The California State University
OFFICE OF THE CHANCELLOR

STEM-NET

2019-2020 Annual Report

401 Golden Shore
Long Beach CA 90802
Website: www2.calstate.edu/impact-of-the-csu/research/stem-net
#CSUSTEMNET

Letter From Executive Director

Dear Friends,

I always knew the California State University (CSU) system was special. As a proud graduate then faculty member for 25 years, I saw firsthand how a CSU education could play such a pivotal role for students. The CSU is that stepping-stone to upward mobility, to lifelong learning, and is the cornerstone to a happy and rewarding life. Since arriving in August, this has been a central tenet of mine as the inaugural Executive Director of STEM-NET.

The Bureau of Labor Statistics (BLS) forecasts that by 2022, employment related to STEM will account for 13 percent of all jobs in the nation. In 2014, STEM jobs held 6.2 percent of total employment. California will have more than 1.4 million STEM jobs by 2020, having gained 200,000 in employment, more than any other state.

In California, STEM drives our economy and there is no part of our lives it does not impact. Similarly, STEM-NET is the catalyst and facilitator, leading STEM research and education across the 23-campus CSU system. By linking STEM faculty throughout the CSU, we nurture, foster and drive innovation and collaboration across the CSU system which is critical to developing a strong California workforce for tomorrow.

This year the coronavirus pandemic has changed the entire landscape of higher education. Campus closures, online classes, and budgetary concerns have combined to make us all wonder what lies ahead. Yet, STEM-NET has tried to operate as business as usual to give that sense of normalcy and be that calming voice to the CSU.

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STEM-NET has been at the forefront to lay the foundation to examine innovative approaches to education all the while ensuring we view them through a lens of equity and opportunity for all our students. Working together with creative and talented faculty and students, STEM-NET will continue to make an impact in developing tomorrow's STEM leaders.

Frank A. Gomez

Dr. Frank A. Gomez

Executive Director

MISSION

To enable CSU STEM leaders to share expertise and leverage system-wide opportunities to foster the implementation of global best practices for our students and faculty in pedagogy, learning and research related to STEM fields within the CSU system.

VISION

To make the CSU a world-wide leader in increasing the pipeline, preparation, graduation and employment of outstanding, diverse STEM students.

STRATEGIC OBJECTIVES

- Foster and support research and educational scholarship in STEM throughout the CSU system.
- Promote, encourage and support faculty development to improve STEM across the CSU.
- Develop long-term STEM-NET sustainable funding.
- Communicate with and engage key stakeholder groups in collaborative strategies supporting the vision.
- Promote and develop collaborative partnerships to increase capacity for K-12 STEM teacher preparation.

STEM-NET FACULTY GRANT PROGRAMS

This year STEM-NET developed two programs to support faculty research, their pursuit of extramural funding, and professional development.

The goal of the Faculty Fellows program is to develop and submit targeted STEM-based proposals of a collaborative (multi-campus) nature with potential for a high investment return and with an aim to increase capacity across the CSU system. 10 faculty were nominated by their respective campus provosts to participate in a year-long program to work collaboratively to develop intercampus interdisciplinary proposals.

The goal of the Faculty Education SEED Grants is to support and encourage the development of a strong program of education research or scholarship by faculty members in STEM fields.

STEM-NET provided $179,695 in support to faculty members through Grant Development Programs in AY 2019-20.

'I am constantly impressed by our students' engagement and input into meaningful STEM research. I view my job as a STEM-NET fellow as an opportunity to build the resources to reveal their full potential across the CSU'.

Dr. Catalina Cuellar-Gempeler

Humboldt State University

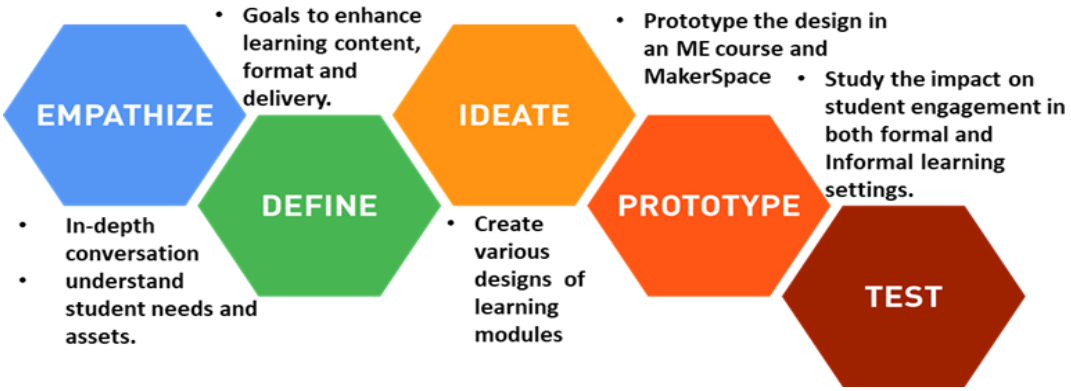
STEM-NET FACULTY FELLOWS

FACULTY FELLOWS AWARDEES	CSU CAMPUS
Dr. Lynn Cominsky	Sonoma State University
Dr. Lauren Anne Cooper	Cal Poly San Luis Obispo
Dr. Nina Robson	California State University, Fullerton
Dr. Catalina Cuellar-Gempeler	Humboldt State University
Dr. Paul Orwin	California State University, Bakersfield
Dr. Subodh Bhandari	Cal Poly Pomona
Dr. Arturo Pacheco-Vega	Cal State LA
Dr. Rachel Teasdale	California State University, Chico
Dr. Ravinder Seghal	San Francisco State University
Dr. Cassandra Paul	San Jose State University

"The main objective of this work is to explore a learner-centered design process to design video learning modules. The Faculty Education SEED grant is enabling this multidisciplinary collaboration to identify effective strategies to develop engaging STEM video modules".

Drs. Jim Kuo (PI), John Bachman, Pearl Chen

Cal State LA SEED Project Team



STEM-NET FACULTY EDUCATION SEED GRANT Program

FACULTY EDUCATION SEED GRANT AWARDEES	PROJECT TITLE	FUNDING AMOUNT
Drs. Jim Kuo (PI), John Bachman, Pearl Chen Campus: Cal State LA	Using Asset-based Participatory Design Thinking to Develop Culturally-Relevant STEM Video Modules to Promote Intrinsic Motivation	$34,412
Drs. Kim Elce (PI), Julie Fogarty, Ravin Pan Jenna Porter Campus: Sacramento State	Supporting STEM Teacher Identity Development as a Key Strategy for Strengthening the Pipeline of Diverse STEM Educators	$40,000
Drs. Lynne Slivovsky (PI), Lauren Cooper, Jane Lehr Campus: Cal Poly San Luis Obispo	Supporting STEM Teacher Identity Development as a Key Strategy for Strengthening the Pipeline of Diverse STEM Educators	$39,923

STEM-NET FACULTY AWARDEES SPOTLIGHT

STEM-NET SEED grants in 2019 to Drs. Cassandra Paul (SFSU) and Brigitte Lahme (Sonoma State) resulted in the successful funding of NSF HSI-STEM program grants in the amounts of $1.69 and $2.2 million, respectively. Paul's project (*Supporting Inclusion, Cultural Sustainability, and Community Through Cohesive, Active, and Asset-Based Approaches to Introductory STEM Courses*) will support undergraduate students, particularly Hispanic and other underrepresented minority students, during the first 2 years of college by transforming teaching and learning in introductory undergraduate science courses. Lahme's project (*Transformative Inclusion in Postsecondary STEM: Towards Justice (TIPS Towards Justice)*) will develop programming to assist HSI STEM departments to create a pathway for Hispanic Students to be successful in STEM and increase their participation in STEM disciplines.

Dr. Brigitte Lahme

Sonoma State University

Professor

Department of Mathematics

Dr. Cassandra Paul

San Jose State University

Assistant Professor

Department of Physics & Astronomy

ACTIVITIES

STEM-NET WEBCASTS

Webcasts are an important service STEM-NET offers to the CSU community highlighting research of faculty exemplars. A myriad of topics is presented demonstrating the high level of research and scholarship conducted in the CSU. This is the perfect forum for faculty to foster research collaborations leading to potential funding opportunities.

National Science Foundation's Improving Undergraduate STEM Education: Hispanic-Serving Institutions (HSI Program) (October 10th, 2019)

Dr. David Gillespie, CSU Channel Islands, HSI-SMART: STEM Model for Research and Teaching Undergraduate-Intervention Program

Dr. Kirsty Fleming, CSU Long Beach, Leveraging a Faculty Community of Practice Model of Professional Learning to Enhance Diversity, Equity, and Inclusion in STEM Teaching, Learning, and Leadership

Christopher Meyer, CSU Fresno, and **Marina Shapiro**, CSU Bakersfield, Catalyzing New Practices for the San Joaquin Valley to Innovate Effective Teaching Pedagogies in Lower-Division Mathematics and Chemistry Courses

Dr. Ben Van Dusen, CSU Chico, Developing Faculty Resources of Evidence-based Practices that Improve Learning and Equity in STEM

STEM-NET WEBCASTS

2019 STEM-NET Mini-Grant Awardees (November 13th, 2019)

Dr. Amelia Vankeuren, CSU Sacramento, Combating Climate Change with Mantle Rocks
Dr. **Cawa Tran,** CSU Chico, Microbiome Engineering in the Sea Anemone Aiptasia, A Key to Saving Coral Reefs
Dr. Jeffrey Marshall, Cal Poly Pomona, Research Experience for Undergraduates: Geohazards Analysis Using UAV-Based Remote Sensing Technology
Dr. Julie Simons, CSU Maritime Academy, Sperm Motility of Populations in Viscoelastic Networks
Dr. Cassandra Paul , San Jose State, Transforming Undergraduate Experiences in Science: A Focus on Teaching, Learning, and Identity Construction of Underrepresented Students In Introductory Science Courses

Dr. Lalita Oka, CSU Fresno, Investigating the Effect of Microbial Activity on Hydraulic Conductivity and Mechanical Behavior of Soils
Dr. Ben Ford, Sonoma State, Transformative Inclusion in Postsecondary STEM: Towards Justice (TIPS Towards Justice)
Dr. Gail Farmer and Dr. Emel Demircan, CSU Long Beach, Students with Disabilities in STEM Disciplines: Faculty Perspectives and Implementation of Universal Design for Learning
Dr. Ellen Hines, San Francisco, A Socio-Environmental Approach to the Assessment and Prevention of Marine Megafaunal Bycatch
Dr. Darren Ward, Humboldt State, Inter-Tribal Science Collaboration: Developing Baseline Data Syntheses Prior to Dam Removal on the Klamath River
Dr. Karina Garbesi, CSU East Bay, On Creating School-Wide Climate-Justice Social-Impact STEM Programs for Transformative Sustainability Learning (TSL)

STEM-NET WEBCASTS

CSU BUILD Alliance: Building and Sustaining Diversity in the Biomedical Research Workforce (January 30th, 2020)

Dr. Sue V. Rosser, CSU Office of the Chancellor, Building and Sustaining Diversity in the Biomedical Research Workforce
Dr. Leticia Marquez-Magaña, San Francisco State, BUILDing Diverse Teams for CSU-UCSF Transformation
Dr. Kelly Young and Dr. Chi-Ah Chun, Cal State Long Beach, Building a Mentoring Community: RSCA Mentor Training for the CSU
Dr. Patchareeya Kwan and Dr. Gilberto Flores, CSUN, Using Critical Race Theory to Transform Biomedical Research at California State University Northridge

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CSU Course-Based Undergraduate Research Experiences (CUREs) (February 6th, 2020)

Dr. Amelia Vankeuren, Sacramento State, Getting SIRIUS about Geology: CUREs Investigating Human Impacts on the Local Environment
Dr. David Rhoads, Cal State San Bernardino, Reflections on a Mature CURE Focused on Functional Microbial Genomics
Dr. Kim Coble, San Francisco State, CUREs in Upper and Lower Division Astronomy Courses
Dr. Vadim Keyser and Dr. Christopher Meyer, Fresno State, Structure-Function Approaches to CUREs - from Disciplinary to Transdisciplinary

Dr. Corin Slown and Dr. Corin White, CSU Monterey Bay, Scaffolding Course Based Undergraduate Research Experiences (CUREs) at CSUMB
Dr. Lipika Deka, Dr. Peri Shereen and Dr. Jeffrey Wand, CSU Monterey Bay, Building Course Embedded Undergraduate Research Experiences (CUREs) in a Mathematics Major Pathway

STEM-NET WEBCASTS

CSU Major Institutional Grants (March 11th, 2020)

Dr. Kimberly Cousins and Timothy Usher, Cal State San Bernardino, Center for Advanced, Functional Materials at CSUSB
Dr. Arturo Pacheco-Vega, Cal State LA, CREST Center for Energy and Sustainability at Cal State LA
Dr. Keith Trujillo, California State University, San Marcos, CUREs Working with the Division of Training, Workforce Development, and Diversity (TWD) at NIGMS: Changes and Opportunities in the Alphabet Soup
Dr. Alexander Rudolph, Cal Poly Pomona, Cal -Bridge: A CSU-UC Partnership Engaging Underrepresented Students in STEM
Dr. Lisa Hammersley, Sacramento State, The California State University Louis Stokes Alliance for Minority Participation (CSU-LSAMP): A Collaborative, Comprehensive Approach to Broadening Participation in STEM
Dr. Nicholas Kioussis, CSUN,
PREM – Computational Research and Education for Emergent Materials

Inquiry-Based Learning (April 15th, 2020)

Dr. Topaz Wiscons and Dr. Stan Yoshinobu, Sacramento State and Cal Poly San Luis Obispo
Examples of IBL in Math
Dr. Erik Helgren, Cal State East Bay,
The Solar Suitcase Class – A Sustainability and Social Justice Motivated Inquiry Based Learning Class
Dr. Marina Shapiro, CSU Bakersfield,
California Challenges in STEM Energy Education
Dr. Brian Self and Dr. Jim Widmann, Cal Poly San Luis Obispo,
Inquiry-Based Learning: Hands-On Activities in Mechanics
Dr. Michele Korb and Dr. Julia Olkin, Cal State East Bay,
Inquiry-Based Learning: Engaging STEM Faculty in the Teacher Preparation Pathway
Dr. Edward Price, CSU San Marcos,
A Guided Inquiry, Physical Science Curriculum for Future Elementary Teachers

STEM-NET WEBCASTS

NIH and NSF Update: Including Existing and New Funding Opportunities (April 24th, 2020)

Dr. Irene Avila, National Institutes of Health, SGM Research Activities & COVID-19 Response at the NIH
Dr. Michelle M. Camacho, National Science Foundation, Hispanic-Serving Institutions Program
Dr. Talitha Washington, National Science Foundation, Convergence Accelerator

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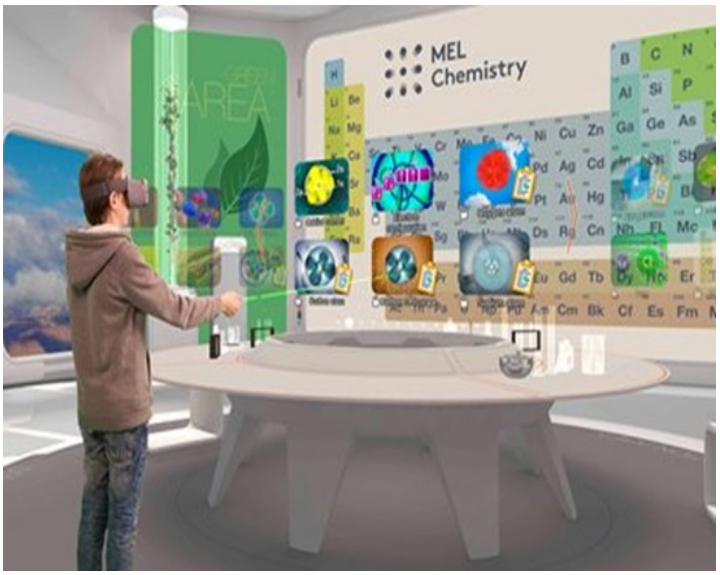
Assessing Student Learning in STEM Courses (June 10th, 2020)

Dr. Regis Komperda, San Diego State University, Catalyzing Best Practices in Chemistry Assessment
Dr. Rachel Teasdale, Chico State, Improving Student Performance with Aligned Activities and Assessments in a Large Lecture Geoscience Course
Dr. Gina Passante, CSU Fullerton, Assessments for "Just-in-Time" Instruction
Dr. Vimal Viswanathan, San Jose State University, Assessing Student Learning in Blended-Model and Flipped Classrooms
Dr. Dermot Donnelly, Fresno State, Using Knowledge Integration Rubrics to Score Assessment Items for an Undergraduate Laboratory
Dr. Seema Shah-Fairbank & Dr. Laila Jallo, Cal Poly Pomona, Integrated Assessment Strategies: From Course to Program to Institution



STEM-NET WEBCASTS

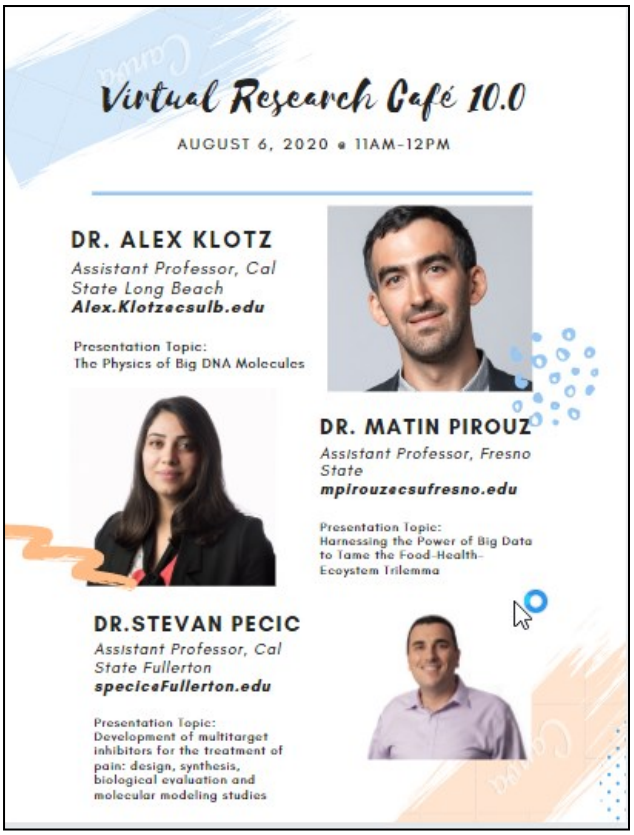
Virtual Reality/Augmented Reality in STEM Teaching and Learning (July 23rd, 2020)

Fadi Castronovo, Cal State East Bay, Application of a Virtual Reality Educational Game to Improve Design Review Skills
Kambiz Hamadani, CSU San Marcos, Hands-on Virtual/Mixed-reality Chemistry and Biochemistry Lab experiences
James Lindholm, CSU Monterey Bay, Immersive VR SCUBA 'Dives' Enable Student Research, Training, and Education Like Never Before
Priscilla Zhao, Cal Poly Pomona, Development of a Virtual Reality Fluid Mechanics Laboratory
Tumay Tunur, CSU San Marcos, The Impact of XR-Immersive Labs on Student Motivation to Learn Kinesiology
Abraham Wolcott, San Jose State, Physical Chemistry: Incorporation of VR into Thermodynamics, Kinetics and Quantum Mechanics
Vivien Luo & Wei Wu, Fresno State, VR/MR Applications in Construction Management

Exemplars in Engineering Research (September 3rd, 2020)

Dr. Chris Bachman, Cal State Los Angeles, Electrochemical Energy Storage for Sustainable Technologies
Dr. Perla Ayala, Cal State Long Beach, Engineering Models for Tissue Repair
Dr. Sankha Banerjee, Fresno State, Design and Fabrication of Electro and Photo-active Materials for Applications in Biomedical Devices and Water Purification
Dr. Christy Dykstra, San Diego State, Resource Recovery Using Bioelectrochemical Systems (BESs)
Dr. Christopher Heylman, Cal Poly San Luis Obispo, Vascularized Human Tumors on a Chip for Drug Screening
Dr. Dahyun Oh, San Jose State, Making Nonflammable Lithium-Ion Batteries.
Dr. Subhradeep Roy, CSUN, Study of Interactions in Complex Dynamical Systems

VIRTUAL RESEARCH CAFÉ 10.0



The "Café" is a recently piloted program focused on creating conversations amongst CSU STEM faculty. The aim is to help foster research collaborations across the CSU system and catalyze the submission of intercampus proposals. Each café involves three faculty research and ideas (10 minutes) for future work. Q&A takes place during the virtual mixer following the presentations.

Café 1 (August 6th, 2020)

Dr. Alex Klotz, Cal State Long Beach,
The Physics of Big DNA Molecules
Dr. Matin Pirouz, Fresno State,
Harnessing the Power of Big Data to tame the Food-Health-Ecosystem Trilemma
Dr. Steven Pecic, Cal State Fullerton,
Development of Multitarget Inhibitors for the Treatment of Pain: Design, Synthesis, Biological Evaluation and Molecular Modeling Studies

Café 2 (September 9th, 2020)

Dr. Darcy Taniguchi, Cal State San Marcos,
Plasmonic Based Imaging Tools for Single Entity Analysis
Dr. Patrick Jurney, San Jose State,
Developing a Sensing System for Non-Invasive Blood Glucose Monitoring Using Breath Volatile organic compounds
Dr. Yadira Ibarra, San Francisco State University,
Modeling Wave Propagation in Time-Modulated Materials

ACHIEVEMENTS

RAPID: Reimagined Virtual STEM Laboratory Experiences in Response to COVID-19 Pandemic Impacts on Undergraduate Education

STEM-NET was awarded a National Science Foundation (NSF) RAPID program grant ($197,870) to design and test three Exemplar Virtual Labs in chemistry, math and physics that are purposely designed to support the success of CSU HSI students. The COVID-19 pandemic and the rush to online course delivery has brought into focus many weaknesses of commercially available online virtual labs thereby presenting a challenge to achieve the learning objectives of laboratory and other 'hands-on' classroom experiences for students.

The objectives of this project are for Latinx students and students from other groups underrepresented in STEM, who complete Exemplar Virtual Labs, to experience increased: 1) knowledge of and utilization of scientific and mathematics practices; 2) sense of STEM disciplinary identity development, self-efficacy and sense of belonging/connection, and; 3) integration rather than fragmentation of identities.

In addition to STEM-NET, this project involves a team consisting of Drs. Blake Gillespie (Chemistry, CSU Channel Islands) Sara Callori (Physics, CSU San Bernardino), Shirley Yap (Mathematics, CSU East Bay) and Jane L. Lehr (Ethnic Studies, Cal Poly San Luis Obispo).

Rebalancing the Equity Gap in Chemistry Education with Culturally Sensitive Adaptive Learning

In collaboration with CSU San Bernardino and UC Davis, STEM-NET obtained funding ($1,000,000; $21,708 to STEM-NET) from the Governor's Office of Planning and Research California E Learning Lab (CELL) program to improve student performance in gateway chemistry courses and promote their persistence in STEM fields, particularly for students from backgrounds underrepresented in STEM fields. The project seeks to directly improve outcomes for disadvantaged student groups in California by using technology-enabled adaptive learning to improve access to quality General Chemistry education for the State's disadvantaged and underrepresented student populations.

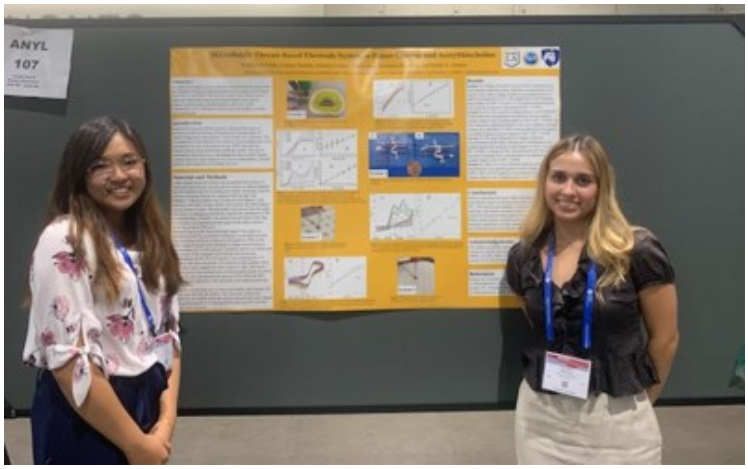
Student and Faculty STEM Research Podcasts for the California Workforce

STEM-NET received funding ($10,000) from SoCalGas to develop a series of podcasts to highlight CSU student and faculty research. This work inspires current, present and future students to entertain careers in STEM and motivates them to succeed and enter the workforce, thereby, strengthening the California of tomorrow.

ACHIEVEMENTS

During the past year, STEM-NET has:

- Implemented a strategic vision in conjunction with the Consortium Presidents and Steering Committee.
- Facilitated collaborative STEM research and education programs and initiatives inclusively across the 23 CSU campuses and with external partners.
- Supported networking opportunities across the CSU system to promote collaboration among faculty members.
- Engaged and convened faculty to develop, implement and share STEM research and educational initiatives.
- Highlighted faculty exemplars to disseminate these best practices for scaling across the CSU.
- Pursued and obtained external funding to ensure STEM-NET's future viability.
- Promoted and marketed STEM achievements of the 23 CSU campuses.
- Effectively managed and budgeted all STEM-NET activities.



FINANCIALS

In academic year 2019-20 STEM-NET made significant investments in faculty and student research to enhance CSU STEM education and research.

This year STEM-NET:

- Provided $180,665 directly to CSU faculty members and students.
- STEM-NET awarded funds to 20 faculty members at 12 CSU campuses.
- Since its inception, SEED funding from STEM-NET has resulted in over $7.1 million in extramural funding to CSU faculty members.

Budget Allocated

Salaries, Wages, Benefits	$315,000
Operating Expenditures	$74,000
Faculty Grants	$282,000
Balance Forward from the Previous FY	$18,000
Total	$689,000

Budget Expenditures

Salaries, Wages, Benefits	$304,638
Operating Expenses	$6,106
Faculty Fellows Grants Paid	$179,695
Total Fiscal Year Expenses	$490,439

CARRYOVER	
Operating Funds Carried Over to FY 2020-21	$17,895
Grant funds to be carried over to FY 2020-21	$180,665

LOOKING AHEAD

TOWARD THE FUTURE

- Increase external funding for STEM-NET & diversify funding streams to sustain programs & operations.
- Develop podcast program content focusing on current topical issues.
- Continue to point, connect, link, & support STEM faculty research & grant guidance.
- Diversify & broaden scope of webcast content.
- Pilot new programs involving different segments of the CSU.
- Develop collaborative proposals with faculty & catalyze multi-campus initiatives.
- Continue to build STEM communities of excellence across disciplines & the CSU.
- Finalize & obtain approval of strategic plan & by-laws.

STEM-NET GOVERNING BOARD

Presidential Consortium

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California State University, East Bay

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President,
California Polytechnic State University, San Luis Obispo

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