1554-Pos
Integrating Computation and Wet Lab Methods in a Biochemistry Lab Course-Based Undergraduate Research Experience (Cure)

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We have developed an undergraduate biochemistry lab curriculum based on authentic inquiry. Over 3800 structures in the Protein Data Bank have unknown function. Students use structural bioinformatics tools to compare these structures to known enzymes and predict a function. The *in silico* modules include protein visualization with PyMOL, structural alignment using Dali and ProMOL, sequence exploration with BLAST and Pfam, and ligand docking with PyRX and Autodock Vina. The goal is to predict possible functions for the target enzymes and to identify promising substrates for their active sites. Students then use standard wet-lab biochemistry techniques to express and purify the target enzymes and perform kinetic assays with substrates selected from their docking studies. We are assessing their learning as students and their growth as scientists in terms of research methods, visualization, biological context, and mechanisms of protein function. We have successfully used this curriculum in biochemistry lab courses for majors and non-majors, and we have adapted the experimental modules for implementation in a single course in a single term or across multiple courses. We recently created a GitHub repository for all course materials, and we welcome new collaborators who wish to adopt the curriculum on their own campuses. This project is supported in part by NSF IUSE 1709355.

1555-Pos
Multimedia Jupyter Notebooks for Learning Structure Prediction and Design

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PyRosetta is a Python library of the Rosetta computational methods for protein structure prediction and design. Because the field attracts students from many different majors, teaching a class with a wide variety of skills and experience levels is a challenge. Therefore, the goal of this project is to develop interactive multimedia material that promotes self-paced active learning. We have developed a hands-on education strategy with a set of nine modules to teach topics in the field, from protein structural analysis to protein folding and docking. These workshop modules are created in Jupyter Notebooks, a shareable web application that supports live code, visualizations, and text. When used in the Google Colaboratory environment, students can access and learn PyRosetta with no local machine setup necessary. By capitalizing on the advantages of this online digital format, we have embedded images, molecular visualization movies, and interactive coding examples. This multimedia approach may better reach students from different majors and experience levels as well as attract more researchers from smaller labs and related disciplines to leverage PyRosetta in their work.

1556-Pos
Investigation of Sea Urchin Sperm Motility: an Undergraduate Project

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Cells that display self-motility are a very interesting case of active matter. In particular, sperm cells move in order to encounter and fertilize the egg. Individual and collective movements are crucial for fertilization, especially in species where this process is external, like in sea urchins. These organisms release sperm and eggs into sea water. Sperm cells propel themselves by rotating their flagella (1.5 cycles per second). In this work we experimentally study the collective and individual movement of sea urchin sperm (*Echinometra vanbrunti*). The collective movement was studied by analyzing the correlation functions in dynamic light scattering experiments (DLS). The individual trajectories were followed by videomicroscopy, determining properties such as: average speed, frequency and angle of turns, etc. These experiments are easy to perform and can be very illustrative in cell biophysics courses.

1557-Pos
Research Project for Undergraduate Level Students: Toxic Metals Biosorption Potential of *Aspergillus spp*

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Toxic metals contamination is a serious environmental issue in the world. There are various physical and chemical methods that help in the reduction of these contaminants, but these methods are often expensive and inefficient. Bioremediation is a more adequate technology due to its accessibility, lower cost and being better for the environment. Micromycetes are emerging as powerful bioadsorbents of toxic metals because of the chemical composition of their cellular wall. This research model has the goal of identifying the biosorption properties of *Aspergillus spp.*, by analyzing its tolerance level in toxic metals often found in high risk areas affected by industrial activities.
The research model consisted on inoculating the fungus in a supplemented culture medium with Cd^{+2}, Pb^{+2} and Hg^{+2}. The tolerance index was evaluated for each metal at different concentrations, followed by characterizations with X-ray Photoelectron Spectroscopy (XPS) and Fourier Transform Infrared Spectroscopy (FT-IR), in order to analyze the elemental composition and functional groups on the cell surface, with the goal of identifying possible biosorption mechanisms. It is important to understand these mechanisms in order to be able to create a strategy based on bioremediation that has a higher chance of being successful in the removal of toxic metals and contaminants from affected ecosystems. This work was designed with the intention to carry out the research in an organized way that is easily applied by an undergraduate student with a good understanding of chemistry and biology, but also interested in the area of biophysics.

1558-Pos
Increasing Biochemistry Self-efficacy in Freshmen Students through Hands-on Experience

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Lack of diversity and poor retention are two important issues faced in STEM education. Science self-efficacy is a person's perception about their ability to succeed in science and is strongly correlated with undergraduate persistence in STEM majors. This sense of self-performance is formed from assessing the skills, time available and motivation needed to accomplish a given task. Self-efficacy can increase through mastery and vicarious experiences such as successfully completion of a task or observing the completion of a task, especially from role models. Student self-efficacy can increase for related tasks and more broadly impacting their academic confidence. Mastery experiences tend to be more effective for males and vicarious experiences for females. We have designed short activities to increase student self-efficacy for biochemistry in an introductory seminar course. Over two 50-minute class periods students learn the background and setup of an experimental protocol and then perform it in small groups with guidance from upperclassmen. Despite limited in-class time, we are able to target both cognitive and affective learning. Two class sessions provide vicarious experiences for the students — through watching peers perform experiments and discussing the major with upperclassmen. The laboratory experiment provides a mastery experience via experiment completion and data analysis. Changes in self-efficacy are determined through pre-post surveys and a reflection exercise upon completion of the classes. A trial run in spring 2019 showed increased self-efficacy for biochemistry and we plan to fully implement and analyze this approach in the Fall 2019 semester. To predict retention, confidence and interest in STEM majors will be measured and compared. The designed activities increase the connections freshmen have to the biochemistry department and provides self-efficacy increasing experiences that are effective with a diverse group of students.