Abstracts

Education

Program/Abstract # 74
Teaching Developmental Biology at University of Havana
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The main aim of this work is to show the experience of teaching Developmental Biology by the author at the Faculty of Biology, University of Havana. The tendency of the qualifications obtained by the students in these courses during more than 15 years was analyzed, as well as the substitution of the laboratories by practical classes or virtual laboratories. The career of Biology at Havana University has ten semesters and Developmental Biology is located in the eighth semester because of its integrative approach. It is a mandatory course and the students should receive previously courses of molecular biology, genetics, and cellular biology, among others. The course comprises 80 h; half of which are on seminars and practical activities. The main goals of the course are to present a comparative view of animal development (gametogenesis, fertilization, gastrulation, neurulation and organogenesis) and cellular and molecular mechanisms that regulate development, such as induction mechanisms, cell adhesion and migration and cell–matrix interactions. Model organisms are emphasized and evolutionary aspects receive appropriate attention. At the end of the course the students have two options: an oral examination of the main topics or the presentation of an oral and written report from one of the selected themes, such as stem cells, cloning, bioethics, and others current issues.

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Program/Abstract # 75
Success of student-directed experimentation in a developmental biology laboratory class
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The developmental biology laboratory experience is enhanced by student-directed experimentation and exploration of the primary literature. Upper-level classes composed of mostly seniors are especially suited for this design. Student presentations from two different semesters were compared. Each student from semester #1 proposed an experimental procedure, collected data, presented results to their peers, and critically analyzed others’ work. Students from semester #2 also designed, carried out and presented data from experiments, but were allowed additional time to investigate the primary literature. During semester #2, a portfolio was maintained for each student which contained student summaries of relevant journal articles, experimental design proposals, data, and feedback from the instructor. Presentations were evaluated by the instructor, and the mean scores from each class were calculated. The ability of students to critically analyze peers’ data was also assessed via the quality of questions following presentations. Each student was required to ask at least two questions of any other class members. The experience in semester #2 resulted in more stimulating questions as well as higher quality presentations. Students who were allowed more time to investigate the literature gained a better understanding of the scientific process including the development of hypotheses and experimental design.

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Program/Abstract # 76
Novel use of primary literature in class promotes critical thinking as well as interest in research careers
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We have devised a new approach to teaching undergraduate Biology majors through intensive, guided analysis of primary literature in class. Our approach, C.R.E.A.T.E. (Consider, Read, Elucidate hypotheses, Analyze and interpret the data, and Think of the next Experiment), uses a novel combination of pedagogical tools to guide students through analysis of journal articles, highlighting the evolution of scientific ideas by focusing on a module of four papers from the same laboratory. Students become fluent in the universal language of data analysis as they decipher the figures, interpret the findings, and propose and defend further experiments to test their own hypo-
Program/Abstract # 77
Undergraduate cell and developmental biology laboratory designed to increase student learning of transfection of cultured cells with GFP plasmids
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Training in cell and developmental biology requires a wealth of academic and practical experience. We have designed a 2- to 3-week laboratory sequence that integrates cell culture, transfection of green fluorescent protein (GFP) plasmids, and studying and visualizing cells in mitosis with fluorochrome-tagged antibodies using immunofluorescence microscopy. These experiments reflect current research investigations performed by actual scientists. Students work in teams to culture HeLa cells on glass coverslips, transfect them with one of two plasmids to demonstrate cytoplasmic (pEGFP-N1) or nuclear (COUP-TFI-GFP) localization. The cells are fixed 24 h after transfection before immunocytochemical methods are used to label the mitotic spindle with anti-tubulin and anti-aurora B antibodies followed by fluorochrome-tagged secondary antibodies. The essential role of tubulin in the cell cycle is reinforced as the students have the thrill of labeling the apparatus themselves. Furthermore, they have the opportunity to investigate the mitotic process in greater depth by examining the expression pattern of other players in mitosis such as aurora B, which mediates chromosomal segregation and cell cycle regulation. These exercises provide the basis for development of inquiry-based projects and can easily be expanded into student research projects. We will discuss assessment and student posed hypotheses, results and interpretations.

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Program/Abstract # 78
The group investigation course: Transitioning undergraduates into research in developmental neurobiology
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The value of undergraduate research is well documented, but transitioning from learning science via traditional lecture courses to doing productive and original experiments can be challenging. To facilitate this transition we developed a practical research course that emphasizes microscopy and imaging skills using techniques such as time-lapse and confocal microscopy that cannot be taught in traditional lab sessions. The course enrolls six undergraduates who collaboratively approach an original research question in developmental neurobiology. The course also includes instruction on literature searches, keeping lab notebooks, documenting protocols, analyzing data, and presenting results in written and oral formats. Class meetings are structured as lab meetings and journal clubs with students taking responsibility for planning and executing their research. Brief, weekly e-mail writing assignments help students reflect on lessons learned and questions raised in the research process. Students individually master specific techniques while the class collaborates to answer an original research question such as determining the developmental expression of a protein, investigating factors that influence neuronal morphology, or examining growth cone dynamics. This group approach allows research projects that are more ambitious and satisfying than what individual students accomplish independently. Evaluations indicate that this course effectively provides students with opportunities to engage in original scientific research, master advanced techniques, develop confidence, learn the value of collaboration, and stimulate continued interest in research.

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Program/Abstract # 79
Enlarging contexts: Enhancing learning in Developmental Biology using web conferencing in the classroom
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A core focus of many biology courses is to teach students to critically think about the subject matter. In my BIO346, Developmental Biology Lecture course I have 5 main pedagogical goals for student learning. (1) Convey main concepts of Development, (2) foster appreciation for the research behind those concepts, (3) build proficiency in science communication, (4) enhance critical thinking, and (5) provide an environment that invites students to be intellectual contributors to the field of Development rather than bystanders peering in. Web conferencing provides one way to achieve all of these pedagogical goals. In my course, students are assigned key research articles to critically analyze and present in class. Use of a simple web camera and internet access enables students to then participate

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