Mini-workshops

Tara Luckau & Joe Newsome

Title: A paper simulation of sexual selection: Let the mating begin

Mechanisms that drive evolution are easily memorized by students. Do these same students really understand terms like "differential reproduction?" This hands-on workshop demonstrates how SDSU non-major undergraduates experience a simulation of sexual selection first-hand. Participants are physically engaged in finding mates in a process that highlights female choice, but also reinforces the concepts of genotypes, phenotypes, inheritance and meiosis. This exercise also lays the groundwork for the concepts of population genetics with its emphasis on allele frequencies. The spreadsheets used to log allele frequencies over five generations document evolution caused by female choice, and often, also show linkage of female preference with "attractive" male characteristics. This energetic exercise is a favorite among students.

Lakshmi Chilukuri & L. Almazan,

Title: The Benefits of Obsessive Compulsive Organization in Running Large Lab Courses

Planning the logistics of a large lab involves consideration of budgetary constraints, resource availability, instructor experience, teaching assistants, student skills, and a host of other factors. Under ideal conditions, instructors should be able to forget about these logistics when they walk in the lab and focus exclusively on the pedagogy and the science. Likewise, students should be able to concentrate on mastering difficult concepts. In this workshop, we share with you a simple but highly effective strategy that has ensured the productivity of our content intensive, media intensive, 200-student lab course. Through careful attention to numbers, details, placement, visual identification, and timing of materials and experiments, we have refined the organization of our lab to a fine art and have successfully ensured that the main focus of the lab is teaching and learning. This workshop will walk you through the intense preliminary planning to the finished product as seen by the instructors and students in the classroom.

Brian Sato

Title: Attack of the Killer Fungus – A Hypothesis Driven Lab Module

This workshop focuses on the nematophagous fungus, *Arthrobotrys oligospora*, and its ability to capture the nematode *Caenorhabditis elegans*. Groups of four students are provided with the experimental background and conduct their own literature search to identify a variable that may affect the efficiency of *C. elegans* capture. Students develop a hypothesis and conduct an experiment to compare worm survival in the control versus variable condition, writing a lab report in the format of a primary research article. From this experimental module, students were able to produce results that agree with published data as well as add to the existing literature, while showing positive gains towards the learning objectives.

Aaron Coleman

Title:
Enzyme Purifications in Introductory Biology Labs: A Fast and Inexpensive LDH Purification that Highlights the Biology

Enzyme purification projects are an excellent way to introduce several critical concepts in cell biology, including cellular localization, enzyme catalytic activity, and ligand-receptor interactions. Multi-step enzyme purifications are rarely done in intro biology labs, though, and are typically only considered as curriculum for upper division biochemistry labs. Because of the constraints from equipment requirements, time, and cost, it is understandable that most intro biology lab instructors are reluctant to implement these experiments, particularly in a high-enrollment setting. With some planning, however, these challenges can be overcome, and it is possible to do multi-step enzyme purifications in a high-enrollment class with a minimal budget. This workshop will describe a student project for the purification of lactate dehydrogenase (LDH) that has minimal equipment requirements and allows students to isolate the enzyme as a single protein from the source tissue in three lab periods. A template for the project will be presented, from which instructors can also implement single experiments that fit their curriculum.

Chris Armour

Title:
A Simple Frog Experiment to Demonstrate the Cardiovascular Applications of Ohm's Law and the Starling Equation

It is often difficult for students to understand the Starling Equation of Ultrafiltration and its application of forces across the capillary wall to explain fluid exchange between the blood and interstitial tissue. In this simple experiment, students cannulate a frog’s aorta and perfuse with a dextran solution. By using a force transducer to measure the frog’s weight, experiments can be done to demonstrate the effects of changing different Starling Equation parameters. The students also use the perfusate flow through the frog, measured as the number of drops coming off the frog’s toes, to evaluate the application of Ohm’s Law to the circulatory system. This lab can be done as the basis for student lab reports or as a laboratory demonstration where the students predict the results and explain their reasoning.

Liz Dinsdale

Title:
Microbes, metagenomes and Marine mammals: Educating the next generation of scientists to enter the genomic era

The revolution in DNA sequencing technology continues unabated, and is impacting all aspects of the biological and medical sciences. The training and recruitment of the next generation of researchers who are able to use and exploit the new technology is severely lacking. Here I will present a cross-disciplinary course that provides undergraduate students with practical experience in running a next generation sequencing instrument through to the analysis and annotation of the generated DNA sequences. The students conducted the workflow from DNA extraction, library preparation, running the sequencing instrument, to analysis of the data. They sequenced microbes, metagenomes, and a marine mammal, the Californian sea lion, Zalophus californianus and became part of a international consortium to investigate cancers in Sea Lions. During the workshop we will go over the implementation of the course, investigate some of the online components and assessments that were used in evaluating students perceptions on their ability to conduct scientific research.

Paul Detwiler

Title:
Increasing Student Engagement during Marine Biology Dissection via Smart Phone Technologies

Smart phones have become increasingly important devices for collecting and communicating information within an educational context. Use of various smart phone technologies in the laboratory will be demonstrated for data collection and visualization during a simple dissection of the market squid Loligo opalescens. Participants attending this hands-on session will dissect Loligo using an easy-to-follow guide, learn a few trade secrets to ensure good results, collect and display data collected during the dissection, and brainstorm how these and other cell phone applications could be adapted within the context of their own particular laboratories to increase student engagement.