populations in the Tijuana River Estuary, a sensitive natural resource near the US/Mexico border cities of San Diego and Tijuana, respectively. Sample data sets for the computational simulations and mathematical modeling were provided by local monitoring agencies, available online resources, or primary research articles. Student training culminates in a guided self-directed group research project on the topic of global climate change and emerging infectious diseases. Students are encouraged to employ at least two of the three interdisciplinary approaches in designing, executing, and data analysis of their research projects. Students then present their research findings in both a poster and oral presentation format. A total of 31 students have participated in the program over three summers from 2012-2014. Since completing the program 77% of these students were placed in research labs from a variety of STEM fields to do undergraduate research using their new training and gaining valuable experience as an undergraduate research student. Moreover, 33% of the students who participated in the program have received scholarships to do research in STEM fields and six students have applied to graduate programs. This program has proven successful in increasing student participation in interdisciplinary research in STEM fields.

# USING AN URBAN AGRICULTURE COMMUNITY-BASED RESEARCH PROJECT TO ENHANCE STUDENT LEARNING IN STEM

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## ABSTRACT

The Urban Agriculture Community-based Research Experience (U-ACRE) is designed to attain four main objectives: 1) develop student research skills through community engagement; 2) connect undergraduates to professional networks and increase dissemination skills through presentations, grant writing, and publication; and 3) increase awareness of STEM fields and USDA careers in undergraduate students as well as K-8 students through mentoring and involvement with U-ACRE; and 4) advance applied research and outreach with community partners to improve food security and nutrition through the use of urban agriculture.

U-ACRE community partners include food producers (aquaponic farm and arboretum), food providers for low income consumers (transitional living center and food distribution centers), schools (K-8), and non-profit social enterprises (café and culinary training for young adults emancipated from the foster care system). U-ACRE students all complete an intensive class on sustainable urban food systems, and participate in ongoing research service learning and internships classes. Our U-ACRE students benefit from active engagement in on-going research, serving as team leaders at community sites, mentoring K-8 students, submitting applications to the Institutional Review Board at CSUF, presenting papers and/or posters at national and local conferences and to county-wide community organizations. Outputs include: thriving urban gardens at schools and other facilities, a lunch waste diversion program through vermicomposting (with corresponding data collection app) at a large middle school, U-ACRE student designed garden iPad app for K-8 students; sustainability tutorials for K-8 students focused on nutrition, urban farming, and environmental education. Formative assessment at the first milestones shows significant increases in skills and knowledge of research, urban agriculture, and communication skills, as well as USDA career opportunities. Our partners have benefitted from increased access to fresh foods and nutrition knowledge as well as enhancement of urban farming and resource management methods and practices.

Acknowledgements: Funded by USDA-NIFA HSI 2011-02404 and 2013-01564 and the Orange County Community Foundation, 2011. Joel K. Abraham was co-PI on the 2013 grant.

# STEM CELL INTERSHIPS FOR LABORATORY BASED LEARNING.

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## ABSTRACT

The primary goal of the San José State University Consortium for Stem Cell Internships in Laboratory-based Learning (SJSU SCILL) is to continue to provide the State of California and the central coast region with well-educated scientists who are proficient in stem cell biology at the graduate level. The program is designed to equip students with a broad-based understanding of stem cell biology through classroom instruction and seminars, and in-depth, laboratory-based expertise in a specialty area unique to each student's professional development plan through a yearlong internship. These experiences are built on the foundation of a strong classroom laboratory experience at San José State University, coupled with an array of stem cell internship opportunities encompassing basic cell and molecular research university partners (Stanford University and UC Santa Cruz), translational research involving stem cell product development at our corporate partner (Escape Therapeutics, Inc.), and clinical applications of stem cell science at the Parkinson's Institute.



**RUI: OCEAN ACIDIFICATION: MULTIPLE STRESSOR EFFECTS OF OCEAN  
ACIDIFICATION & HYPOXIA ON BEHAVIOR,  
PHYSIOLOGY & GENE EXPRESSION**

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**ABSTRACT**

This project will provide educational opportunities and direct research experience for graduate and undergraduate students at 4 institutions: Moss Landing Marine Labs, CSU Monterey Bay, Humboldt State University and UC Santa Cruz. Students will be actively engaged in all components of the lab experiments, field sampling, and genomic analyses. CSUMB has historically placed emphasis on placing underrepresented students as interns with active science professionals through their highly successful Undergraduate Research Opportunities Center. PI's Sogard, Logan and Hamilton have mentored many such students over the past several years. Undergraduates at CSUMB and HSU will be paired with graduate students at home institutions and at MLML and NOAA/UCSC for summer internships, providing valuable research experience in fish physiology and nearshore oceanography, while preparing them for entry into competitive graduate programs. Students will be trained to communicate the results of their sciences and will attend scientific conferences present results and meet other experts in the field. Students will also help develop curricula for K-12 education on climate change impacts and will work with the Teacher Education Program at MLML and local marine science programs at Monterey area high schools to test and implement the curricula. This project will also expand the experimental capacities of HSU's marine laboratory for educational and interdisciplinary collaborative research efforts, with PI's Bjorkstedt, Abell, and Mulligan. Two of the PI (Hamilton and Logan) are new faculty members developing new research programs, and this project will provide valuable support in those efforts. The results of the field studies and lab experiments will be rapidly disseminated to fisheries management agencies, oceanographic observing programs, and the science community to provide information on climate change impacts for economically valuable groundfish.

# **A PROPOSAL TO CONDUCT COLLABORATIVE HUMAN SYSTEMS INTEGRATION RESEARCH BETWEEN NASA**

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## **ABSTRACT**

This sponsored project proposal is in response to NASA Cooperative Agreement Notice "NASA Human Systems Integration Research" (NNA11364623A). We request the funding of a new cooperative agreement, A Proposal to Conduct Collaborative Human Systems Integration Research between NASA Ames Research Center and San Jose State University. The period of performance is July 1, 2011 to June 30, 2016. The objective of the cooperative agreement is to provide collaborative research relevant to: (1) Human Automation Interaction, (2) Flight Deck Research, (3) Human Computer Interaction, (4) Human Centered Systems Research and Modeling, (5) Team and Individual Factors, and (6) Vehicle Interface Systems.

## **SYSTEMS TEACHING INSTITUTE AT NASA-AMES.**

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## **ABSTRACT**

Under the auspices of NASA and the UARC, the Systems Teaching Institute (STI) will serve science, technology, engineering and mathematics students as a teaching hospital serves medical students. Research will examine realistic problems and data. Students will learn through direct experience in a real setting. Faculty will be skilled professionals and have significant responsibilities for teaching, research and technology development..

## **REU: RESEARCH BY UNDERGRADUATES USING MOLECULAR BIOLOGY APPLICATIONS.**

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### **ABSTRACT**

The three-year renewal of our REU program at San Jose State University called Research by Undergraduates using Molecular Biology Applications (RUMBA) will focus its efforts in increasing the number of underrepresented minority and female students doing biological research in the Silicon Valley. The objectives of our RUMBA program are to:(1) increase the number of underrepresented minority and female undergraduate students doing biological research, (2) develop an undergraduate research cohort by their participation in a short laboratory course focused on the applications of molecular biology techniques to investigate problems in varied biological fields, and (3) expose our cohort to a national scientific community by presenting posters at the annual SACNAS (Society for the Advancement of Chicanos and Native Americans in Science) Conference.

## **SILICON VALLEY INNOVATION & ENTREPRENEURSHIP SCHOLARSHIPS (SVIES) PROGRAM.**

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### **ABSTRACT**

The Silicon Valley Innovation and Entrepreneurship Scholarships (SVIES) Program awards annual renewable scholarships to academically talented, financially needy graduate engineering students at San Jose State University (SJSU). Only US citizens or permanent residents are eligible. The objectives of the project include: Provide graduate students of College of Engineering (COE) with opportunities to learn about innovation and entrepreneurship, equip them with methods facilitating innovation and entrepreneurship, and mentor them with direct support of Silicon Valley innovators and entrepreneurs. -Solicit mentoring support from leading and start-up technology companies of Silicon Valley and build direct relationships with Silicon Valley companies with respect to innovation education.

-Based on the lessons learned, inform the College of Engineering in its endeavor to institutionalize innovation education and propose a development strategy and implementation timeline for an Innovation and Entrepreneurship Certificate Program at SJSU COE.

# **IOS: RUI: INVESTIGATION OF THE ROLE OF A RECEPTOR PROTEIN TYROSINE PHOSPHATASE IN SYNAPTIC PARTNER RECOGNITION**

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## **ABSTRACT**

Perception, thought, and behavior rely on the faithful transfer of information between neurons. During development, neurons are linked into circuits, the structural basis of nervous system function. Neurons project neurites into specific regions during axon guidance. However, within a target region, most neurites still contact many potential partners, and it is critical that neurons recognize and form connections only with only correct neuronal partners. Currently, we have a poor understanding of the molecules involved in this fundamental process of synaptic partner recognition (SPR). Using a novel split-GFP based transsynaptic marker, our research aims to characterize the role of the receptor protein tyrosine phosphatase (RPTP) CLR-1 in SPR, in the genetic model organism *Caenorhabditis elegans*.

# **EXPLORING EMERGING WASTE STREAMS CREATED BY ADVANCES IN TECHNOLOGY: BRINGING REAL WORLD ISSUES INTO THE UNDERGRADUATE STEM CURRICULUM AT CAL POLY, SAN LUIS OBISPO**

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## **ABSTRACT**

<sup>1</sup>The Global Waste Research Institute (GWRI) at Cal Poly is proposing to broadly incorporate management issues and environmental impact of emerging waste and byproduct streams in the undergraduate STEM curriculum. In particular, waste and byproduct management aspects of nanotechnology will be integrated into the curriculum across disciplines. This is Phase II of a two phase proposal to the W. M. Keck Foundation Undergraduate Education Program.

Sponsor:

*W. M. Keck Foundation*

## **COLLABORATIVE RESEARCH: UNDERSTANDING STUDENTS' DEVELOPMENT AND DEPLOYMENT OF LIFELONG LEARNING SKILLS**

*K.C. Chen<sup>1</sup>*

California Polytechnic State University, San Luis Obispo, CA, United States

### **ABSTRACT**

This project seeks to improve the Science, Technology, Engineering, and Mathematics (STEM) educational community's understanding of how students develop the skills and attitudes necessary for self-directed and lifelong learning. Specifically, the work examines first- and second-year students' conceptions of learning; measures students' sense of control and responsibility in their learning processes; and evaluates their skill in using self-regulated learning strategies to respond to diverse learning opportunities and challenges. The project draws upon existing social-cognitive theories of motivation and self-regulation, as well as the investigators' successful practice in autonomy-supportive pedagogies and current studies of self-directed learning in STEM environments. Participants in this study will be engineering faculty, humanities faculty, and undergraduate students at Olin College of Engineering and California Polytechnic State University at San Luis Obispo.

*Sponsor:*

*National Science Foundation (TUES) via Franklin W. Olin College of Engineering*

## **ADVANCING INTERSECTIONALITY: AN ANALYSIS OF UNDERREPRESENTED MINORITIES IN NSF ADVANCE PROGRAMMING**

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### **ABSTRACT**

The overall objective of this NSF ADVANCE PAID-Research proposal is to identify and disseminate successful strategies to support and empower underrepresented minority (URM) women in academic Science Technology Engineering and Mathematics (STEM) positions. To this end, we will investigate how and in what specific ways recent NSF ADVANCE Institutional Transformation (IT) programs have addressed the concerns of URM women and sought to increase the success of URM women in STEM. Our goal is to develop a data-driven working document that will enable us to disseminate best practices and indicators for supporting URM women in STEM fields. The proposed work is timely and specifically addresses the need for more extensive, data-driven investigations of factors that promote the success of, enhance opportunities for, and empower URM groups to succeed in STEM fields. This PAID research project is a collaborative effort between Dr. Jasna Jovanovic and Dr. Mary A. Armstrong at Lafayette College.

*Sponsors:*

*National Science Foundation (ADVANCE)*

## CESAME AMERICORPS\*VISTA PROGRAM

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### ABSTRACT

The Cal Poly Center for Excellence in STEM Education (CESAME) proposes to support two CSU STEM AmeriCorps\*VISTA volunteers focused on STEM student success for undergraduates who have been traditionally underrepresented and underserved in STEM disciplines. One volunteer will be supervised by Engineering Professor Kathy Chen, PI for a recently awarded NSF S-STEM grant entitled “PEEPS” – Program for Engineering Excellence for Partner Schools. The VISTA volunteer will participate in the development and support of a “posse”-based learning community, as well as lead development of a STEM-focused outreach program to partner schools in collaboration with Admissions. The second VISTA volunteer will be supervised by Ethnic Studies / Women’s and Gender Studies Professor Jane Lehr, PI for the Cal Poly Louis Stokes Alliance for Minority Participation (LSAMP). The volunteer will work with Dr. Lehr to develop an undergraduate research internship program for LSAMP students. Both VISTA volunteers will be housed within CESAME and participate in regular meetings and activities associated with the Center.

Sponsors:

*1. AmeriCorps VISTA via the California State University*

## EXPANDING OPPORTUNITIES FOR PRE-HEALTH AND LIFE SCIENCE PROFESSIONALS

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### ABSTRACT

California State University, Los Angeles (Cal State L.A.) is one of the largest Hispanic serving universities in the country. The campus is overall 56% Hispanic and 40% of graduate/post-baccalaureate students are Hispanic. Cal State L.A. ranks 8<sup>th</sup> for producing the most Hispanic B.A. graduates in California and ranks 26<sup>th</sup> in the nation for Hispanic Master's graduates. Highlighting the problem of underrepresentation, Hispanic Americans constitute 39% of the California population but comprised only 7.7% of students accepted to medical school and only 7% of the STEM/life science workforce. Forty-two federally designated Health Professional Shortage Areas (HPSAs) exist in Los Angeles County and 62% of them are within the Cal State L.A. service area. The Los Angeles Basin is also home to a burgeoning biotechnology industry. Thus, *there exists a substantial need to develop and improve Cal State L.A. programs aimed at increasing the number of competitive Hispanic applicants to pre-health professions schools and careers in the STEM/life science workforce.* Cal State L.A. is uniquely positioned to develop programs addressing these disparities.

This project is composed of three components to expand and improve Cal State L.A. post-baccalaureate certificate programs as mechanisms for addressing Hispanic under-representation in the health professions and STEM/life science workforce.

**Component One – Increasing Pre-Health Professions Certificate Program (PHPCP) outreach and impact.** We serve 20 “record-enhancer” PHPCP students and create a “career-changer” option within the PHPCP to serve an additional 10 students per year from underrepresented minority (URM) or low-income backgrounds.

**Component Two – Increasing Biotechnology Certificate Program (Biotech-CP) outreach and impact.** We update and expand the Biotech-CP to serve 10 students per year from URM or low-income backgrounds with unique “biotechnology research academy” experience and biotechnology internships to facilitate job placement.

**Component Three – Improve courses and management for Certificate and MS degree students.** We expand, update and improve course offerings and improve equipment maintenance for laboratory courses, benefitting all graduate students in the Biological Sciences.

# PROMOTING SUCCESS FOR UNDER-REPRESENTED TRANSFER STUDENTS AT CSU NORTHRIDGE

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## ABSTRACT

California State University, Northridge (CSUN), like many large urban institutions, has a very diverse student body. This diversity is not only reflected in ethnic and racial differences, but also in the students' educational backgrounds. CSUN enrolls a large number of transfer students, mostly from community colleges in our state. These students face a number of challenges, including the adjustment to a new learning environment, issues related to transfer credits, and the necessity of taking additional courses to complete lower division major requirements.

In 2011, CSUN's College of Engineering and Computer Science received a five-year, \$5.5 million dollar HSI-STEM grant from the Department of Education to address the challenges faced by transfer students from under-represented groups. Glendale Community College and College of the Canyons, two local community colleges, are partners in the grant. The main goals of the grant are to recruit promising students from community colleges, and then provide them with financial and academic support to ensure their success. There are also opportunities to work on summer research projects under the guidance of their faculty mentors. Many of the students that entered the program have now graduated.

To be eligible for the program, students must be an individual who has faced or faces social, cultural, educational, or economic barriers to a career in a STEM field, and must be a U.S. citizen or a Permanent Resident. Thirty students in each annual cohort at CSUN are selected by contacting eligible transfer students and asking them to fill out an application. Each applicant is interviewed by the department chair and faculty mentor as part of the selection process. In parallel, cohorts of approximately fifteen students are recruited and selected at each of the community colleges, which upon graduation and transfer, have priority for being selected into the program at CSUN.

Evaluation of program effectiveness is measured by a variety of methods, including quantitative measures of academic progress versus a control group of non-participants, collection and interpretation of monthly student online journals, and analysis of detailed interviews with selected students. Quantitative results show that participants in the program have higher transfer and completion rates than students in the control group,

## Acknowledgements

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## **SJSU UNDERGRADUATE MBRS RISE PROGRAM**

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### **ABSTRACT**

The overall goal of this RISE proposal is to improve institutional research and related educational capabilities so that San Jose State University can better provide underrepresented minority students with the research and academic experience to ensure successful careers in biomedical research. In particular, we wish to assist and mentor students so that they can excel in their math and science course work while they perform research with a faculty mentor. We hope to see improvements in student grade point averages, increased graduation rates and a larger fraction of students electing to pursue graduate degrees in biomedical fields.