

CEMaST NEWS

OF INTEREST TO STUDENTS/ TEACHERS:

Funds available to support future teachers

Information on how to become a single subject teacher

Dynamic Equilibrium

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Cal Poly Pomona

CEMaST

Center for Excellence in Mathematics and Science Teaching

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Learning Assistant Program Expands

By Dr. Paul Beardsley

The Learning Assistant Program in the Department of Physics and Astronomy, led by Dr. Homeyra Sadaghiani, is a very promising program showing great results. Building on that success, a similar program was started in Fall 2013 in the Department of Biological Sciences by Dr. Paul Beardsley, who holds a joint position in CEMaST and Biology. The Biology Learning Assistant (Bio-LA) program is a win-win-win for undergraduate students in the Foundations of Biology courses, the undergraduates who serve as Bio-LA, and the faculty that teach these courses.

What are our goals? The goals of the Bio-LA program are:

- To improve the achievement of course learning objectives by undergraduates enrolled in classes supported by LAs (one of the major goals laid out by the CSU Chancellor's Office);
- To recruit and prepare talented majors in the Department of Biological Sciences so they may consider a career in teaching; and
- To facilitate the development of a culture among faculty in the Biological Sciences

that values and collaborates to offer research-based teaching for our students.

How Does It Work?

The Bio-LA program at CPP, initiated using funding generously provided by the Department of Biological Sciences and CEMaST's Math and Science Teacher Initiative funds, currently employs six learning assistants per quarter who support students enrolled in the three courses in the Foundations of Biology introductory course sequence for majors. The Bio-LAs are students who

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The Biology Learning Assistants and the program director from Fall 2014. From left to right, Chonlawan Khaothiemsang, Dr. Paul Beardsley, Melissa Ruben, Kayla Beres, Cecilia Lee, Ryan Christensen, and Shela Pournazari.

Interested in a Career in Teaching?

To become a math or science teacher in California you must obtain a Single Subject Teaching Credential. This credential authorizes public school teaching in a departmentalized classroom such as those in most middle schools or high schools. To obtain a Preliminary Credential the following requirements must be met:

- Bachelor's Degree or higher from an accredited university.
- Completion of a teacher preparation program (credential program, including student teaching)
- Meet the Basic Skills Requirement (CBEST exam)
- Demonstrate subject matter competency with the passage of California Subject Examinations for

Teachers (CSET) or completion of approved single subject program.

Cal Poly has an approved single subject program for mathematics and science as well as a credential program. For more information or for an advising appointment please contact CEMaST at cmast@cpp.edu.

Learning Assistant Program

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successfully completed the introductory series for majors and have experience and interest in teaching, to some degree.

Once selected, the Bio-LAs choose which Foundations course they will be able to support and commit to attending lectures. Bio-LAs enroll in either Bio 299 (Introduction to Science Teaching) or Bio 499 (Advanced Biology Teaching Methods). Outcomes in these courses include an increased understanding of aspects of biology education theory, ability to diagnose areas of student difficulty, ability to lead student groups, and to implement active learning techniques aligned with the practices of science. Past course surveys show that 100% of the Bio-LAs "strongly agreed" that these courses were valuable learning opportunities. A repository of active learning activities developed by students in these courses is available to all biology faculty. Bio-LAs commit to a weekly preparation session with their assigned faculty member to review content for the course. Finally, the Bio-LAs select five hours when they can staff the Biology Learning Center (BLC) and be available to lead study sessions.

Is It Working? Yes!

Evidence suggests that students use the tutoring resources—over the four quarters this program has existed, there have been 1,167 student visits to the BLC (supporting just three classes). Students enrolled in Bio 121 were polled about the impact of the Bio LAs in three separate quarters.

On average:

- 71% of students visited the BLC and interacted with the Bio-LAs,
- 94% reported that their experience with the Bio-LAs was "good" or "great," and
- 54% came to the BLC three or more times during the quarter.

A comparison of final grades of the combined sections Dr. Beardsley taught in fall 2012 and winter 2013 (no Bio-LAs) with those of students in fall 2013 and winter 2014 (with Bio-LAs) show that the sections with Bio-LAs scored significantly higher than those without Bio-LAs-- the equivalent of changing a grade from a B- to a B.

Aside from helping a larger number of students achieve the course objectives, the Bio-LAs themselves receive job-training skills and experiences that will make more competitive in the job market, especially if they pursue science teaching in K-12 schools or at the community college level.

The future? Because of the success of the current Bio-LA program, both students and faculty have asked that the program expand to cover additional courses. In response, Dr. Beardsley surveyed the biology faculty and current Bio-LAs to generate a list of courses and faculty who are interested in supporting a learning assistant. Eight faculty, representing six different courses, agreed to participate. We're excited to secure the funding to expand this promising program!

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Scholarship Funds Available



Dr. Nicole Wickler has announced that scholarship funds are available for the 2015-16 academic year through the Math and Science Teacher Initiative (MSTI) Scholarship Program. The program's objective is to support talented Science and Mathematics majors who might not have considered the teaching profession. Each MSTI Scholar can receive up to two years of scholarships, up to \$5,000 per year. MSTI Scholars are selected on the basis of academic achievement, under-representation and financial need. MSTI Scholarships are available to those seeking a single subject credential in Biology, Chemistry, Geology, Mathematics, and Physics. Scholarships will be awarded on a competitive

basis and there are minimum requirements for undergraduate students.

They include:

- a declared Cal Poly major in a Mathematics or Science discipline.
- at most two years and 96 units remaining to complete bachelor's degree.
- an overall GPA of 3.0 with a preference given to those who have a GPA no lower than 3.0 in their major.
- Be a US citizen, national, or permanent resident alien.

There are also scholarships available for single subject mathematics or science credential candidates. The deadline for the fall quarter is August 11, 2014. For more information and to apply please visit the website

<http://www.cpp.edu/~msti/msti-scholarship/index.shtml>

CSET Preparation Science/Math

With support from MSTI funds CEMaST offers FREE CSET Preparation Workshops for science and math majors who are interested in obtaining their Foundational Level General Science Credential or their Foundational Level Mathematics Credential.

The Science CSET Preparation

for the CSET Science Subtest I and II (Tests 118 and 119) consists of online prep courses and is provided to Cal Poly students, and credentialed teachers who hold a multiple subject credential.

The CSET Preparation for CSET Mathematics Subtest I and II (Tests 110 & 111) are in

the form of summer workshops and are offered free of charge to Cal Poly students and credentialed teachers who are already working in a classroom. The workshops provide an intensive review of mathematics concepts and skills required for the CSET tests. For more information please visit the CEMaST website.

MSTI seeks to encourage talented Science and Mathematics majors who are considering secondary teaching

Seminars Offered

CEMaST offers a seminar series for students to learn about teaching as a career and to promote innovative and effective teaching strategies. The seminar series begins with a fall reception and continues to meet during the academic year. Past seminars include teaching demonstrations from local teachers, K-12 classroom video analysis of teaching and learning, review of educational research papers, resume development, and interview techniques.



The MSTI Seminars support future teachers

California Mathematics and Science Partnership (CaMSP)

“I got so much information and strategies to teach fractions with more confidence”

The California Mathematics and Science Partnership (CaMSP) grant program, administered by the Science, Technology, Engineering, and Mathematics Office in the California Department of Education (CDE), is dedicated to increasing the academic achievement of students in mathematics and science by enhancing the content knowledge and teaching skills for classroom teachers through professional learning activities

Faculty in CEMaST are supporting two California Mathematics and Science Partnership grants. The partnerships are in Rialto USD (science) and Hacienda La Puente USD (mathematics).

Dr. Laurie Riggs is the Co-PI for the Hacienda La Puente partnership and is working with both teachers and administrators in increasing content knowledge and supporting teachers in the Common Core State Standards in Mathematics. Dr. Christina Dehler from the Education Department



Dr. Riggs sharing with Principals in the Hacienda La Puente USD



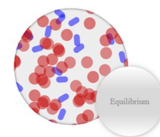
Third grade teachers in Rialto USD dissecting owl pellets

ment is also partnering with the grant in strategies for effective teacher use of technology and its application for student learning,

As part of the follow up meetings teachers are exploring ways to help students deepen their understanding of mathematics and its structure. One teacher commented *“I got so much information and strategies to teach fractions with more confidence . The tools are useful for planning lessons using non-traditional methods.”*

Dr. Jodye Selco is the Co-PI for the CaMSP grant in Rialto R-iSMART (Rialto integrating Science Mathematics And Related Technologies). The 3-year grant provides professional development for 3rd—8th grade science teachers. This project has summer intensive institutes and 24 hours of follow up training. Dr. Selco is supporting teachers in STEM action research projects and the implementation of Project Based Learning and integrated lessons and curricula. Dr. Selco recently presented with her Co-PI’s at the CaMSP Learning Network Meeting in Sacramento.

Dynamic Equilibrium Simulation



By Dr. Jodye Selco

Dynamic Equilibrium is not just an oxymoronic term; it is a very difficult concept to grasp. A new simulation (posted at <https://www.cpp.edu/~sci/cemast/lesson-plans-and-resources/dynaminequilibrium/index.html>) engages users in examining how kinetic rate constants (percentage change in the simulation) are related to both the speed with which a reaction occurs, and how the

chosen kinetic rate constants affect the equilibrium position. In the simulation, students are asked to examine what happens when $A \rightarrow B$ faster, slower, and at the same rate as $B \rightarrow A$.

This simulation helps dispel many of the common misconceptions about equilibrium: that the reaction stops, that you always have equal amounts of A and B at equilibrium, and that any changes made to a system at equilibrium will affect the

equilibrium position. Yes, there is even a tab to explore Le Châtelier's Principle!

Students appreciate being able to independently "play" with the conditions – at any time they need the assistance. The simulation builds a table (with user input), graphs the amounts of A and B (representing the concentrations of A and B), and provides a molecular view simulation to help the user "see" what is actually occurring.

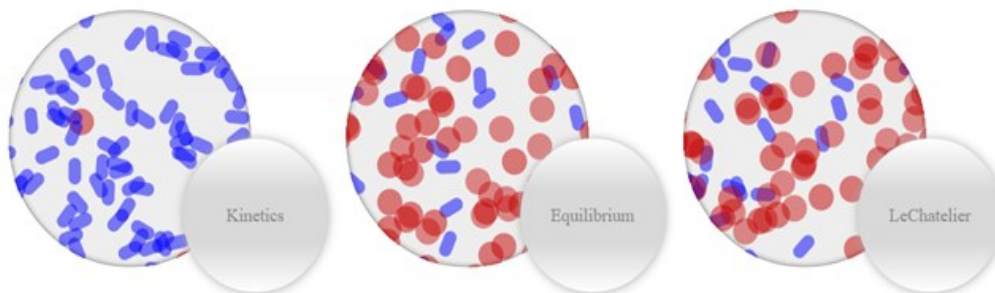
Introduction

On the Kinetics tab, this simulation models the time dependence of a one-way reaction. The rate constant (percent of A converted to B) can be changed to see how this affects the behavior over time.

On the Equilibrium tab, not only does A convert to B, but now B converts to A as well. The rate constants of both reactions can be changed to observe how the rate constants affect the equilibrium amounts and the rate at which equilibrium is approached.

We recommend to start with the Kinetics simulation, then Equilibrium, and then Le Châtelier. Click the "Kinetics" button or tab to begin.

(Instructors: Information about how to extend this simulation to demonstrate Le Châtelier's Principle is presented in the **●** tab.)



Jodye Selco is a Professor of Science Education (in the Center for Excellence in Mathematics and Science Teaching – CEMaST) and Chemistry at California State Polytechnic University Pomona. She is actively involved in research in physical chemistry as well as the teaching and learning of chemistry by all students. Professor Selco has been working with the teachers in Rialto USD for many years and has developed many learning experiences in science for teachers and students in the Rialto USD which have been adopted by many other teachers.

Supporting **Dr. Selco** in this simulation were **Bo Yeun S. Choi** and **Pauline Muljana** who are both instructional designers and **Erick Zelaya** who is a multimedia developer for eLearning at California State Polytechnic University, Pomona.



Master Teacher Sarah Yeh

Master Teacher Fellows!

Cal Poly is toward the end of the fourth year in a five year research grant aimed at the development of Master Teachers. The professional development program is for 7th and 8th grade science and/or math teachers and is funded by the National Science Foundation. Sarah Yeh is an outstanding science teacher at Wiltsey Middle School in Ontario Montclair School District and is making great contributions to teaching science and preparing the next generation of teachers.

By Sarah Yeh

For the last few years, I have been involved with the Cal Poly CEMaST program. I am very proud of the work our team has done with our mentors and with each other developing lessons, refining and revising those lessons and helping each other improve in their craft. This program has pushed me to analyze my facilitation of lessons. My focus on activities, questions, and writing prompts that engage students in the thinking required for the particular learning goal has improved by leaps and bounds. Our team plans and deliberately chooses questions to ask students that will guide them to make the jumps in their understanding of the content.

Last summer we participated in professional development on Claim, Evidence Reasoning (CER) writing in the CEMaST program. At that point, I had been working on a district team to write curriculum for the Common Core State Standards, so I was familiar with the expectation that students would defend their answers. Naturally then, I was excited to learn about the CER format, its application to any

content area and the value of this type of thinking.

I was given the opportunity to present my experiences with teaching CER a couple times, once at a conference in San Francisco and once to a Cal Poly class of future teachers. Teaching middle school students does not prepare you to present a topic, but nevertheless, the presentations were wonderful experiences. Preparing for the presentations focused my research on CER and helped me grow in my own understanding of it. Presenting the material to peers and potential peers confirmed not only the value of this format of writing, but also the activities I chose to use in order to teach it.

Participating in the CEMaST program began as a way to deepen my understanding of content, but over the past three years, has become a natural part of my teaching. I look forward to, and highly value, learning the content, but the strategies we have learned for building lessons and working with colleagues will follow me into any classroom or leadership role.



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<http://www.cpp.edu/~cemast/>

RESPECT Continues!

By Dr. Nicole Wickler

Reinvigorating Elementary Science through a Partnership with California Teachers (RESPECT) continues among Pomona Unified School District, Cal Poly Pomona, and the Biological Sciences Curriculum Study (BSCS), a non-profit science education center in Colorado.



Dr. Mike Page working with teachers in the summer institute.

Now in its second year, the RESPECT program

continues to support Pomona Unified teachers in implementing science curriculum and pedagogies that will engage students in learning science content within the framework of the Next Generation Science Standards.

The first cohort of teachers began their participation in the summer of 2014; this June they will be developing skills as teacher leaders. A second cohort of teachers will begin their initial participation in the program this July. The RESPECT teacher leaders from Pomona Unified will go on to share with other teachers what they've learned, greatly expanding the reach of the

program. Within the five year program nearly one third of Pomona Unified's elementary teachers and 7,500 of its students will benefit. The activities of RESPECT leaders and faculty will lead to large scale, sustainable reform in the delivery and learning of science and mathematics at both Pomona Unified and Cal Poly Pomona.

The RESPECT program is supported by a \$7.7 million dollar grant from the National Science Foundation to Cal Poly Pomona's Center for Excellence in Mathematics and Science Teaching (CEMaST), whose mission is to improve teaching and learning of science and mathematics from kindergarten to graduate school. CEMaST is the vehicle through which the College of Science collaboratively serves the educational community.

The CEMaST Newsletter Committee welcomes news from faculty, students and teachers. Please contact Dr. Laurie Riggs, lriggs@cpp.edu for information on how to be included in upcoming issues!