

Biophysics Outreach Manual For Teachers

For more information please see our website:

<http://www.life.uiuc.edu/biophysics/ibs/K-12Outreach/Homepage.html>

Center for Biophysics and Computational Biology

University of Illinois, Urbana-Champaign

607 South Mathews Avenue Urbana, IL 61801 USA

Ph: (217) 333 1630, FAX: (217) 244 6615, E-Mail: biophysics@life.uiuc.edu

Director: Robert M. Clegg Administrative Coordinator: Cindy Dodds



“...in addition to being competent researchers, STEM graduate students must be able to communicate science and research to a variety of audiences. As the graduate students bring their cutting-edge research and practice into the K-12 classroom, they gain these skills which enable them to explain science to people of all ages, ranging from students to teachers. The graduate students also inspire transformation in the K-12 formal and informal learning environments and stimulate interest in science and engineering among students and teachers.”

- National Science Foundation, GK-12 Program website, www.nsfgk12.org

Introduction

Scientists have been participating in education outreach since at least 1820, when Michael Faraday began his famous Christmas Lectures. More recently though, due to sobering studies exposing the growing science and math deficiencies among American children, there has been a growing number of scientists participating directly in K-12 classrooms. These outreach programs have often proved successful in significantly improving the level of inquiry and enthusiasm for science among both teachers and students. In 1999, the

National Science Foundation created a new graduate fellowship, the NSF GK-12 Program, that pairs science PhD students with K-12 teachers in an effort to improve communication and teaching skills among graduate students while



enriching science and math instruction for their K-12 partners. Since its inception, the GK-12 program has funded more than 200 projects at universities across the US, taking graduate student outreach in K-12 classrooms to an all time high.

The UIUC GK-12 program has been particularly successful in bringing UIUC graduate students into K-12 classrooms. Sadly, this program came to an end in 2009, leaving behind a great demand for partnerships between university researchers and local schools. We hope our program will help to continue the fantastic work of the GK-12 program with biophysics graduate students whose interdisciplinary research can be taught in a wide range of K-12 classrooms.

Our outreach program pairs biophysics graduate students with local K-12 teachers to develop lessons that teach middle and high school students about the exciting research happening here at the University of Illinois, Urbana-Champaign. The teachers we work with come from local and suburban Chicago schools where they teach physics, biology or chemistry to students from 7th to 12th grade. The graduate students are PhD candidates doing research on a vast array of topics in biophysics, from single molecule fluorescence microscopy to molecular dynamics simulation of membrane proteins. These students come from diverse academic backgrounds, including physics, biology and computer science and are eager to give back to the community while improving their ability to teach and communicate their research.

How the Program Works

Teachers interested in participating in this program should contact the Center for Biophysics and Computational Biology Director, Bob Clegg, with their name, school, classes they would like to have participate in the program, and their contact information.

Before working with a graduate student, it is advisable that teachers read through this brief manual, especially if you have not worked with research scientists in your classroom before. If you



would like to see examples of lessons that have been developed as a part of this outreach program, please see our website.

When a UIUC biophysics graduate student has a lesson that they think will be appropriate for your students, they will send you an e-mail with a brief description of what they would like to do along with a range of dates when they are available to do it. You are not required to accept requests from students simply because you are part of the program. Rather, you should decide whether the proposed lesson (or some variation of it) will enrich your course, and whether you can fit it in during a time the graduate student is free. If you can agree on a date, great! Ideally this date will be at least 1 month away to allow sufficient time for lesson development and revision.

The next step is to arrange a meeting time over the phone or in person with the graduate student. The graduate student will bring a rough draft of the lesson to this meeting, including any student handouts or other materials to be printed. During this meeting, it is crucial that you offer your expertise regarding the accessibility of the language and content of the lesson to your students. Graduate researchers will have little to no experience communicating any science, let alone sophisticated research, to K-12 audiences. One of the goals of the lesson is for the graduate student to be able to communicate some aspect of their research to the students and to allow the students to experience the joy of discovery themselves through a hands-on activity, demonstration or lab experiment.

It is particularly important at this initial meeting to assess the feasibility of the lesson plan given the time, space and curricular constraints of your classes. Please be as clear as you can with the graduate student regarding what materials and equipment you can provide, from



photocopies to lab glassware, computers, projectors, etc. By the end of your first meeting, you and the graduate student should be perfectly clear about who is providing what materials on the day of the lesson.

It will also be helpful if you can tell the graduate student what your students will have learned about the lesson topic by the time it is taught. You will also need to provide the graduate student with several logistical details such as your class size, the time allotted for actual teaching (after roll call, announcements, etc.) and any special school rules you think he or she will need to know.

Based on this initial meeting, the graduate student will revise the lesson plan and complete a list detailing who will be providing what equipment or materials. This semi-final draft will be e-mailed to you about 2-weeks before the lesson date. At this point, it is crucial that you read the lesson over and ensure it is feasible and appropriate for your students. Any feedback you can provide the graduate student will be very helpful for them.

The graduate student will then make the final changes and e-mail you the final draft one week before the lesson date. If there are any changes in the materials you can provide, please let the graduate student know as soon as possible so they can look for alternate sources.



Have fun! At this point you should have a well-planned lesson that will excite both you and your students and allow you to learn about some of the cutting edge biophysics research being done at the University of Illinois! We hope this will inspire your students to consider college majors and careers in science.