Education

Program/Abstract # 24
Impacting K-12: What makes Project BioEYES work?
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Project BioEYES is a K-12 science education program which provides classroom-based learning opportunities through the use of live zebrafish. Founded in 2002 by Drs. Jamie Shuda and Steven Farber, the mission of BioEYES is to foster enthusiasm for science by giving students opportunities to explore a variety of fields through real world applications using a hands-on approach to learning. This exposure helps students gain an appreciation for scientific research, increases their understanding of fundamental scientific principles, and leads to a consideration of careers in science, medicine, and health professions. Specifically, BioEYES provides students the opportunity to mate zebrafish and learn how genetics plays a role in the offspring’s development. Each classroom is provided with a high quality stereo microscope for the duration of the week long unit along with an age appropriate laboratory journal for students to record their observations and results. Since the program’s inception in 2002, BioEYES has reached over 25,000 students nationally and has programs at the University of Pennsylvania, Carnegie Institution for Science and the University of Notre Dame. Project BioEYES continues to gain in popularity, demonstrating knowledge changes in standards-aligned science content and in measurable attitudes towards science, scientists, and science careers. Student learning data from all partnering universities as well as feedback from teachers and students who have participated in the program will be presented.

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Program/Abstract # 67
Graphing and Socratic tutorials improve student thinking about gene networks
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Biological systems, whether at the molecular, cellular, developmental, physiological or ecological level, are characterized by dynamic interaction networks. Such networks can be homeostatic, adaptive, or evolving, as in the case of embryogenesis. We have examined the understanding of molecular and cellular level networks through assessments that asked students to articulate their assumptions and generate graphs representing the concentrations of gene products over time. We found that i) when asked, students generally fail to articulate the majority of assumptions needed to generate an accurate graphical representation; ii) the graphs generated often contradicted their articulated assumptions; and iii) these graphs displayed a number of common errors. We then developed an interactive tutorial (“Network Thinking” available at BeSocratic@colorado); a tiered series of scenarios and leading questions designed to provoke discussion and metacognitive reflection. These materials were applied in an upper division class in a “one-off” group setting. An analysis of the effectiveness of this intervention will be presented.

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Program/Abstract # 68
Mendel/Muller: A Socratic activity designed to connect mutation, molecular effects, and evolutionary novelty
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A key hurdle in understanding of evolutionary mechanism is the question of how novel and useful variations arise. This problem is related to the more general issue of students’ appreciation of the role of stochastic processes in general and in biological systems in particular (Garvin-Doxas and Klymkowsky, 2008. CBE Life Sci Edu. 7: 227–233), as well as an understanding of the origin and nature information. Based on interviews and responses to the Biology Concept Inventory (Garvin-Doxas and Klymkowsky, submitted) it is common to find that students fail to think at the molecular level, a behavior that does not change dramatically as they progress through the curriculum. To begin to address this issue, we designed an interactive tutorial, available through BeSocratic@colorado, based on Muller’s classic work (Muller. 1932. Sixth Int. Cong. Genet 1:213–255) on the classification of mutant phenotypes as amorphic, hypomorphic, hypermorphic, antimorphic, or neomorphic.

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