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Using a Model System Workshop to Teach Cell Biology

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Extended Abstract

Numerous schools have integrated student centered active learning approaches into their biology classes even at early stages in the careers of undergraduates. These experiences enhance the development of critical thinking skills and communication skills (Derting and Ebert-May, 2010, Fechheimer et al., 2011, Rubble and Lom, 2008, Ruis-Primo et al., 2011, Watson, 2008, Wei and Wooden, 2011, Weigant et al., 2011). Undergraduate research is an example of such an approach. Students develop critical thinking skills, learn to work independently from the teacher and in many cases this experience stimulates an interest in science in these students. These courses try to link the knowledge that students gain in traditional classes with the practice of performing laboratory research (Fechheimer et al., 2011, Weigant et al., 2011). It is difficult to accommodate many students doing research due to a limited budget and resources of the school as well as faculty time. To overcome this obstacle, schools have been trying to incorporate laboratory research or the methods that researchers use into the curriculum. For example, teachers have the students read scientific literature in order to start the students to think like scientists and understand the steps involved with research (Wei and Wooden, 2011).

Other classes have used the active learning process to teach students skills in communication. An important skill of scientists is the ability to write and communicate their findings. During undergraduate education, however, these skills are often not given high priority. In a developmental biology class, instead of having the students write laboratory reports, they were required to submit their results in the form of a poster and give oral presentations of their posters. It was thought that the communication skills that the students learned in this class would carry over to other aspects of both their professional and non professional lives (Watson and Lom, 2008). Another student explained that when a student works on a project under the direction of a faculty member they are usually required to write a paper on their work which enhances their writing skills. In addition, during the process of research, the students also develop critical thinking skills (Reynolds and Thompson, 2011).

In the present study, we have organized and held a workshop at Morehouse College in the summer of 2011 in model systems in cell biology. Our goals were to introduce students, even those in the beginning levels of their careers, to model systems. We hoped that this experience would build critical thinking skills in the students and we hoped to interest students in pursuing a career in cell biology research. To improve their communication skills, we taught the students how to present their work through posters and explained that this is how scientists present their work.

Students were recruited from metro Atlanta institutions via blast e-mails and campus advertisements. The participants were from Morehouse College (Atlanta, Georgia), Clayton State University (Morrow, Georgia) and the University of Georgia (Athens, Georgia). In this study, 17 students participated. In this group, 5 students attended the conference for 8-10 days; one student attended the conference for 5-7 days; and two students attended the conference for 3-4 days. There were students who attended the conference for less than 3 days but they were not included in the analysis of the data since we did not feel that they had sufficient time to learn about the model systems. The participants in this study included two students who had attended two years of college; two students who had attended three years of college; three students who had attended four years of college; one student who did not designate how many years of college they had attended. At this workshop, experiments were performed on *Chlamydomonas reinhardtii, Escherichia coli*, and *Caenorhabditis elegans* and a lecture on *Saccharomyces cerevisiae* was presented.

The students were given a pre-test on day 1 and a post-test at the conclusion of the workshop. These tests allowed the instructors to learn about the background and interests of the students including their level of education, how many days they attended the workshop and if it they thought they would pursue a career in research. Questions

on the assessment covered the scientific method, model systems in general and some specifics about *C. reinhardtii* and *C. elegans*. In addition, there were questions about some basic laboratory techniques and calculations for preparing solutions.

During this workshop, students were required to perform math calculations in order to perform their experiments. They did so under the guidance of the instructors. In addition, at the end of the workshop after a presentation on how to make a poster was given, the students selected 1-2 experiments and made a poster on the computer using PowerPoint.

Although the average attendance was only four days, there was a 33% gain in knowledge. We feel that this workshop was a very important introduction to research for many of the students. It taught them not only about model systems but about critical thinking and communication skills. Some of the participants commented that they did not really know what research was about and that this workshop was so interesting that they would like to learn more about cell biology and possibly pursue a career in research.

Keywords: cell biology, teaching

Link to Original Poster: http://www.ableweb.org/volumes/vol-34/poster?art=64

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